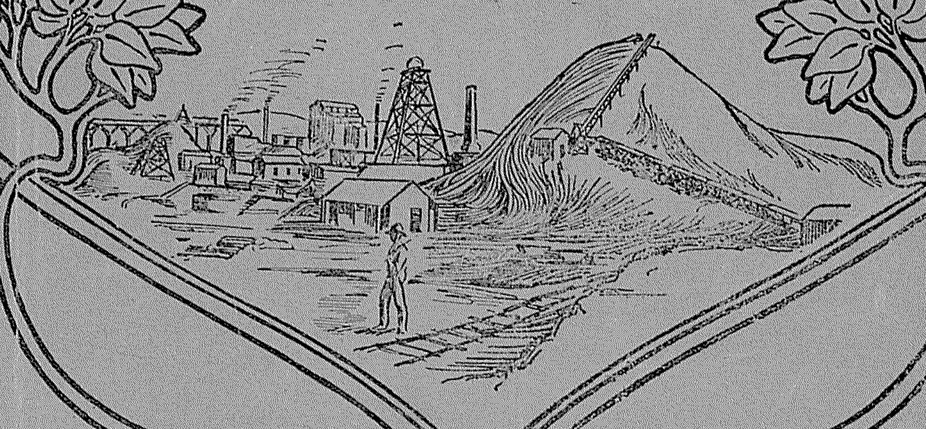
REPORT
OF THE
DEPARTMENT OF MINES
FOR THE YEAR
WESTERN · 1926. · AUSTRALIA



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

1927.

WESTERN AUSTRALIA.

REPORT

OF THE

DEPARTMENT OF MINES

FOR THE YEAR

1926.

Presented to both Houses of Parliament by His Excellency's Command.

[FIRST SESSION OF THE THIRTEENTH PARLIAMENT.]

PERTH:
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1927.

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ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1926.

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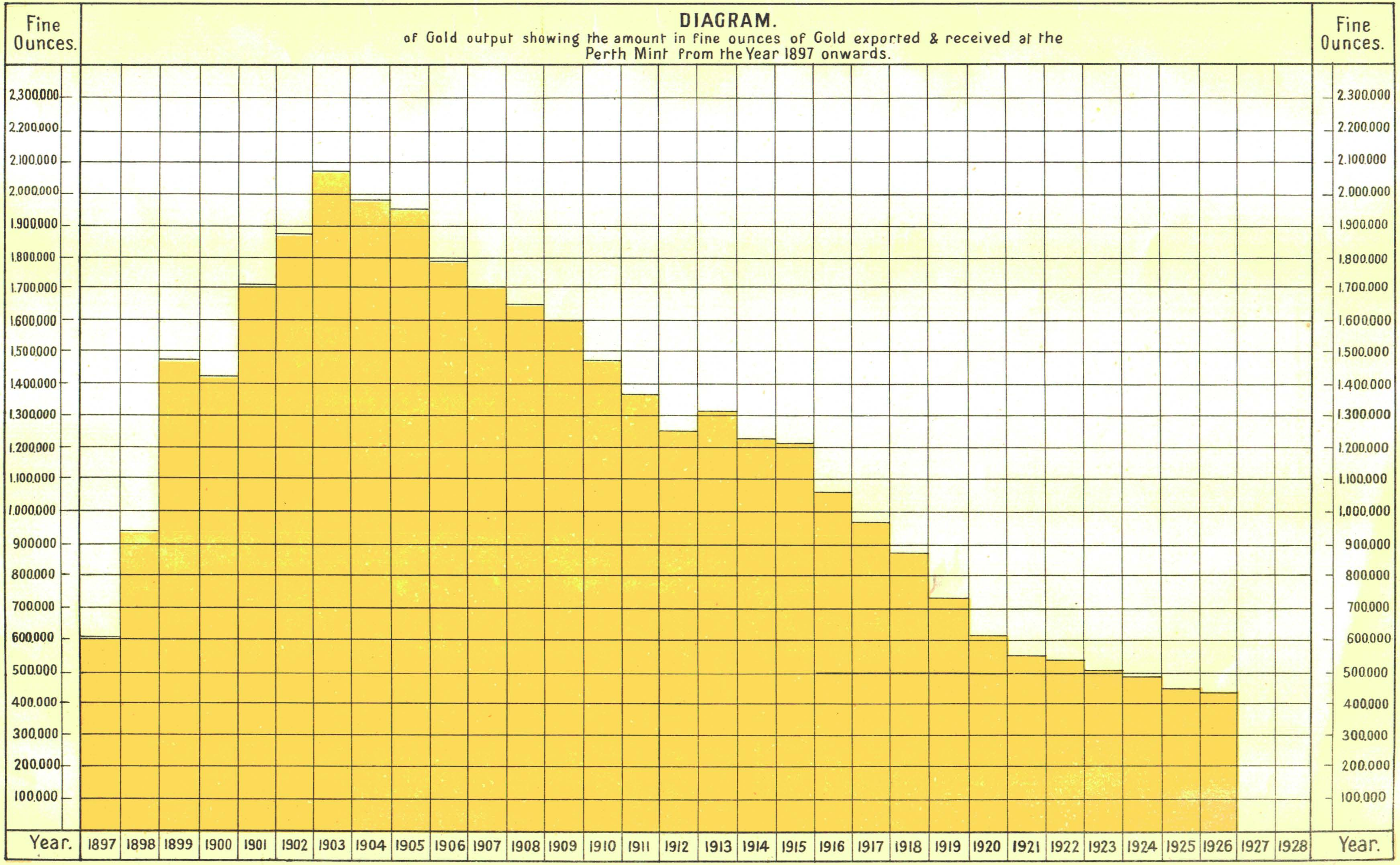
Fine Ounces.
DIAGRAM.
of Gold output showing the amount in fine ounces of Gold exported & received at the Perth Mint from the Year 1897 onwards.
Fine Ounces.
2.300.000
2.200.000
2.100.000
2.000.000
1.900.000
1.800.000
1.700.000
1.600.000
1.500.000
1.400.000
1.300.000
1.200.000
1.100.000
1.000.000
900000
800.000
700.000
600.000
500.000
400.000
300.000
200.000
100.000
Year.
1897
1898
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1900
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1917
1918
1919
1920
1921
1922
1923
1924
1925
1926
1927
1928
Year.
1926.

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STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines for the State of Western Australia for the Year 1926.

To the Hon. the Minister for Mines.

Sir,—

I have the honour to submit the Annual Report of the Department for the year 1926, with summaries of reports from the Wardens and other officers, together with various comparative tables furnishing statistics relating to the Mining Industry of the State.

Reports from the officers controlling the various sub-departments are also submitted.

I have, etc.,

M. J. CALANCHINI,

Under Secretary for Mines.

Department of Mines,

Perth, 31st March, 1927.

DIVISION I.

Summary by the Under Secretary for Mines.

PART I.—GENERAL REMARKS.

The value of the mineral output of the State for the year 1926 was £2,371,864, being £22,026 less than that for the previous year. Copper ore exported showed a decrease of 1,201 tons. Coal showed an increase, but tin, silver, and lead decreases.

The value of the gold yield was £1,857,716, being 78.32 per cent. of the total output.

The value of the coal output was £394,400, silver £8,863, and tin £10,450.

The dividends paid by mining companies amounted to £61,479, and in the preceding year £55,224, an increase of £6,255.

The total dividends paid to the end of 1926 amounted to £28,622,180. To the same date the total mineral production was £166,678,705, and the total gold production £155,927,839.

GOLD.

The gold yield shows a decline, being 3,909 fine ounces less than in 1925, which was 43,783 fine ounces less than in 1924.

The average value per ton of ore treated in the State as a whole has fallen from 45.84 shillings in 1925 to 45.41 shillings in 1926; and in the East Coolgardie Goldfield, which produced over 70 per cent. of the State's reported yield, it rose from 46.04 shillings to 47.39 shillings.

Comparing the tonnage of ore treated in 1925 and 1926, there was a decrease of 7,343 tons in the latter year, during which 792,955 tons were treated.

There were increases in Mount Margaret, Murchison, Yalgoo, Peak Hill, North-East Coolgardie, Pilbara, Dundas, Yilgarn, and East Murchison of 16,496, 5,892, 4,587, 1,356, 1,328, 966, 935, 716, and 394 tons respectively. All the others treated less tonnage, the largest decreases being in East Coolgardie, Coolgardie, Broad Arrow, and North Coolgardie of 19,469, 9,278, 8,815, and 2,406 tons respectively. So far as can be ascertained, there has not been any improvement in regard to working costs.

There were increases in the production from Dundas, Gascoyne, Kimberley, Mount Margaret, Murchison, North-East Coolgardie, Peak Hill, and Yalgoo; the others reported decreases.

The acreage held under mining leases for all minerals is 52,236 acres, being a decrease of 566 acres when compared with 1925. The area leased for gold mining is lesser by 815 acres and for other minerals greater by 249 acres.

The area held under prospecting areas is 9,868 acres, including 256 acres for coal. This is a decrease of 24,551 acres on the area held in 1925, the area held for coal mining being reduced by 24,744 acres.

The number of men engaged in all classes of mining was 5,437, a decrease of 574 on the number employed in 1925. The number of men engaged in mining for minerals other than gold decreased by 53, due to a falling off in the numbers employed in lead mining which offset improved numbers in tin and coal mining. In mining for other minerals, there was little alteration.

In gold mining there was a decrease of 521.

The average value of gold produced per man employed on gold mines was £376.60 in 1925 and £410.36 in 1926.

The average tonnage raised per man was 180.75 tons and in the previous year 164.33 tons.

The Miners' Phthisis Act, enacted for the purpose of ascertaining the exact position with regard to the health of men engaged in the mining industry, was proclaimed on the 7th September, 1925, and applies to all persons occupied or employed in mining operations on, in, or about a mine on or after the 7th June, 1925.

The Act provides for the compulsory examination of all persons employed in mines, the prohibition of the further employment on, in, or about a mine of any found to be suffering from tuberculosis, and the payment of compensation unless other suitable employment is found for them. Men suffering from miners' phthisis uncomplicated by tuberculosis, and whose condition is such that further employment on, in, or about a mine or part of a mine may be detrimental to their future health, are notified accordingly, but no provision is made for payment of any compensation to them. The Government, however, has in view a scheme of land settlemnt, by which it is hoped to absorb some of those who may wish to leave the mines.

The medical examinations commenced on the 14th September, 1925, and were completed at the end of October, 1926. The total number of men examined was 4,017, of whom 642 were found to be suffering from miners' phthisis, comprising 459 in the early stage and 183 in the advanced stage; 131 were reported to be suffering from miners' phthisis, complicated by tuberculosis, and nine from tuberculosis only, while 3,235 were reported as normal.

It is intended to hold periodical examinations and these will commence early in the year.

In the East Murchison field there was a small decrease.

The Black Range district was exceedingly quiet.

At Sandstone, the Government is carrying out some diamond drilling in the hope of locating payable deposits.

In the Lawlers district there was practically no change.

In the Wiluna district an improved output was reported. At Wiluna a vigorous development policy was being carried out by the Wiluna Gold Mines, Limited, and a large number of men was employed.

At Cole's Find, Mount Hilda and Diorite centres there was a large amount of prospecting and some good crushings were raised.

The Murchison field had an increase.

In the Meekatharra district there was a small increase and the position was well maintained.

In outlying centres a few prospectors were at work.

In the Cue district mining was quiet, but notwithstanding this, there was a small increase.

At Reidy's the Mararoa Company was actively developing its property.

In the Day Dawn district production was limited to three or four mines, but at Lake Austin a good crushing was reported from the "Mainland Consols."

In the Mount Magnet district there was an increase. The principal activity was at Boogardie and Mt. Magnet where several prospectors were producing. From Moyagee a good crushing was reported. Other centres were quiet.

The Mt. Margaret field had an increase of 1,778 fine ounces. In the Mount Margaret district there was a slight improvement consequent on regular production from the King of Creation mine. One or two other mines were producing, but generally the district was very quiet.

In the Mount Morgans district the chief outputs were from the Westralia Mount Morgans at Mount Morgans and the "Devon" at Linden; elsewhere only a small amount of prospecting was going on.

In the Mount Malcolm district there was an increase, the principal producer as hitherto being the Sons of Gwalia Mine. No new finds of any promise were reported.

The Coolgardie field recorded a decrease.

In the Kunanalling district the producing mines maintained their output and the position was little changed.

At Gibraltar only one mine, the "Carlton," is now working and there is no promise of any early improvement.

In the Widgiemooltha, Burbanks, and other centres only a small amount of prospecting is in evidence. The Government is putting down bores in the vicinity of Coolgardie in the hope of locating fresh deposits.

At St. Ives the Reward Mine has been let on tribute. Several other properties are being worked, but nothing of note has been reported.

The North Coolgardie field recorded a decrease.

In the vicinity of Menzies a couple of prospecting shows had good crushings which should stimulate efforts in the locality.

At Comet Vale the "Gladsome and Sand Queen" Mine has been acquired by a company and is now being vigorously worked.

At Goongarrie and Mount Ida a little prospecting was in evidence. In the Ularring district an effort is being made to re-open the "Riverina South" mine, the possibilities of which are thought to be considerable.

The Niagara and Yerilla districts remained exceedingly quiet.

The North-East Coolgardie Goldfield had a small increase but there was little change.

At Kurnalpi a find of some promise was made, but shortage of water is retarding development.

The Broad Arrow field had a large decrease consequent on lessened outputs from the Associated Northern and other mines in the Ora Banda district. Milling operations have been restricted on account of a shortage of water and this has also hampered prospecting throughout the other centres of the field.

The rush at Bardoc reported last year did not result in anything noteworthy being located.

In the East Coolgardie Goldfield the number of men engaged in mining was 2,272, and in 1925 2,723, a decrease of 451. This goldfield gave employment to 50 per cent. of the number of men engaged in gold mining, and the reported production during the year was 304,037 fine ounces, over 70 per cent. of the total reported yield.

The tonnage treated was 543,842 tons, being 19,469 tons less than in 1925. The yield showed only a slight decrease amounting to 1,732 fine ounces. The average grade of the ore per ton rose from 46.04 shillings in 1925 to 47.39 shillings in 1926.

In the Yilgarn Goldfield there was a decrease but a considerable amount of prospecting was in progress at the various centres.

At Burbidge the Great Victoria Mine was a steady producer but, unfortunately, present appearances do not indicate a long life.

At Westonia one or two prospectors got encouraging results.

At Hollow's Find much activity was shown and a good deal of optimism prevails regarding the finds there.

At Manxman the Radio was a consistent producer, and at Golden Valley the Valley Queen was working throughout the year, and its future seems promising.

In the Dundas field there was a small increase. On the old "Mararoa" mine plant was erected and the owner has much faith in the possibilities of his property. A few other mines were working, but there was not much change.

The Phillips River field recorded a small decrease on the previous year, but the gold output is infinitesimal. The chief production has always been copper, but the low price ruling for this metal has paralysed the industry for the time being, and none was produced. Success has not yet been achieved by the local company operating the new flotation process from which much was hoped.

In the Northern goldfields, Kimberley, West Kimberley, West Pilbara, Ashburton, and Gascoyne no development of any note was reported.

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 1926.

FIG. 1.

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

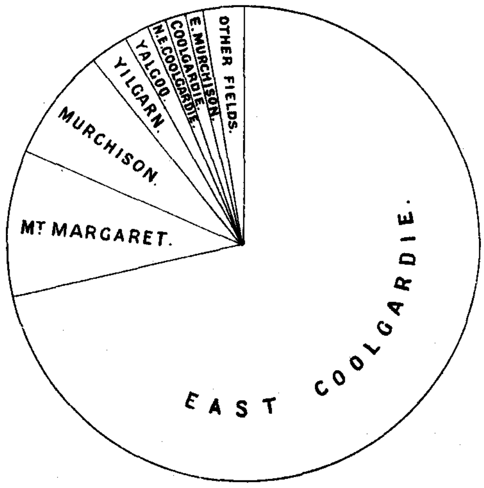


FIG. 2.

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

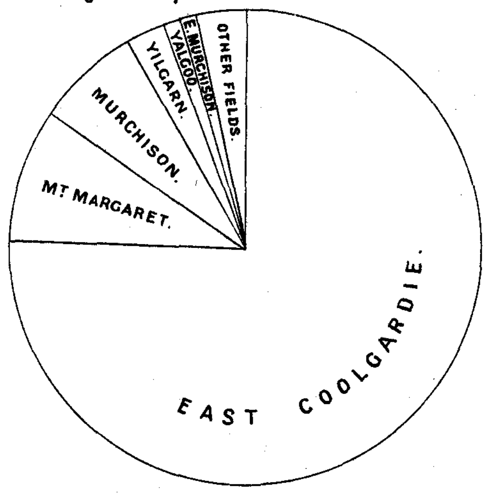


FIG. 3.

Value of Gold and other Minerals.

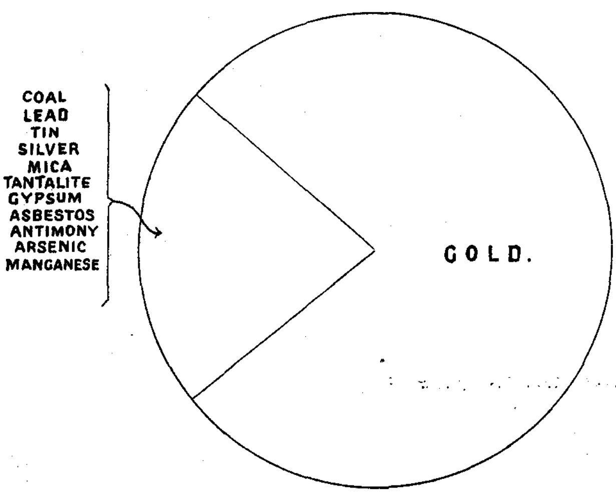


FIG. 4.

Value of Minerals other than Gold.

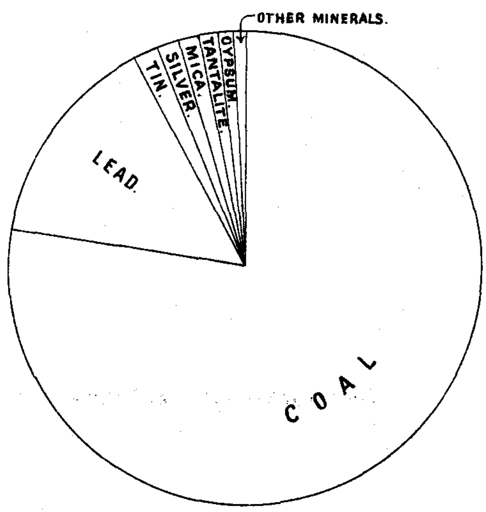


FIG. 5.

Areas of Land leased for Goldmining on various Goldfields.

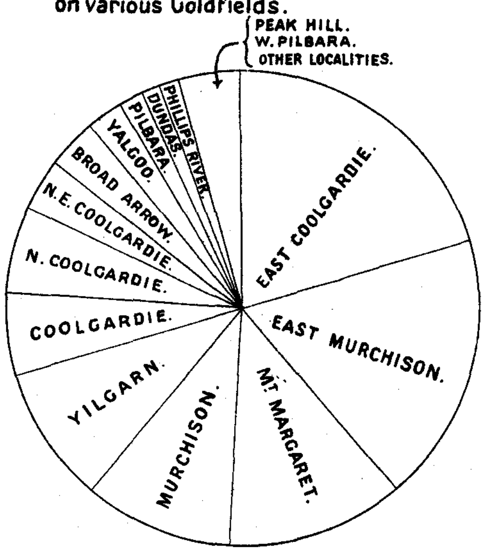
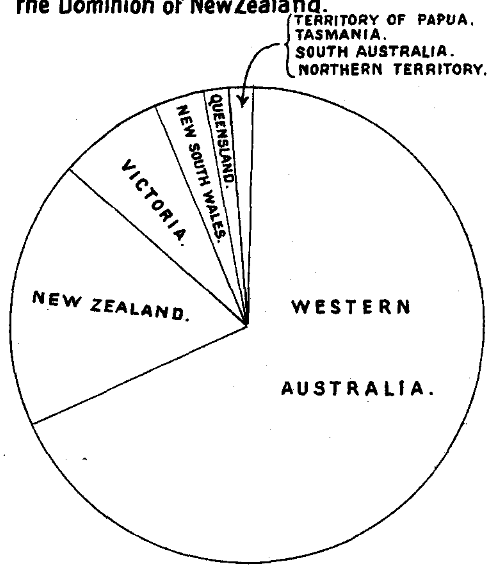


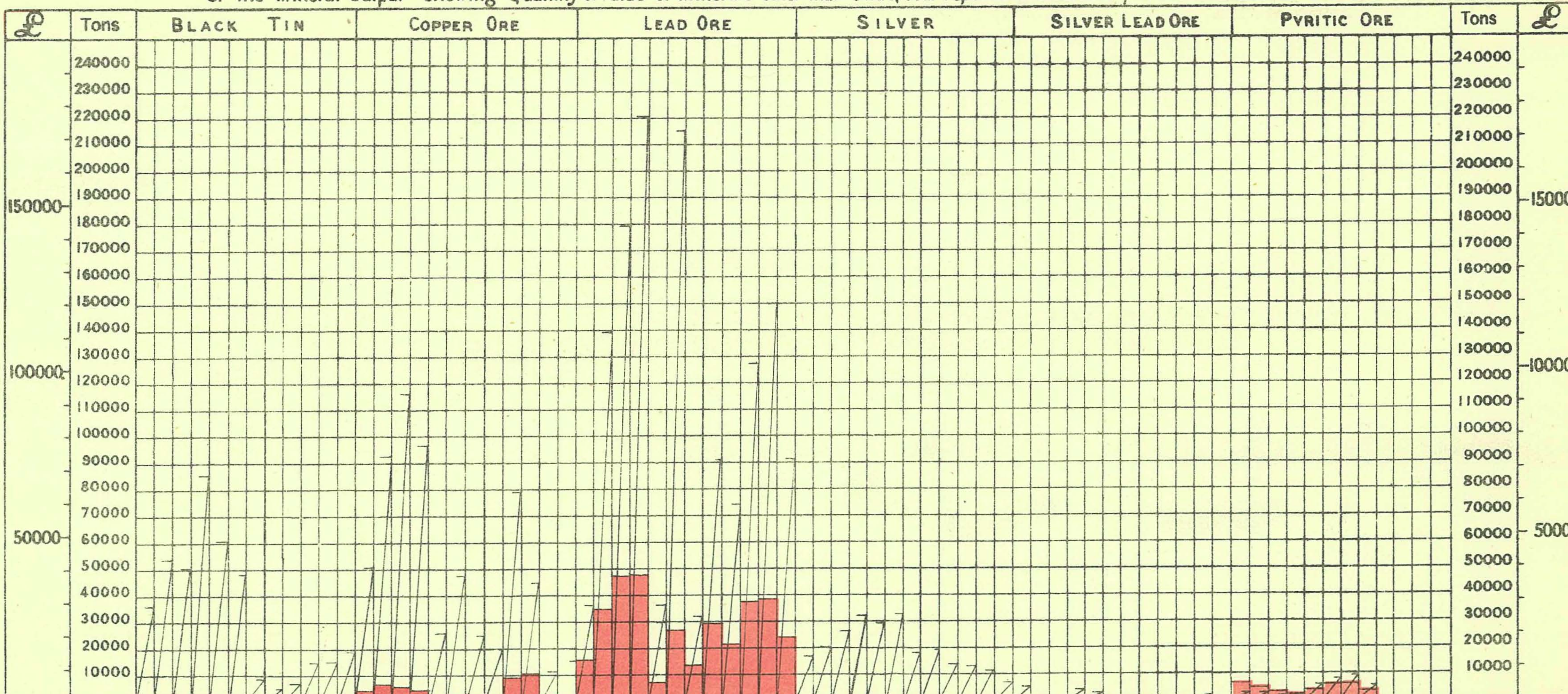
FIG. 6.

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



DIAGRAM

of the Mineral Output - showing Quantity & Value of Minerals other than Gold & Coal reported to the Mines Dept from the Year 1915 onwards



Year	Black Tin Value £	Black Tin Quantity Tons	Copper Ore Value £	Copper Ore Quantity Tons	Lead Ore Value £	Lead Ore Quantity Tons
1915	28064	339	40998	4499	29396	15676
1916	43258	435	74376	6697	111642	34622
1917	33192	307	93711	6489	144684	45865
1918	78637	395	77527	4983	176330	47080
1919	40830	281	21530	1277	29841	7386
1920	38865	232	37945	1962	172483	27716
1921	7238	67	20162	1150	25649	10330
1922	3839	41	16133	1195	72338	29603
1923	5984	52	63184	9873	59194	21635
1924	11517	81	36011	10755	101219	36750
1925	12373	79	8952	2470	119299	37866
1926	15572	97	NIL	NIL	72872	23973

Year	Silver Value £	Silver Quantity	Silver Lead Ore Value £	Silver Lead Ore Quantity Tons	Pyritic Ore Value £	Pyritic Ore Quantity Tons
1915	13793	130120 Ozs	4429	299	2368	6558
1916	16714	118677 Ozs	554	68	2263	4409
1917	22872	124191 Ozs	NIL	NIL	1752	3575
1918	25442	118748 Ozs	3461	237	1629	2252
1919	24023	93142 Ozs	3116	215	4919	4136
1920	26230	95744 Ozs	NIL	NIL	7276	6020
1921	14770	89140 Ozs	NIL	NIL	7871	6116
1922	15172	98050 Ozs	NIL	NIL	4203	3441
1923	10930	76124 Ozs	NIL	NIL	NIL	NIL
1924	10135	66341 Ozs	NIL	NIL	NIL	NIL
1925	8736	60529 Ozs	1898	81	NIL	NIL
1926	5710	44263	1305	90	NIL	NIL

NOTE. The Pink denotes Quantities produced and Diagonal lines Values thereof

Minerals not shown above.

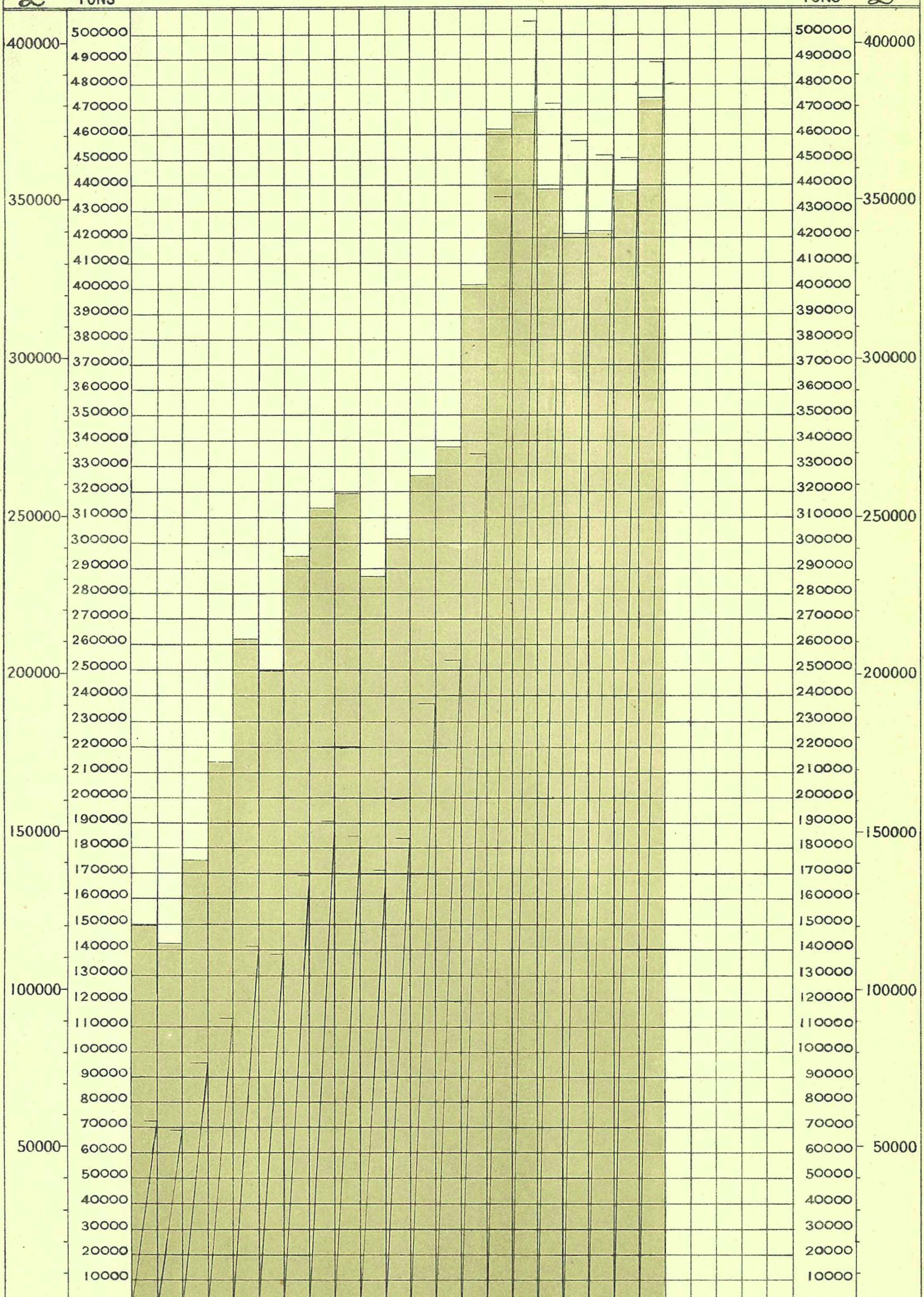
Tantalite 19 tons, Value £2357
Gypsum 3918 " " £5618
Asbestos 105 " " £2728
Also reported in the year 1925.

Previous to 1915 the Quantity & Value of various Minerals reported amounted to ....

Black Tin ..	14299 Tons	£1,142,902
Copper	201879 "	1,254,298
Ironstone ...	57820 "	36,695
Lead	61820 "	134,711
Asbestos	43 "	1,754
Silver Lead ...	2064 Tons	£22,427
Tantalite	89 "	13,486
Limestone	93706 "	18,290
Silver	1,537,935 Ozs.	180,846
Total		£2,805,409

DIAGRAM

Of the Coal Output - Shewing Quantity & Value as reported to Mines Dept from 1906 onwards



Year		Value £	Quantity Tons
1906		57998	149765
1907		55158	142373
1908		75694	175248
1909		90965	214302
1910		113699	262166
1911		111154	249890
1912		135857	295079
1913		153614	313818
1914		148684	319210
1915		137589	286666
1916		147823	301526
1917		191822	326550
1918		204319	337039
1919		270355	401713
1920		350346	462021
1921		407117	468 817
1922		381555	438443
1923		368949	420714
1924		363255	421864
1925		363203	437461
1926		394400	474819

1926.

In the Pilbara field there was a small decrease and no improvement in any of the gold mines.

TIN.

The quantity of tin exported was 67 tons, valued at £10,450, a decrease in tonnage of 41 tons and in value of £4,942.

The Greenbushes tinfield produced 61.41 tons, valued at £10,126, an increase in tonnage of 6.14 tons and in value of £1,362; the Pilbara field 35.42 tons valued at £5,446, an increase in tonnage of 11.46 tons and in value of £1,837. None was produced in any other field.

TANTALITE.

The production of 19.45 tons of this mineral, valued at £2,357, was reported from the Pilbara field. This is an increase in tonnage of 13.20 tons and in value of £1,607 on the production in the previous year.

COPPER.

The low price ruling for this metal resulted in an entire absence of production.

COAL.

The output of coal was 474,819 tons, being 37,358 tons more than in 1925.

All the production was at Collie, where five (5) collieries were contributing.

The deposits at Wilga remained unworked but it is expected that something will be done in regard to them during the next year.

At Eradu boring operations by the Government are now in progress as a result of which it is hoped workable deposits will be revealed.

The number of men employed, 686, is greater by nine men than in 1925 and the output per man was, in 1925, 646 tons and in 1926, 692 tons.

OIL.

Boring operations are proceeding on the area known as "Freney's" in the north of the State.

The Company operating, the Freney Kimberley Oil Company, Ltd., is being subsidised by the Federal Government and the boring is being carried out on sites suggested by an expert on behalf of that Government.

No boring for oil is being carried out elsewhere in the State at present.

ASBESTOS.

In the Pilbara field 91.45 tons, valued at £2,436, were produced, an increase in tonnage of 41.45 tons and in value of £817.

In the West Pilbara field the production was 13.89 tons, valued at £292, an increase in tonnage of 13.15 tons and in value of £270.

In each field the deposits are deemed well worth exploitation.

OTHER MINERALS.

The quantity of silver obtained as a by-product and exported was 68,413 ounces, valued at £8,863, and in the preceding year 81,226 ounces, valued at £11,661, a decrease of 12,813 ounces and £2,798.

Arsenical ore valued at £347 was exported, also 4½ tons of antimony valued at £85, 8 tons of felspar valued at £250, 82 tons of manganese valued at £503, 4 tons of mica (value unknown), and 4,162 tons of lead and silver-lead valued at £76,741, a decrease in tonnage of 502 tons and in value of £26,559. In addition, the production of gypsum to the extent of 3,918 tons, valued at £5,618, was reported, an increase in tonnage of 858 tons and in value of £1,500.

MINING GENERALLY.

The Territory of Papua had an increase of 3,349 fine ounces of gold, but all the States of the Commonwealth and New Zealand recorded decreases.

The Western Australian production was 68.25 per cent. of the total for Australasia, and in the preceding year 65.28 per cent.

The continued falling-off in the output has caused the Government the gravest concern, and the most sympathetic consideration and generous financial assistance has been extended wherever possible with a view to stemming the drift, stimulating production from existing mines and, if possible, adding to their number.

Of the amount granted to the State, as a result of the report of the Disabilities Commission, a large sum (£165,924) has been earmarked to be applied towards assistance to the industry.

An offer has been made to provide cheaper power for the Kalgoorlie mines by the establishment of an up-to-date station, and it now remains for the interested mine owners to indicate the extent to which they would avail themselves of this provision before further action can be taken.

Considerable concessions in regard to water supplies and charges at State batteries have also been extended.

The Commonwealth Development and Migration Commission appointed a Technical Committee to visit the State and inquire into matters with a view to reporting how best assistance could be rendered to revive the industry. The committee spent a considerable time here, and it is expected that their conclusions will be known early in the year. It is thought that whatever assistance is recommended, the Federal Government will accord.

In mining for base metals, the low prices ruling for most of them caused diminished output.

The assistance to prospectors by way of sustenance, explosives, loans of equipment and transport facilities, was continued. The Board controlling this activity recommended approval of 173 applications, representing 262 men, and granted extensions in 123 instances. The expenditure amounted to £4,798 0s. 7d. The find in the vicinity of Glenelg Hills (Hollow's Find), and which attracted considerable attention, was made by parties which had been assisted by the Board. Gold to the value of approximately £2,700 was reported as having been obtained by assisted prospectors.

The area under prospecting areas for gold and minerals apart from coal, viz., 9,612 acres, is greater than in 1925 by 193 acres, an indication that the interest in prospecting is well sustained.

The expenditure incurred in rendering assistance to mine owners and the industry generally, under the provisions of the Mining Development Act, totalled £79,607 13s. 11d. Details relative to most of this expenditure are given in the report of the State Mining Engineer, Division II. of this report.

In addition guarantees were given to banks on behalf of several mine owners, the liability of the Government at the close of the year in respect to these being £54,500.

PART II.—MINERALS RAISED.

TABLE 1.

Quantity and Value of all the Minerals produced during 1925 and 1926.

Description of Minerals.	1925. Quantity.	1925. Value.	1926. Quantity.	1926. Value.	Increase or Decrease for Year compared with 1925. Quantity.	Increase or Decrease for Year compared with 1925. Value
		£		£		£
1. Antimony (exported), statute tons	...	...	4½	85	+ 4½	+ 85
2. Arsenical ore (exported), statute tons	*	1,045	*	347	...	— 698
3. Asbestos (reported), statute tons	51	1,641	105	2,728	+ 54	+ 1,087
4. Coal (raised), statute tons	437,461	363,203	474,819	394,400	+ 37,358	+ 31,197
5. Copper — Ore (exported), statute tons	1,201	18,200	...	...	— 1,201	— 18,200
5. Copper — Ingot, Matte, etc. (exported), statute tons	...	...	1	84	... 1	+ 84
6. Felspar (exported), statute tons	...	...	8	250	+ 8	+ 250
7. Gold (exported and minted), fine ounces	441,252	1,874,320	437,343	1,857,716	— 3,909	— 16,604
8. Gypsum (reported), statute tons	3,060	4,118	3,918	5,618	+ 858	+ 1,500
9. Lead and Silver Lead (exported), statute tons ...	4,664	103,300	4,162	76,741	— 502	— 26,559
10. Manganese (exported), statute tons	...	...	82	503	+ 82	+ 503
11. Mica (exported), statute tons	...	...	4	† 8,328	+ 4	+ 8,328
12. Silver (exported), fine ounces	81,226	11,661	68,413	8,863	— 12,813	— 2,798
13. Tantalite, (exported) statute tons	5	1,010	24	5,751	+ 19	+ 4,741
14. Tin (exported), statute tons	108	15,392	67	10,450	— 41	— 4,942
Total Values	...	2,393,890	...	2,371,864	...	— 22,026

* Contained in Gold ore. † The value stated for Mica is that declared by the exporter at the time of shipment, but later information indicates that it is overstated.

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.
	£	£	
1901	8,515,623	6,920,118	81·27
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
Total since 1900 ...	270,685,304	130,691,580	48·28

* The Mineral Exports for 1925 were abnormally low, for the reason that the movement of fine gold bars and gold specie was restricted during the year, probably due to the uncertainty in the London-Australian exchange position, also to the restoration of the gold standard and the opportunity afforded Banks to replenish depleted stocks. The Exports of Minerals other than gold were approximately the same as in the previous year.

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 Gold per ton of ore treated.

Goldfield.	Reported Yield. 1925.	1926.	Percentage for each Goldfield. 1925.	1926.	Average Value of Gold per ton of Ore treated. 1925.	1926.
	fine ozs.	**fine ozs.**			shillings	**shillings.**
1. Kimberley	29	**65**	·01	**·01**	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	2,502	**2,876**	·57	**·55**	149·19	**82·29**
4. West Pilbara	35	**29**	·01	**·01**	...	...
5. Ashburton	11	**10**	·01	**·01**	...	...
6. Gascoyne	3	**85**	·01	**·02**	...	...
7. Peak Hill	1,636	**2,140**	·37	**·50**	168·82	**82·71**
8. East Murchison	5,399	**5,336**	1·24	**1·24**	86·93	**74·89**
9. Murchison	29,439	**33,487**	6·77	**7·82**	46·29	**47·38**
10. Yalgoo	2,828	**6,382**	·65	**1·49**	47·85	**56·26**
11. Mt. Margaret	41,850	**43,628**	9·63	**10·19**	34·68	**31·05**
12. North Coolgardie	4,550	**2,472**	1·05	**·58**	102·94	**162·66**
13. Broad Arrow	8,242	**1,460**	1·89	**·34**	69·94	**89·42**
14. North-East Coolgardie	5,898	**6,199**	1·36	**1·45**	73·55	**61·47**
15. East Coolgardie	305,769	**304,037**	70 37	**70·98**	46·04	**47·39**
16. Coolgardie	10,309	**5,998**	2·37	**1·40**	48·95	**55·56**
17. Yilgarn	13,297	**11,792**	3·06	**2·75**	35·87	**31·11**
18. Dundas	2,601	**2,682**	·60	**·62**	134·83	**106·50**
19. Phillips River	27	**19**	·01	**·01**	37·29	**65·47**
State generally	108	**133**	·02	**·03**	...	...
Totals and averages	434,533	**428,330**	100·00	**100·00**	45·84	**45·41**

The total gold yield of the State is as shown in Table 1, being the amount of gold exported, and also that lodged at the Royal Mint, which total includes alluvial gold and gold not reported to the 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.

Number of Gold-producing Mines in the several Goldfields and Districts during 1925 and 1926.

Goldfield.	District.	1925. District	1925. Goldfield.	1926. District.	1926. Goldfield.	Increase or Decrease.
Kimberley	... ...	...	...	...	...	...
West Kimberley	... ...	...	...	...	...	...
Pilbara	Marble Bar	10	10	10	**11**	+ 1
	Nullagine	...		1		
West Pilbara	... ...	...	...	...	...	...
Ashburton	... ...	...	...	...	...	...
Gascoyne	... ...	...	...	...	...	...
Peak Hill	... ...	...	4	...	**9**	+ 5
East Murchison	Lawlers	6	26	5	**24**	— 2
	Wiluna	13		14		
	Black Range	7		5		
Murchison	Cue	4	32	5	**31**	— 1
	Meekatharra	13		10		
	Day Dawn	5		3		
	Mt. Magnet	10		13		
Yalgoo	... ...	...	9	...	**9**	...
Mt. Margaret	Mt. Morgans	2	11	2	**7**	— 4
	Mt. Malcolm	4		2		
	Mt. Margaret	5		3		
North Coolgardie	Menzies	5	9	8	**10**	+ 1
	Ularring	...		...		
	Niagara	2		...		
	Yerilla	2		2		
Broad Arrow	... ...	...	10	...	**9**	— 1
North-East Coolgardie ...	Kanowna	6	6	8	**8**	— 2
	Kurnalpi	...		...		
East Coolgardie	East Coolgardie ...	47	49	40	**42**	— 7
	Bulong	2		2		
Coolgardie	Coolgardie	18	26	14	**18**	— 8
	Kunanalling	8		4		
Yilgarn	... ...	...	25	...	**26**	+ 1
Dundas	... ...	...	6	...	**7**	+ 1
Phillips River	... ...	...	1	...	...	— 1
State generally	... ...	...	...	...	**1**	+ 1
	Totals	...	224	...	**212**	— 12

TABLE 5.

Gold Yield from Registered Gold Mining Companies and Gold Mining Leases for the Years 1923, 1924, 1925, *and* 1926.

Goldfield.	Registered Companies producing over 12,000 ozs.								Registered Companies producing under 12,000 ozs.								Leases, exclusive of Sundry Claims and Treatment.							
	1923.		1924.		1925.		1926.		1923.		1924.		1925.		1926.		1923.		1924.		1925.		1926.	
	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.	No.	Fine ozs.
Kimberley	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
West Kimberley ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilbara	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	14	1,602	15	1,532	10	1,759	11	1,671
West Pilbara	...	...	...	...	...	...	...	...	...	...	1	15	...	...	...	...	...	...	...	...	...	...	...	...
Ashburton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gascoyne	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Peak Hill	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	558	6	986	4	552	9	1,035
East Murchison	...	...	...	...	...	...	...	...	6	6,494	5	1,237	3	379	3	322	15	1,356	14	1,295	23	2,655	21	2,555
Murchison	...	...	...	...	...	...	...	...	3	425	3	324	1	209	2	2,323	41	23,436	28	19,674	31	24,634	29	27,140
Yalgoo	...	...	...	...	...	...	...	...	3	5,265	2	4,368	2	924	1	3,494	15	1,446	7	847	7	1,092	8	2,099
Mt. Margaret	1	18,533	1	35,371	1	35,057	1	36,569	3	4,037	2	5,214	2	4,791	2	5,331	20	2,636	11	2,378	8	1,009	4	832
N. Coolgardie	...	...	...	...	...	...	...	...	2	8,038	1	5,981	1	2,638	1	607	11	2,036	11	1,364	8	1,003	9	214
Broad Arrow	...	...	...	...	...	...	...	...	1	55	...	...	1	6,416	...	...	12	1,574	10	1,691	9	1,005	9	658
N.E. Coolgardie	...	...	...	...	...	...	...	...	2	2,740	2	2,401	2	3,829	4	2,804	9	1,416	6	2,059	4	1,796	4	2,693
E. Coolgardie	8	334,664	9	306,476	7	280,033	7	286,305	10	14,000	10	12,967	9	12,540	8	7,311	30	13,614	34	11,083	33	8,884	27	8,616
Coolgardie	...	...	...	...	...	...	...	...	3	6,886	2	2,694	3	4,244	3	969	27	4,274	29	3,764	23	3,695	15	3,004
Yilgarn	...	...	...	...	...	...	...	...	6	2,477	6	3,163	4	7,580	5	6,009	18	4,328	17	4,496	21	4,922	21	4,897
Dundas	...	...	...	...	...	...	...	...	1	3,789	1	2,014	1	669	...	...	11	1,811	8	1,178	5	1,084	7	1,504
Phillips River	...	...	...	...	...	...	...	...	1	9	...	...	...	...	...	...	2	317	1	96	1	12	...	...
State generally	...	...	...	...	...	...	...	...	1	32	...	...	...	...	...	...	...	...	...	...	...	...	1	57
Total	9	353,197	10	341,847	8	315,090	8	322,874	42	54,247	35	40,378	29	44,219	29	29,170	230	60,404	197	52,393	187	54,102	175	56,975

TABLE 6.

Increase or Decrease in Output of certain producing Gold Mines in 1926 as compared with 1925.

Goldfield.	District.	Name of Mine.	Gold Production. 1925.	Gold Production. 1926.	Increase or Decrease for Year compared with 1925.
			fine ozs.	fine ozs.	fine ozs.
Pilbara	Marble Bar ...	1. Kitchener	398·30	146·55	— 251·75
		2. Outward Bound	341·74	311·54	— 30·20
Peak Hill ...	... ...	3. Evening Star	179·43	171·86	— 7·57
		4. No. 1 North leases	204·61	341·55	+ 136·94
East Murchison	Lawlers ...	5. Yellow Aster leases	244·60	4·77	— 239·83
		6. Corboys' Reward	82·66	436·83	+ 354·17
	Wiluna ...	7. Black Adder	364·90	129·74	— 235·16
		8. Neb	257·16	...	— 257·16
		9. Toscana	424·03	623·14	+ 199·11
Murchison ...	Cue	10. Emu North: Mararoa G. M. Co. N.L.	1,056·16	2,203·05	+ 1,146·89
	Meekatharra ...	11. Empire	493·57	106·26	— 387·31
		12. Fenian leases	313·66	67·97	— 245·69
		13. Ingliston Consols Extended leases	19,606·58	21,777·87	+ 2,171·29
		14. Ingliston	86·04	123·42	+ 37·38
		15. Marmont	194·40	90·72	— 103·68
	Day Dawn ...	16. Mainland Consols	40·19	847·97	+ 807·78
	Mt. Magnet ...	17. Hill 60	72·92	901·00	+ 828·08
		18. Revenue	591·14	40·17	— 550·97
Yalgoo	... ...	19. Brown's Reward	600·19	1,505·76	+ 905·57
		20. Brilliant G.M. Co., N.L.	546·78	3,493·58	+ 2,946·80
		21. Sweet William	210·43	69·78	— 140·65
Mt. Margaret ...	Mt. Morgans ...	22. Torquay leases	516·07	214·35	— 301·72
		23. Westralia Mt. Morgans Mines, N.L.	3,791·40	4,330·16	+ 538·76
	Mt. Malcolm ...	24. Sons of Gwalia, Ltd.	35,057·19	36,569·02	+ 1,511·83
	Mt. Margaret...	25. Lancefield G.Ms., Ltd.	999·30	1,000·57	+ 1·27
		26. King of Creation	...	401·19	+ 401·19
		27. Nil Desperandum	232·13	188·18	— 43·95
North Coolgardie	Menzies ...	28. Crusoe	585·71	5·00	— 580·71
		29. Menzies Consolidated G.Ms., Ltd.	2,638·17	607·25	— 2,030·92
Broad Arrow ...	... ...	30. Associated Northern Blocks (W.A.), Ltd. ...	6,416·16	...	— 6,416·16
		31. Orinda	344·33	121·44	— 222·89
		32. Oversight Tara United	76·21	210·16	+ 133·95
North-East Coolgardie	Kanowna ...	33. Golden Valley	1,287·48	186·21	— 1,101·27
		34. Golden Valley Main Reef	...	1,208·37	+ 1,208·37
		35. Orion Gold Mines, Ltd.	60·50	132·18	+ 71·68
		36. Kanowna Red Hill G.M. Co., N.L.	3,768·06	2,597·14	— 1,170·92
		37. Sirdar	439·43	1,000·51	+ 561·08
East Coolgardie	East Coolgardie	38. Associated Gold Mines of W.A., Ltd. ...	26,889·34	23,649·62	— 3,239·72
		39. Associated Northern Blocks (W.A.), Ltd. ...	1,818·69	2,525·55	+ 706·86
		40. Boulder Perseverance, Ltd.	37,135·51	52,027·93	+ 14,892·42
		41. Golden Horseshoe Estates Co., Ltd.	43,234·30	19,132·87	— 24,101·43
		42. Great Boulder Proprietary G.Ms., Ltd. ...	55,300·29	49,144·08	— 6,156·21
		43. Great Boulder Proprietary G.Ms., Ltd. (North End)	3,036·87	2,048·50	— 988·37
		44. Great Hope	1,901·93	2,115·11	+ 213·18
		45. Great Hope North	424·30	29·87	— 394·43
		46. Hopeful Syndicate, Ltd.	2,206·66	2,040·27	— 166·39
		47. Lake View and Star, Ltd.	52,880·35	72,643·45	+ 19,763·10
		48. North Kalgoorlie (1912), Ltd.	1,006·52	127·39	— 879·13
		49. Oroya Links, Ltd.	17,887·61	22,752·89	+ 4,865·28
		50. Pernatty Central Copper Mining Co., N.L. ...	637·12	132·25	— 504·87
		51. South Kalgurli Consolidated, Ltd.	46,705·35	46,953·95	+ 248·60
		52. Surprise North	3,151·40	1,852·78	— 1,298·62
	Bulong ...	53. Sweet Nell	547·16	35·58	— 511·58
Coolgardie ...	Coolgardie ...	54. Brennan's Idough	346·97	148·35	— 198·62
		55. Ives' Reward Gold Mines, N.L.	2,888·17	450·71	— 2,437·46
		56. Lloyd George	1,222·83	470·73	— 752·10
	Kunanalling ...	57. Carbine leases	1,460·57	1,365·31	— 95·26
		58. Turn of the Tide	252·44	97·83	— 154·61
Yilgarn ...	... ...	59. Banker: Golden Butterfly G.M. Co., N.L. ...	389·87	5·78	— 384·09
		60. Great Victoria Gold Mines, N.L.	6,808·13	4,633·54	— 2,174·59
		61. Radio	2,566·02	2,352·97	— 213·05
		62. Radio Deeps	659·85	186·63	— 473·22
		63. Spring Hill G.M. Co., N.L.	86·57	760·57	+ 674·00
		64. White Horseshoe	291·41	194·54	— 96·87
		65. Just in Time	...	958·52	+ 958·52
Dundas ...	... ...	66. Viking No. 1	606·79	373·28	— 233·51
		67. Mararoa No. 1	...	484·54	+ 484·54

TABLE 7.

Averages of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State, during 1925 and 1926.

Goldfield.	1925. Tons of Gold Ore raised and treated. Per man employed under ground.	1925. Tons of Gold Ore raised and treated. Per man employed above and under ground.	1925. Fine ounces of Gold produced therefrom. Per man employed under ground.	1925. Fine ounces of Gold produced therefrom. Per man employed above and under ground.	1926. Tons of Gold Ore raised and treated. Per man employed under ground.	1926. Tons of Gold Ore raised and treated. Per man employed above and under ground.	1926. Fine ounces of Gold produced therefrom. Per man employed under ground.	1926. Fine ounces of Gold produced therefrom. Per man employed above and under ground.
	tons.	tons.	fine ozs.	fine ozs.	tons.	tons.	fine ozs.	fine ozs.
1. Kimberley	...	...	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...	...	...
3. Pilbara	40·01	24·74	70·31	43·46	96·94	61·22	93·92	59·32
4. West Pilbara	...	...	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...	...	...
7. Peak Hill	102·84	3·47	204·46	60·58	114·66	62·24	111·66	60·62
8. East Murchison	64·27	28·72	65·78	29·40	57·66	25·39	50·84	22·39
9. Murchison	243·21	131·81	132·52	71·82	253·05	138·69	141·13	77·35
10. Yalgoo	91·25	46·04	51·41	25·94	165·62	84·26	109·68	55·80
11. Mt. Margaret	439·09	214·03	179·29	87·39	428·90	233·41	156·73	85·29
12. North Coolgardie	103·72	34·91	125·69	42·30	43·72	17·24	83·70	33·01
13. Broad Arrow	153·03	70·46	126·00	58·01	17·79	8·09	18·74	8·52
14. North-East Coolgardie ...	159·34	74·36	137·97	64·39	182·27	87·17	131·88	63·07
15. East Coolgardie	381·65	209·25	206·85	113·41	442·15	242·14	246·65	135·08
16. Coolgardie	96·88	51·99	55·83	29·96	71·01	34·07	46·44	22·28
17. Yilgarn	436·79	192·94	184·46	81·48	466·16	179·69	170·90	65·88
18. Dundas	28·01	13·84	60·93	30·10	58·65	27·78	73·51	34·82
19. Phillips River	20·67	5·64	9·07	2·47	5·67	1·42	4·37	1·09
Total Averages	314·95	164·33	169·92	88·66	346·57	180·75	185·23	96·61

The average value of gold produced per man above and under ground was £376·60 in 1925 and £410·36 in 1926. The average tonnage of ore raised shows an increase from 164·33 tons to 180·75 tons. The average tonnage raised per man is highest in the East Coolgardie Goldfield, *viz.*, 242·14 tons, average value £573·77, the next being Mount Margaret Goldfield with 233·41 tons, average value £362·29.

TABLE 8.

Output of Gold from the several States of Australia, the Northern Territory, the Territory of Papua, and the Dominion of New Zealand during 1926.

State.	Output of Gold.	Value.	Percentage of total Output of Australasia.
	Fine ozs.	£	
1. Western Australa	437,343	1,857,716	68·25
2. Victoria	49,078	208,471	7·65
3. New South Wales	19,435	82,551	3·03
4. Queensland	10,339	43,914	1·62
5. Tasmania...	4,223	17,936	·66
6. South Australia	758	3,219	·12
7. Northern Territory	153	650	·02
8. Territory of Papua	5,952	25,282	·93
9. New Zealand	113,573	482,427	17·72
Total	640,854	2,722,166	100·00

TABLE 9.

Dividends paid by Western Australian Gold Mining Companies during 1926 and Total to date.

(Compiled from information supplied by the Government Statistician's Office and the Chamber of Mines of W.A., Kalgoorlie.)

Goldfield.	Name of Company.	Capital. Authorised	No. of Shares.	Par Value Shares.	Paid up to.	Dividends. Paid in 1926. No.	Total Amount.	Grand Total paid to end of 1926.
		£		£ s. d.	£ s. d.		£	£
Peak Hill ...	Various Companies ...	...	...	...	...	...	...	160,666
East Murchison...	Various Companies ...	...	...	...	...	...	...	437,968
Murchison ...	Various Companies ...	...	...	...	...	...	...	1,992,670
Mt. Margaret ...	Various Companies ...	...	...	...	...	...	...	1,504,701
North Coolgardie	Various Companies ...	...	...	...	...	...	...	575,032
North-East Coolgardie	Various Companies ...	...	...	...	...	...	...	89,854
East Coolgardie...	Boulder Perseverance, Ltd. ...	125,000	2,130,266	0 1 0	0 1 0	2	30,229	1,528,415
Do. ...	South Kalgurli Consolidated, Ltd.	150,000	250,007	0 10 0	0 10 0	2	31,250	377,501
Do. ...	Other Companies	...	...	...	...	...	...	20,880,054
Coolgardie ...	Various Companies ...	...	...	...	...	...	...	339,495
Yilgarn	Various Companies ...	...	...	...	...	...	...	513,199
Dundas	Various Companies ...	...	...	...	...	...	...	222,625
	Total Dividends paid during 1926	...	...	...	...	...	61,479	...
	Total Dividends paid to end of 1926	...	...	...	...	...	...	28,622,180

TABLE 10.

Value of Gold Production and Percentage of Dividends paid.

Year.	Value of Gold Production.	Dividends paid by Gold Mining Companies.	Dividends % of Total Production.	Value of Gold Production by Gold Mining Companies only.	Dividends % upon Production by Gold Mining Companies.
	£	£	%	£	%
Previous to 1917	129,766,686	26,127,269	20·13	...	...
1917	4,121,645	590,856	14·34	3,310,536	17·85
1918	3,723,183	368,295	9·81	2,914,325	12·64
1919	3,118,113	338,244	10·85	2,337,433	14·23
1920	2,624,427	384,083	14·63	2,212,711	17·36
1921	2,352,098	306,958	13·05	1,787,721	17·17
1922	2,286,325	191,251	8·36	1,789,879	10·69
1923	2,143,028	73,750	3·44	1,730,712	4·26
1924	2,060,298	124,771	6·06	1,623,588	7·68
1925	1,874,320	55,224	2·94	1,526,248	3·62
1926	1,857,716	61,479	3·31	1,495,388	4·11
Total ...	155,927,839	28,622,180	18·36	*20,728,541	*12·03

* Last ten years only.

TABLE 11.

Quantity and Value of Minerals, other than Gold and Coal, reported to the Mines Department during 1926.

Goldfield, District, or Mineral Field.	1926.		Increase or Decrease for Year compared with 1925.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£
BLACK TIN.				
Pilbara Goldfield (Marble Bar District)	35·42	5,446	+ 11·46	+ 1,837
Greenbushes Mineral Field	61·41	10,126	+ 6·14	+ 1,362
Total	96·83	15,572	+ 17·60	+ 3,199
TANTALITE.				
Pilbara Goldfield (Marble Bar District)	19·45	2,357	+ 13·20	+ 1,607
COPPER ORE.				
Northampton Mineral Field	...	...	−2,469·72	− 8,952
LEAD ORE.				
Northampton Mineral Field	23,973·35	72,872	−13,892·64	− 46,427
SILVER-LEAD ORE.				
Ashburton Goldfield	...	...	− 30·00	− 630
Pilbara Goldfield (Marble Bar District)	90·50	1,305	+ 39·50	+ 37
Total	90·50	1,305	+ 9·50	− 593
ASBESTOS.				
Pilbara Goldfield (Nullagine District)	91·45	2,436	+ 41·45	+ 817
West Pilbara Goldfield	13·89	292	+ 13·15	+ 270
Total	105·34	2,728	+ 54·60	+ 1,087
GYPSUM.				
Yilgarn Goldfield	139·00	139	+ 139·00	+ 139
State generally	3,778·76	5,479	+ 718·81	+ 1,361
Total	3,917·76	5,618	+ 857·81	+ 1,500

The output of black tin shows an increase in tonnage of 17.60 tons and an increase in value of £3,199. The production of tantalite was 19.45 tons valued at £2,357, being an increase of 13.20 tons and an increase in value of £1,607 over the previous year. There was not any production of copper during the year, which consequently shows a decrease of 2,469.72 tons of ore. Lead ore shows decreases in tonnage of 13,892.64 tons and in value of £46,427, while silver-lead ore shows an increase of 9.50 tons but a decrease in value of £593. The quantity of asbestos increased by 54.60 tons and the value by £1,087. Gypsum shows an increase in tonnage of 857.81 tons and in value of £1,500.

The production of tin was again confined to Pilbara and Greenbushes Fields, and tantalite came from Pilbara goldfield. Lead ore came from Northampton mineral field, and silver-lead ore from Pilbara Goldfield. Asbestos came from Pilbara and West Pilbara goldfields, and gypsum from Yilgarn goldfield and from the State generally.

TABLE 12.

Quantity of Coal raised during 1925 and 1926, and estimated Value thereof, with 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	1925	437,461	363,203	154	523	836	·646
	1926	474,819	394,400	156	530	896	692

The number of men employed at collieries has increased by 9, and the output has increased by 37,358 tons, and the value by £31,197.

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

TABLE 13.

Total Number and Acreage of Leases held for Mining on 31st December, 1925 and 1926.

Description of Leases	1925.		1926.	
	No.	Acreage.	No.	Acreage.
Gold mining leases on Crown land	468	7,371	414	6,580
,, ,, ,, private property	1	24	...	...
Mineral leases on Crown land	236	45,088	247	45,331
,, ,, private property	10	319	11	325
	715	52,802	672	52,236

The total number of leases held for mining purposes decreased by 43 and the area by 566 acres, as compared with the year 1925. The number of leases for gold mining decreased by 55 and the area by 815 acres. The number of mineral leases increased by 12 and the area by 249 acres.

TABLE 14.

Number and Acreage of Gold Mining Leases in force each year for the Five Years ending the 31st December, 1926.

Goldfield. Name.	Goldfield. Proclaimed.	District. Name.	District. Proclaimed.	1922. Leases.	1922. Acreage.	1923. Leases.	1923. Acreage.	1924. Leases.	1924. Acreage.	1925. Leases.	1925. Acreage.	1926. Leases.	1926. Acreage.	Percentage of Total Acreage. 1925.	Percentage of Total Acreage. 1926.	Increase or Decrease in Acreage for 1926 compared with 1925. Increase	Increase or Decrease in Acreage for 1926 compared with 1925. Decrease	Goldfield.
West Kimberley ...	19–3–20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	West Kimberley.
Kimberley ...	20–5–86	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Kimberley.
Yilgarn	1–10–88	...	...	60	1,032	45	788	40	665	34	544	**33**	**619**	7·69	**9·41**	51	...	Yilgarn.
		(Private Property)	...	...	...	...	...	...	...	1	24	...	...					
Pilbara	1–10–88	Marble Bar ...	6–11–96	30	435	29	403	17	167	10	85	**11**	**91**	1·56	**1·56**	...	12	Pilbara.
		Nullagine ...	6–11–96	1	12	3	36	3	30	3	30	**2**	**12**					
Ashburton ...	11–12–90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Ashburton.
Murchison... ...	24–9–91	Cue	7–12–94	18	226	10	105	11	149	14	198	**10**	**137**	9·71	**10·06**	...	56	Murchison.
		Meekatharra ...	7–12–94	48	770	32	501	28	449	22	356	**20**	**310**					
		Day Dawn ...	10–1–96	15	228	11	122	9	79	7	73	**6**	**64**					
		Mount Magnet ...	7–12–94	21	210	18	191	11	92	10	91	**16**	**151**					
Dundas	31–8–93	...	...	22	253	14	159	13	147	8	108	**8**	**90**	1·47	**1·37**	...	18	Dundas.
Coolgardie ...	6–4–94	Coolgardie ...	7–12–94	50	865	54	965	33	521	30	474	**14**	**250**	8·21	**5·82**	...	224	Coolgardie.
		Kunanalling ...	1–9–97	11	130	12	140	12	160	10	133	**10**	**133**					
East Coolgardie ...	1–10–94	East Coolgardie	7–12–94	135	2,134	121	1,872	123	1,847	112	1,673	**87**	**1,302**	23·57	**20·65**	...	383	East Coolgardie.
		Bulong	15–4–96	13	302	30	629	2	45	3	69	**3**	**57**					
Yalgoo	23–1–95	...	...	45	753	29	520	18	285	16	239	**14**	**166**	3·23	**2·52**	...	73	Yalgoo.
North Coolgardie	28–6–95	Menzies	15–4–96	18	298	19	304	20	330	19	295	**16**	**270**	4·90	**5·73**	14	...	North Coolgardie.
		Ularring	15–4–96	13	161	5	88	3	56	...	...	**2**	**48**					
		Yerilla	15–4–96	6	81	5	75	10	149	3	51	**4**	**42**					
		Niagara	1–4–97	3	48	2	36	2	17	2	17	**2**	**17**					
East Murchison ...	28–6–95	Lawlers	1–7–04	13	212	11	174	16	248	12	178	**8**	**155**	18·00	**18·69**	...	101	East Murchison.
		Black Range ...	1–7–04	15	270	36	664	8	165	5	86	**6**	**89**					
		Wiluna	1–3–10	16	294	22	419	80	1,710	51	1,067	**48**	**986**					
North-East Coolgardie	15–4–96	Kanowna ...	15–4–96	20	276	17	251	16	256	13	165	**12**	**162**	2·55	**3·56**	45	...	N.E. Coolgardie.
		Kurnalpi ...	15–4–96	4	23	2	17	...	...	1	24	**3**	**72**					
Broad Arrow ...	20–11–96	...	...	26	401	22	341	16	257	16	274	**13**	**218**	3·70	**3·31**	...	56	Broad Arrow.
Peak Hill ...	1–4–97	...	...	7	69	13	142	6	32	8	42	**9**	**55**	·56	**·84**	13	...	Peak Hill.
Mount Margaret	1–4–97	Mount Margaret	1–4–97	20	364	40	924	12	254	9	182	**7**	**134**	11·24	**11·76**	...	57	Mount Margaret.
		Mount Malcolm...	1–4–97	30	627	31	617	29	595	25	547	**24**	**529**					
		Mount Morgans...	2–4–02	15	241	14	250	11	186	6	102	**7**	**111**					
West Pilbara ...	1–11–95	...	...	2	12	1	6	1	6	1	6	**2**	**30**	·08	**·46**	24	...	West Pilbara.
Phillips River ...	14–9–00	...	...	9	108	6	88	6	88	7	94	**6**	**88**	1·27	**1·34**	...	6	Phillips River.
Other Localities ...	...	...	...	...	...	...	...	...	...	9	156	**11**	**192**	2·10	**2·92**	36	...	Other Localities.
Gascoyne	15–4–97	...	...	2	12	2	12	4	24	2	12	...	...	·16	...	...	12	Gascoyne.
Totals ...	... ...	... ...	...	688	10,847	656	10,839	560	9,009	469	7,395	**414**	**6,580**	100·00	**100·00**	183	998	

Decrease for the Year 1926: Leases, 55; acres, 815. The largest percentage of the area leased for gold mining purposes is in the respective order: East Coolgardie, 20·65; East Murchison, 18·69; Mt. Margaret, 11·76; Murchison, 10·06; Yilgarn, 9·41; Coolgardie, 5·82; North Coolgardie, 5·73.

TABLE 15.

Number and Acreage of Mineral Leases in force 31st December each year, for the Five Years ending 31st December, 1926.

Mining District. Name.	Mining District. Proclaimed.	Sub-District. Name.	Sub-District. Proclaimed.	1922. Leases.	1922. Acreage.	1923. Leases.	1923. Acreage.	1924. Leases.	1924. Acreage.	1925. Leases.	1925. Acreage.	**1926. Leases.**	**1926. Acreage**	Increase or Decrease in Acreage for 1926, compared with 1925. Increase.	Increase or Decrease in Acreage for 1926, compared with 1925. Decrease	Mining District.
Ashburton	11-12-90	...	...	3	30	1	48	3	87	1	15	**3**	**75**	60	...	Ashburton.
Murchison	24-9-91	Cue	7-12-94	3	90	...	...	...	...	...	...	**2**	**42**	42	...	Murchison.
		Meekatharra ...	7-12-94	...	...	...	...	...	...	...	...	...	...			
		Day Dawn ...	10-1-96	...	...	...	...	...	...	...	...	...	...			
		Mt. Magnet ...	7-12-94	...	...	...	...	...	...	...	...	...	...			
Greenbushes ...	7-4-92	...	...	18	282	7	146	6	107	5	97	**7**	**152**	55	...	Greenbushes.
Pilbara	16-6-92	Marble Bar ...	16-6-92	13	367	10	271	14	447	16	509	**27**	**752**	222	...	Pilbara.
		Nullagine ...	6-11-96	12	125	4	34	4	30	3	21	...	...			
Yalgoo	23-1-95	...	...	3	132	2	96	2	96	...	...	...	...	...	...	Yalgoo.
Yilgarn	22-3-95	...	...	1	48	...	...	1	10	...	...	...	...	...	...	Yilgarn.
Coolgardie	22-3-95	Coolgardie ...	22-3-95	5	112	2	28	2	28	2	28	**2**	**28**	...	...	Coolgardie.
		Kunanalling ...	1-9-97	...	...	...	...	...	...	...	...	...	...			
East Coolgardie ...	22-3-95	East Coolgardie	22-3-95	1	1	...	...	1	1	1	1	**2**	**13**	12	...	East Coolgardie.
		Bulong	15-4-96	...	...	...	...	...	...	...	...	...	...			
East Murchison ...	28-6-95	Lawlers	17-4-04	...	...	...	...	...	...	...	...	...	...	...	...	East Murchison.
		Black Range ...	1-7-04	1	6	...	...	...	...	...	...	...	...			
		Wiluna	1-3-10	...	...	...	...	...	...	...	...	...	...			
North Coolgardie ...	16-8-95	Menzies	15-4-96	1	48	1	48	...	...	...	...	...	...	...	...	North Coolgardie.
		Ularring	15-4-96	...	...	...	...	...	...	...	...	...	...			
		Yerilla	15-4-96	...	...	...	...	...	...	...	...	...	...			
		Niagara	1-3-97	...	...	...	...	...	...	...	...	...	...			
West Pilbara ...	1-11-95	...	...	18	710	22	826	21	778	14	588	**11**	**476**	...	112	West Pilbara.
Dundas	27-12-95	...	...	...	...	...	...	...	...	2	36	**2**	**36**	...	...	Dundas.
Collie	21-2-96	...	...	127	38,671	135	41,108	125	38,059	117	35,619	**117**	**35,619**	...	...	Collie.
North-East Coolgardie	15-4-96	Kanowna ...	15-4-96	1	10	1	10	1	10	2	106	**2**	**106**	...	...	North-East Coolgardie.
		Kurnalpi ...	15-4-96	...	...	...	...	...	...	...	...	...	...			
Broad Arrow ...	20-11-96	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Broad Arrow.
Northampton ...	1-1-97	...	...	12	250	12	238	13	278	19	387	**19**	**371**	8	...	Northampton.
		(Private Property)	...	4	167	4	167	5	191	8	251	**9**	**275**			
Peak Hill	1-4-97	...	...	5	216	1	48	...	...	...	...	...	...	...	...	Peak Hill.
Mt. Margaret ...	1-4-97	Mt. Margaret ...	1-4-97	...	...	...	...	...	...	...	...	...	...	...	...	Mt. Margaret.
		Mt. Malcolm ...	1-4-97	...	...	...	...	...	...	...	...	...	...			
		Mt. Morgans ...	2-4-02	3	69	3	69	...	...	...	...	...	...			
Gascoyne	15-4-97	...	...	...	...	...	...	1	48	...	...	...	...	...	...	Gascoyne.
Phillips River ...	1-7-99	...	...	15	485	17	520	17	398	19	373	**18**	**323**	...	50	Phillips River.
Other localities ...	...	...	...	13	3,016	20	5,114	25	6,820	25	6,860	**25**	**6,890**	12	...	Other localities.
		(Private Property)	...	7	204	6	212	6	166	2	68	**2**	**50**			
West Kimberley ...	19-3-20	...	...	10	448	10	448	10	448	10	448	**10**	**448**	...	...	West Kimberley.
Totals ...	...	...	...	276	45,487	258	49,431	257	48,002	246	45,407	**258**	**45,656**	411	162	

In the Collie Mineral Field the largest area is held, viz.: 35,619 acres, worked entirely for coal; thus follow Pilbara, 752 acres for tin, silver and lead, asbestos, vanadium, tantalite, lead; Northampton, 646 acres, for lead and coal; West Pilbara, 476 acres, for copper, lead and silver, asbestos; West Kimberley, 448 acres, for iron; Phillips River, 323 acres, for iron, copper, manganese.

TABLE 16.

Number and Acreage of Mineral Leases in force on 31st December, 1926, showing Minerals for which they are worked.

Goldfield or Mineral Field.	District.	Coal: Leases.	Coal: Acres.	Tin: Leases.	Tin: Acres.	Copper: Leases.	Copper: Acres.	Iron: Leases.	Iron: Acres.	Emerald: Leases.	Emerald: Acres.	Ochre: Leases.	Ochre: Acres.	Silver and Lead: Leases.	Silver and Lead: Acres.	Asbestos: Leases.	Asbestos: Acres.	Vanadium: Leases.	Vanadium: Acres.	Clay: Leases.	Clay: Acres.
Pilbara	Marble Bar	...	...	11	251	...	...	...	...	...	...	...	...	4	130	2	96	1	48	...	...
Murchison	Cue	...	...	...	...	...	...	...	...	2	42	...	...	...	...	...	...	...	...	...	...
West Pilbara	... ...	...	...	...	...	6	304	...	...	...	...	...	...	1	24	4	148	...	...	...	...
Ashburton	... ...	...	...	...	...	...	...	...	...	...	...	...	...	3	75	...	...	...	...	...	...
Dundas	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
East Coolgardie	... ...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	1	12
Coolgardie	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
North-East Coolgardie ...	Kanowna	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Phillips River	... ...	...	...	...	...	16	265	1	10	...	...	...	...	...	...	...	...	...	...	...	...
Collie	... ...	117	35,619	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenbushes	... ...	...	...	7	152	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Northampton	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(Private Property) ...	1	100	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Outside Proclaimed Fields	... ...	21	6,720	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	(Private Property) ...	...	...	...	...	...	...	1	48	...	...	...	...	...	...	...	...	...	...	1	2
West Kimberley	... ...	...	...	...	...	...	...	10	448	...	...	...	...	...	...	...	...	...	...	...	...
	Totals	139	42,439	18	403	22	569	12	506	2	42	1	1	8	229	6	244	1	48	2	14

Goldfield or Mineral Field.	District.	Alunite: Leases.	Alunite: Acres.	Tantalite: Leases.	Tantalite: Acres.	Lead: Leases.	Lead: Acres.	Gypsum: Leases.	Gypsum: Acres.	Graphite: Leases.	Graphite: Acres.	Mica: Leases.	Mica: Acres.	Manganese: Leases.	Manganese: Acres.	Total: Leases.	Total: Acres.
Pilbara	Marble Bar	...	...	6	83	3	144	...	...	...	...	...	...	...	...	27	752
Murchison	Cue	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	42
West Pilbara	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	11	476
Ashburton	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	75
Dundas	... ...	...	...	...	...	...	...	2	36	...	...	...	...	...	...	2	36
East Coolgardie	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	13
Coolgardie	... ...	...	...	...	...	...	...	...	...	...	...	2	28	...	...	2	28
North-East Coolgardie ...	Kanowna	1	10	...	...	...	...	1	96	...	...	...	...	...	...	2	106
Phillips River	... ...	...	...	...	...	...	...	...	...	...	...	...	...	1	48	18	323
Collie	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	117	35,619
Greenbushes	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	152
Northampton	... ...	...	...	...	...	19	371	...	...	...	...	...	...	...	...	19	371
	(Private Property) ...	...	...	...	...	8	175	...	...	...	...	...	...	...	...	9	275
Outside Proclaimed Fields	... ...	1	40	...	...	...	...	1	40	1	42	...	...	1	48	25	6,890
	(Private Property) ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	50
West Kimberley ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	448
	Totals	2	50	6	83	30	690	4	172	1	42	2	28	2	96	258	45,656

TABLE 17.

Number and Acreage of Miscellaneous Leases in force on 31st December, 1926.

Goldfield.	District.	Leases. Tailings. No.	Leases. Tailings. Acres.	Leases. Tramway. No.	Leases. Tramway. Acres.	Leases. Water. No.	Leases. Water. Acres.	Leases. Machinery. No.	Leases. Machinery. Acres.	Leases. Residence. No.	Leases. Residence. Acres.	Total. No.	Total. Acres.
West Pilbara	... ...	...	...	2	25	...	...	...	...	...	...	2	25
Murchison	Day Dawn	...	...	...	...	...	...	...	...	1	1	1	1
North Coolgardie	Menzies	1	12	...	...	1	5	...	...	...	...	2	17
East Coolgardie	... ...	12	245	...	...	...	...	2	16	...	...	14	261
Coolgardie	... ...	1	7	...	...	1	13	...	...	...	...	2	20
Phillips River	... ...	...	...	3	7	...	...	1	10	...	...	4	17
	Total	14	264	5	32	2	18	3	26	1	1	25	341

Table 18.

Claims and Authorised Holdings, under "The Mining Act, 1904," and Regulations, existing on 31st December, 1925 and 1926.

Goldfield or Mineral Field.	District.	Prospecting Areas. Number.		Prospecting Areas. Acreage.		Water Rights. Number.		Water Rights. Acreage.		Lode Claims.		Alluvial Claims.		Mineral Claims.		Dredging Claims.		Residence Areas.		Business Areas.		Machinery Areas.		Tailings Areas.		Garden Areas.		Washing Areas.		Quarrying Areas.	
		1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.
Kimberley	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...
West Kimberley ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Northampton ...	... ...	16	13	303	222	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilbara	Marble Bar ...	29	13	733	202	2	2	2	3	...	1	2	1	...	...	1	...	1	...	6	7	3	1	...	1	5	4	...	...	...	...
Do.	Nullagine ...	8	7	78	72	3	1	3	1	4	1	...	...	5	5	...	...	3	3	...	...	1	1	...	...	3	3	...	...	...	...
West Pilbara ...	... ...	3	...	66	...	...	1	...	5	2	...	...	...	...	...	...	...	6	3	12	10	1	2	...	...	3	3	...	...	1	...
Ashburton ...	... ...	1	4	10	88	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...
Peak Hill ...	... ...	7	8	96	132	1	1	10	10	...	...	...	...	5	5	...	...	1	1	...	...	...	...	3	3	...	...	...	...	...	...
East Murchison ...	Lawlers ...	3	5	46	87	6	6	9	9	...	...	...	...	...	...	...	...	...	...	...	...	4	3	9	8	3	3	...	...	...	...
Do.	Wiluna ...	36	21	557	425	7	7	13	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	3	3	...	...	...	...
Do.	Black Range ...	9	9	138	160	...	...	...	...	1	1	1	...	...	...	...	...	34	34	...	...	1	1	...	...	1	1	...	...	...	...
Murchison ...	Cue ...	23	22	316	281	4	4	19	19	...	...	...	...	...	...	...	...	5	5	...	...	...	...	...	...	1	1	...	...	...	...
Do.	Meekatharra ...	23	13	369	214	1	1	10	10	...	...	...	...	...	...	...	...	4	4	3	2	1	1	1	1	1	1	...	...	...	...
Do.	Day Dawn ...	2	7	17	97	3	3	4	4	...	...	...	...	...	...	...	...	7	7	...	...	1	1	1	1	...	...	...	...	...	...
Do.	Mt. Magnet ...	32	25	418	275	1	1	1	1	...	...	...	...	...	...	...	...	...	...	1	1	1	1	...	...	5	5	...	...	...	...
Yalgoo ...	... ...	22	18	351	280	1	...	1	...	...	...	...	...	...	...	...	...	3	3	10	6	2	2	...	1	...	...	...	...	...	...
Mt. Margaret ...	Mt. Morgans ...	8	5	136	78	...	7	...	16	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	2	...	...	...	...
Do.	Mt. Malcolm ...	8	15	123	221	19	18	173	173	...	...	...	...	...	...	...	...	...	...	4	4	1	...	1	1	13	13	...	...	...	...
Do.	Mt. Margaret ...	17	13	311	270	1	10	1	11	...	...	...	...	...	...	...	...	...	4	...	1	...	2	1	...	...	4	...	...	...	...
North Coolgardie ...	Menzies ...	10	12	186	176	3	4	10	12	...	...	...	...	...	...	...	...	3	3	4	2	1	1	3	...	6	3	...	...	...	...
Do.	Ularring ...	1	2	18	34	6	5	6	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Do.	Niagara ...	4	3	66	46	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2	2	...	...	...	...	...	...
Do.	Yerilla ...	7	5	111	84	4	4	7	7	...	...	...	...	...	...	...	...	...	...	2	2	...	...	...	...	1	...	...	...	...	...
Broad Arrow ...	... ...	27	14	534	181	6	6	20	20	...	...	1	1	...	1	...	...	...	1	4	4	1	1	1	1	...	...	...	...	...	...
N.E. Coolgardie ...	Kanowna ...	7	10	126	145	1	...	3	...	...	...	...	...	3	1	...	...	...	...	...	...	3	3	1	1	4	4	...	...	...	...
Do.	Kurnalpi ...	19	15	426	226	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	...	...
East Coolgardie ...	... ...	69	44	1,203	677	6	5	24	19	1	1	...	1	...	...	...	...	...	...	...	...	2	4	11	11	19	18	...	...	...	...
Do.	Bulong ...	17	2	378	48	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coolgardie ...	... ...	32	24	446	423	9	9	39	39	...	...	1	1	...	...	...	...	2	2	3	3	2	1	2	2	...	...	...	...	...	...
Do.	Kunanalling ...	17	11	287	194	6	6	40	40	...	...	...	...	...	...	...	...	1	1	2	2	...	...	1	1	...	...	...	...	...	...
Yilgarn ...	... ...	52	64	982	1,223	2	1	3	2	...	...	...	...	...	...	...	...	19	19	13	15	1	1	1	...	1	...	...	...	...	...
Dundas ...	... ...	7	7	84	97	3	...	6	...	...	...	...	...	...	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	...
Phillips River ...	... ...	5	4	76	58	1	2	1	2	...	...	...	...	...	...	...	...	...	...	...	...	1	1	1	1	3	3	...	...	...	...
Collie ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Greenbushes ...	... ...	1	...	10	...	9	9	19	13	...	...	7	7	...	...	9	14	19	18	...	...	1	2	...	...	13	15	...	...	...	...
Gascoyne ...	... ...	4	1	120	48	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...
Outside Proclaimed Fields	... ...	18	23	25,298	3,104	...	...	...	...	...	...	...	...	11	38	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Totals ...	544	439	34,419	9,868	106	114	425	433	8	4	12	11	26	52	10	16	109	108	66	60	32	34	40	37	85	86	...	...	1	...
Increase or Decrease for 1926 compared with 1925		— 105		— 2,4551		+ 8		+ 8		— 4		— 1		+ 26		+ 6		— 1		— 6		+ 2		— 3		+ 1		...		— 1	

For the year 1925 the number of prospecting areas held was 544, the total acreage being 34,419, which included 9 areas of 25,000 acres for coal.
For the year 1926 the number held is 439 of a total acreage of 9,868, including 1 area of 256 acres for coal.

TABLE 19.

Miners' Rights issued during 1925 and 1926.

Place of Issue.	Miners' Rights. 1925.	Miners' Rights. 1926.	Place of Issue.	Miners' Rights 1925.	Miners' Rights 1926.
Albany	3	9	Narambeen	...	92
Boulder	30	17	Narrogin	...	3
Bridgetown	2	...	Norseman	32	49
Broome	5	2	Northampton	63	59
Bunbury	5	1	Northam	5	6
Busselton	17	6	Nullagine	34	38
Carnarvon	21	62	Onslow	18	44
Collie	1	2	Ora Banda	20	26
Coolgardie	130	112	Payne's Find	7	1
Cue	93	99	Peak Hill	21	16
Derby	18	15	Perth	233	340
Esperance	...	1	Port Hedland	16	13
Geraldton	28	10	Ravensthorpe	15	28
Greenbushes	64	66	Roebourne	47	23
Hall's Creek	25	32	Sandstone	24	33
Kalgoorlie	583	461	Southern Cross	188	189
Laverton	93	101	St. Ives	...	9
Lawlers	56	36	Wagin	1	4
Leonora	84	77	Westonia	45	27
Marble Bar	106	94	Wiluna	76	51
Marvel Loch	12	...	Wyndham	3	...
Meekatharra	161	133	Yalgoo	60	36
Menzies	82	77	York	8	3
Merredin	...	11	Youanmi	8	...
Mount Magnet	132	136			
Mullewa	3	5	Total	2,678	2,655

TABLE 20.

Number and Acreage of Miners' Homestead Leases in force on 31st December, 1925 and 1926.

Goldfield.	District.	1925. Leases.	1925. Acreage.	1926. Leases.	1926. Acreage.	Increase. Leases.	Increase. Acreage.	Decrease. Leases.	Decrease. Acreage.
West Pilbara	... ...	...	...	...	...	...	...	...	...
Greenbushes	... ...	6	522	6	522	...	...	...	...
Pilbara	Marble Bar ...	...	...	...	...	...	...	...	...
	Nullagine	...	...	...	...	...	...	...	...
Dundas	... ...	21	779	21	1,159	...	380	...	...
Broad Arrow	... ...	2	24	2	24	...	...	...	...
Yilgarn	... ...	13	410	13	410	...	...	...	...
Mt. Margaret ...	Mt. Malcolm ...	6	1,250	7	1,260	2	14	...	...
	Mt. Margaret ...	11	321	12	325				
Murchison ...	Cue	4	1,204	4	1,204	...	...	1	10
	Day Dawn ...	2	25	2	25				
	Meekatharra ...	11	1,675	10	1,665				
	Mt. Magnet ...	1	236	1	236				
Yalgoo	... ...	5	1,204	5	1,204	...	...	...	...
Coolgardie ...	Coolgardie	22	991	21	891	...	...	1	100
	Kunanalling ...	3	530	3	530				
East Coolgardie ...	... ...	82	2,601	78	2,546	...	...	4	55
Phillips River	... ...	124	17,401	124	17,401	...	...	...	...
Peak Hill	... ...	5	547	5	547	...	...	...	...
North-East Coolgardie ...	Kanowna	12	702	12	702	...	...	...	...
North Coolgardie	Menzies	5	690	5	690	...	...	...	...
	Yerilla	1	10	1	10				
	Niagara	1	20	1	20				
	Ularring	1	20	1	20				
East Murchison...	Lawlers	6	1,115	6	1,115	...	...	...	...
	Black Range ...	1	307	1	307				
	Wiluna	4	69	3	39			1	30
	Total ...	349	32,653	344	32,852	2	394	7	195

As compared with the Year 1925, the number of leases held has decreased by 5 and the area increased by 199 acres.

PART IV.—MEN EMPLOYED.

TABLE 21.

Average number of Men engaged in Mining during 1925 and 1926.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1925.	1926.	1925.	1926.	1925.	1926.
1. Kimberley ...	...	...	...	5	4	5	4
2. West Kimberley ...	...	...	...	...	...	...	...
3. Pilbara	Marble Bar ...	40	32	14	10	54	42
	Nullagine ...	15	6	17	1	32	7
4. West Pilbara	...	2	1	2	2	4	3
5. Ashburton ...	...	...	...	2	2	2	2
6. Gascoyne ...	...	...	...	2	2	2	2
7. Peak Hill ...	...	27	35	6	5	33	40
8. East Murchison ...	Lawlers ...	30	24	2	3	32	27
	Wiluna ...	86	145	...	...	86	145
	Black Range ...	63	49	2	2	65	51
9. Murchison ...	Cue ...	56	90	1	...	57	90
	Meekatharra ...	227	204	18	12	245	216
	Day Dawn ...	32	34	...	...	32	34
	Mt. Magnet ...	78	88	4	2	82	90
10. Yalgoo ...	...	109	114	2	1	111	115
11. Mt. Margaret ...	Mt. Morgans ...	71	74	...	...	71	74
	Mt. Malcolm ...	366	394	...	...	366	394
	Mt. Margaret ...	41	41	...	...	41	41
12. North Coolgardie ...	Menzies ...	70	42	...	1	70	43
	Ularring ...	4	3	...	...	4	3
	Niagara ...	12	13	...	...	12	13
	Yerilla ...	18	13	...	...	18	13
13. Broad Arrow ...	...	139	121	6	6	145	127
14. North-East Coolgardie ...	Kanowna ...	68	71	2	3	70	74
	Kurnalpi ...	22	21	2	1	24	22
15. East Coolgardie ...	East Coolgardie ...	2,652	2,205	27	23	2,679	2,228
	Bulong ...	40	41	4	3	44	44
16. Coolgardie ...	Coolgardie ...	273	189	20	17	293	206
	Kunanalling ...	68	59	...	...	68	59
17. Yilgarn ...	...	163	179	...	...	163	179
18. Dundas ...	...	85	76	...	...	85	76
19. Phillips River ...	...	11	12	1	1	12	13
State generally ...	...	2	11	...	...	2	11
	Total—Gold Mining ...	4,870	4,387	139	101	5,009	4,488
MINERALS OTHER THAN GOLD.							
Tantalite ...	Marble Bar ...	3	6	...	...	3	6
Tin ...	Greenbushes ...	30	38	...	...	30	380
	Marble Bar ...	6	10	*19	*30	25	4
Copper ...	West Pilbara ...	...	...	...	...	...	...
	Phillips River ...	22	8	...	...	22	8
	Northampton ...	12	...	...	...	12	...
Lead Ore ...	Northampton ...	198	129	...	...	198	129
Coal ...	Collie River ...	677	686	...	...	677	686
Asbestos ...	Nullagine ...	14	9	...	...	14	9
Gypsum ...	State Generally ...	15	24	...	...	15	24
Silver-Lead Ore ...	Ashburton ...	2	...	...	...	2	...
	Marble Bar ...	4	9	...	...	4	9
	Total—Other Minerals ...	983	919	19	30	1,002	949
	GRAND TOTAL ...	5,853	5,306	158	131	6,011	5,437

*Classified elsewhere as employed at mines.

TABLE 22.

Average Number of Men employed at Mines during 1926.

Mineral.	Above ground.	Under ground.	Total.	Percentage of total men employed.	Increase or decrease compared with 1925.
Asbestos	3	6	9	·17	— 5
Coal	156	530	686	12·86	+ 9
Copper	6	2	8	·15	— 26
Gold	2,099	2,288	4,387	82·21	— 483
Gypsum	24	...	24	·45	+ 9
Lead	50	79	129	2·42	+ 69
Silver-Lead Ore	2	7	9	·17	+ 3
Tantalite...	5	1	6	·11	+ 3
Tin	*73	5	78	1·46	+ 23
Total	2,418	2,918	5,336	100·00	— 536

* As the tin obtained is principally "stream tin," the average number of alluvial workers has been, in this case, included in the heading "above ground."

The above table deals with men working their own mines, or employed on wages, and is compiled from returns furnished to the Department by mine-owners.

TABLE 23.

Average Number of Men employed at Gold Mines during 1926, classified according to the several Goldfields and the proportion of Men employed in each Goldfield.

Goldfield.	Above Ground.	Under Ground.	Total.	Increase or Decrease compared with 1925.	Percentage of total Men employed. 1925.	1926.
1. Kimberley	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	14	24	38	— 17	1·13	·87
4. West Pilbara	...	1	1	— 1	·04	·02
5. Ashburton	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...
7. Peak Hill	16	19	35	+ 8	·55	·80
8. East Murchison	122	96	218	+ 39	3·68	4·97
9. Murchison...	188	228	416	+ 23	8·07	9·50
10. Yalgoo	56	58	114	+ 5	2·24	2·60
11. Mt. Margaret	232	277	509	+ 31	9·81	11·60
12. North Coolgardie	43	28	71	— 33	2·14	1·62
13. Broad Arrow	66	55	121	— 18	2·85	2·76
14. North-East Coolgardie	48	44	92	+ 2	1·85	2·10
15. East Coolgardie	1,016	1,230	2,246	— 446	55·28	51·17
16. Coolgardie	129	119	248	— 93	7·00	5·65
17. Yilgarn	110	69	179	+ 16	3·35	4·09
18. Dundas	40	36	76	— 9	1·74	1·73
19. Phillips River	9	3	12	+ 1	·23	·27
State generally	10	1	11	+ 9	·04	·25
Total	2,099	2,288	4,387	— 483	100·00	100·00

TABLE 24.

Alluvial Gold Workers.

Goldfield.	1925.	1926.	Increase or Decrease compared with 1925.
1. Kimberley	5	4	— 1
2. West Kimberley	...	...	...
3. Pilbara	31	11	— 20
4. West Pilbara	2	2	...
5. Ashburton	2	2	...
6. Gascoyne	2	2	...
7. Peak Hill	6	5	— 1
8. East Murchison	4	5	+ 1
9. Murchison	23	14	— 9
10. Yalgoo	2	1	— 1
11. Mt. Margaret	...	...	...
12. North Coolgardie	...	1	+ 1
13. Broad Arrow	6	6	...
14. North-East Coolgardie	4	4	...
15. East Coolgardie	31	26	— 5
16. Coolgardie	20	17	— 3
17. Yilgarn	...	...	...
18. Dundas	...	...	...
19. Phillips River	1	1	...
Total	139	101	— 38

TABLE 25.

Table showing Rate of Wages Payable in the Mining Industry at the 31st December, 1926.

Class of Employee.	Yilgarn, Coolgardie, Broad Arrow, Dundas, E. Coolgardie, N.E. Coolgardie, N. Coolgardie, Mt. Margaret, and East Murchison Goldfields, except Black Range District.	Meekatharra and Youanmi Districts.	Cue and Day Dawn Districts.	Northampton†
	Rate per Shift. s. d.	Rate per Shift. s. d.	Rate per Shift. s. d.	Rate per Shift s. d.
Rock Drill Men in Shafts	17 8	18 10	18 1	...
Rock Drill Men in Rises	17 2	18 4	17 7	...
Rock Drill Men in Winzes	16 10	18 0	17 3	...
Rock Drill Men in other places	16 6	17 8	16 11	...
Hand Miners in Shafts	16 10	18 0	17 3	15 10
Hand Miners in Rises	16 4	17 6	16 9	15 4
Hand Miners in Winzes	16 0	17 2	16 5	15 0
Hand Miners in other places	15 8	16 10	16 1	14 8
Shaft Timbermen	17 8	18 0	17 3	16 8
Timbermen	16 10	18 0	17 3	15 10
Mullockers, Truckers, Shovellers, etc.	14 10	16 0	15 3	13 10
Bracemen, Platmen, and Skipmen	15 10	16 6	15 9	14 10
Man in charge Explosives Magazine	16 4	...	...	...
Platelayer (Underground)	15 10	...	...	...
Scalers (Underground)	16 10	...	...	...
Sampler	16 0	...	...	...
Rock Breaker—Crackermen	15 4	16 6	15 9	14 4
Battery Feeders and Mill Hands	14 4	16 0	15 3	...
Battery—Repairers, etc.	15 10	...	...	...
Mechanics' Labourer	14 10	16 0	15 3	13 10
Iron Furnacemen	16 4	...	...	...
Castings Dresser	14 10	...	...	...
Pitman and Pumpman	16 10	...	...	15 10
Fireman, Leading	16 4	...	...	...
Fireman, Steam or Roaster	15 4	...	...	14 4
Wood Trimmer	14 10	...	...	13 10
Pumpman on the Surface	15 10	...	...	14 10
Greaser, Cleaner, and Oiler	15 4	...	...	...
Motorman	16 2	...	...	...
Ball Mill Hand	15 4	...	...	...
Mill Hands	...	...	...	13 4
Boiler Cleaners	16 10	...	...	15 10
Filterpress Filler	16 2	18 0	17 3	...
Cyanide and Filterpress Men	15 4	16 6	15 9	...
Amalgamator	16 0	...	...	...
Wilfley Tablemen	14 8	...	...	...
Grinding Panman	14 10	...	...	...
Vacuum Plant Hands (Top)	16 4	18 0	17 3	...
Vacuum Plant Hands (Bottom)	15 0	16 6	15 9	...
Timber Dresser, Sawyer, etc.	16 2	...	...	...
Jigman	...	...	...	14 1
Tool Sharpeners	16 4	18 0	17 3	15 4
Holman Hoist (aboveground)	16 2	...	...	15 2
Holman Hoist (underground)	16 8	...	...	15 8
Blacksmith's Striker	14 10	16 4	15 7	13 10
Platelayer on Surface	15 4	...	...	...
Roper and Rigger	16 4	17 6	16 9	15 4
Sailor Gang Men	14 10	...	...	13 10
Conveyor Belt Men	14 4	...	...	13 4
Horse-driver	14 4	16 0	15 3	13 4
Sanitary Man	17 8	...	...	...
Watchman	15 10	...	...	...
Smelter (Gold Room)	16 0	...	...	...
General Labourer	14 4	16 0	15 3	13 4
Sand Shovellers, Surface residues	...	...	...	13 4
Popper Machine Man	16 6	...	...	...
Pipe Fitter	16 8	...	...	...
Tailings Dam Man	14 4	...	...	...
Diamond Drillers	17 0	...	...	...
Diamond Drillers' Assistant	15 0	...	...	...
Spotters	16 2	...	...	...
*Winding Engine-drivers	18 0	As column 1 with Special District Allowance.		
Winch-drivers	17 0			
Other Engine-drivers	16 6 to 17 6			
Locomotive-drivers	17 6			

Forty-eight hours on surface (exclusive of crib time) and forty-four hours underground (including crib time) constitute a week's work.

*6d. per day extra if they raise or lower human beings.

†District Allowance, Northampton—All workers at Surprise Mine paid 1s. per day extra.

District Allowances.—In addition to the wages as per Column 1, the following allowances are paid to workers in the Districts enumerated hereunder, except those portions situated within a radius of five miles of Kalgoorlie, Coolgardie, and Southern Cross:—

First District—Lying South of Kalgoorlie and comprised within lines starting from Kalgoorlie, thence W.S.W. to Woolgangie, then S.E. to Dundas, then N.E. to a point 10 miles East of Karonie, on the Trans-Australian line, and thence back to Kalgoorlie:

1s. per shift extra for those mines within five miles of the railway and 1s. 6d. per shift for those outside.

Second District—Starting from Kalgoorlie, W.S.W. to Woolgangie, thence N.N.W. to the intersection of the 120 E. meridian with the 30 S. parallel of latitude, thence N.E. by E. to Kookynie, thence back to the point 10 miles East of Karonie on the Trans-Australian line, and thence back to Kalgoorlie:

1s. 3d. per shift extra for those mines within five miles of the railway and 1s. 6d. per shift for those outside.

Third District—Starting from and including Kookynie, then N. by W. to Kurrajong, thence N.E. to Stone's Soak, thence S.E. to and including Burtville, thence S.W. through Pindinnie to Kookynie:

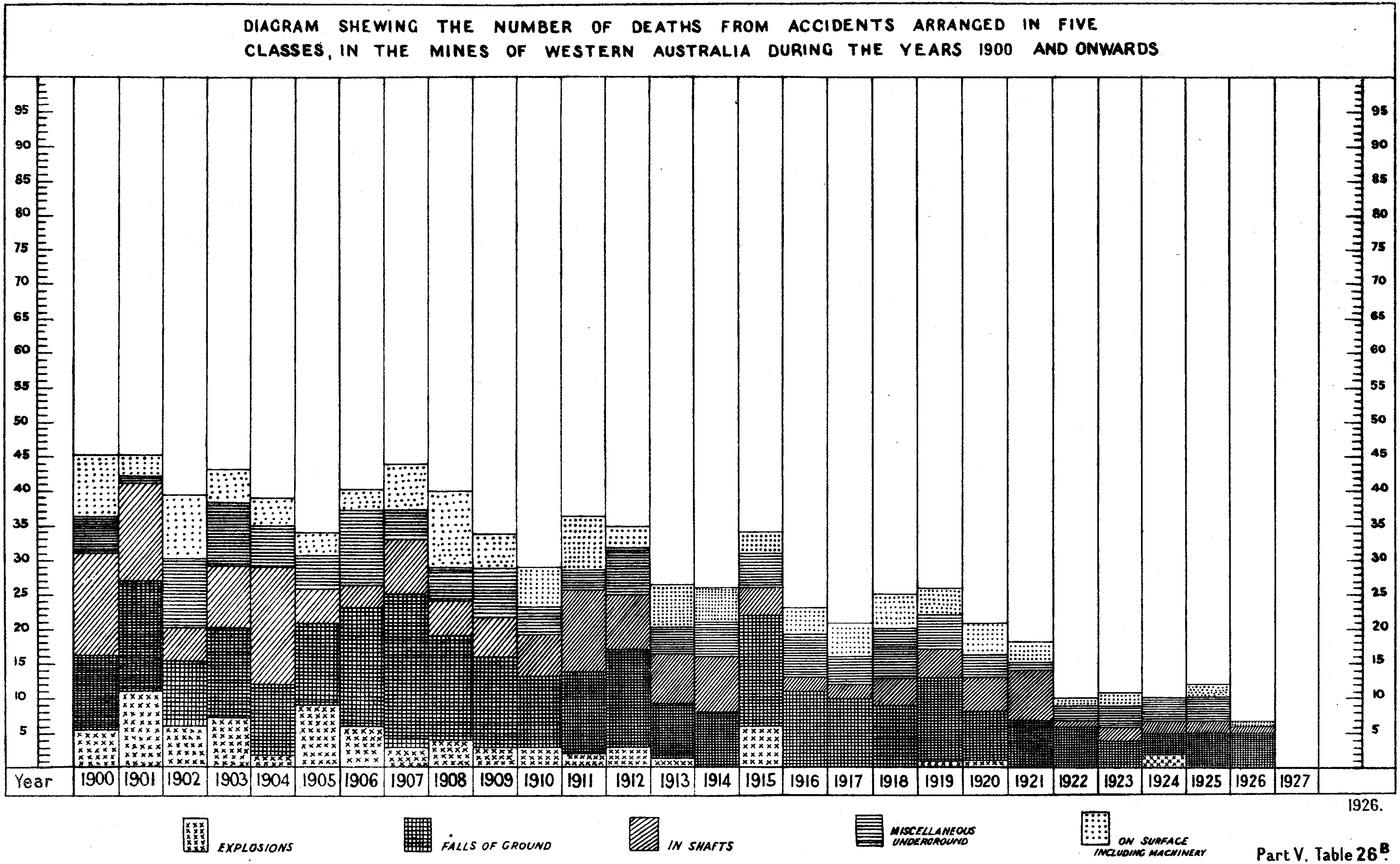
1s. 6d. per shift extra for those mines within five miles of the railway and 1s. 9d. per shift for those outside.

Fourth District—Surrounding Southern Cross within a radius of 30 miles:

1s. per shift extra.

Fifth District—Comprising all mines not specifically defined in foregoing boundaries, but within area comprised in Goldfields enumerated at head of Column 1:

2s. per shift extra.



Part V. Table 26B.

Part V.—ACCIDENTS.

Table No. 26.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS DURING 1925 AND 1926.

A.—According to Locality of Accident.

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1925.	1926.	1925.	1926.	1925.	1926.
1. Kimberley	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	...	...	...	...	...	...
4. West Pilbara	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...
7. Peak Hill	...	...	...	1	...	1
8. East Murchison	2	...	...	10	2	10
9. Murchison	...	...	21	18	21	18
10. Yalgoo	...	...	...	...	...	...
11. Mt. Margaret	2	...	41	38	43	38
12. North Coolgardie	...	1	1	1	1	2
13. N.E. Coolgardie	...	...	...	...	...	...
14. Broad Arrow	...	...	...	...	...	...
15. East Coolgardie	8	6	237	218	245	224
16. Coolgardie	...	...	3	...	3	...
17. Yilgarn	...	...	...	...	...	...
18. Dundas	...	...	1	...	1	...
19. Phillips River	...	...	...	...	...	...
Mining Districts—						
Northampton	...	...	1	...	1	...
Yandanooka	...	...	...	...	...	...
Greenbushes	...	...	...	...	...	...
Collie	...	...	78	89	78	89
Swan	...	...	...	1	...	1
Kendenup	...	...	...	...	...	...
Roelands	...	...	...	...	...	...
Total	12	7	383	376	395	383

From the above table, it will be seen that the total number of fatal accidents for the year 1926 was 7 as against 12 for 1925. The number injured shows a decrease of 7 as compared with the preceding year. Details of these accidents will be found in the report of the State Mining Engineer, published as Division II. to this report.

B.—According to Causes of Accidents.

	1925.		1926.		Comparison with 1925.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Explosives	...	1	...	6	...	+ 5
2. Falls of Ground	5	21	5	41	...	+ 20
3. In Shafts	2	1	1	7	— 1	+ 6
4. Miscellaneous Underground	3	262	...	220	— 3	— 42
5. Surface	2	98	1	102	— 1	+ 4
Total	12	383	7	376	— 5	— 7

The fatal accidents (7) occurred in gold mines.

The death rate per 1,000 men employed in gold mines was 1.60 as against 2.46 in 1925.

TABLE No. 27.

Deaths from Accidents of Persons employed at Mines during 1925 and 1926.

—	1925.						1926.					
	Number of Persons killed.			Death Rate per 1,000 men employed.			Number of Persons killed.			Death Rate per 1,000 men employed.		
	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.
Coal Mines	...	...	...	...	...	...	...	...	...	...	...	...
Men employed	(154)	(523)	(677)	...	...	...	(156)	(530)	(686)	...	...	...
Gold Mines	2	10	12	·81	3·94	2·40	1	6	7	·45	2·62	1·56
Men employed	(2,468)	(2,541)	(5,009)	...	...	...	(2,200)	(2,288)	(4,488)	...	...	...
Other Mines	...	...	...	...	...	...	...	...	...	...	...	...
Men employed	(158)	(167)	(325)	...	...	...	(163)	(100)	(263)	...	...	...
Total for all mines ...	2	10	12	·72	3·10	2·00	1	6	7	·40	2·06	1·2 9
Total number of men employed	(2,780)	(3,231)	(6,011)	...	...	...	(2,519)	(2,918)	(5,437)	...	...	...

TABLE No. 28.

Deaths from Accidents of Persons employed at Quarries during 1925 and 1926.

Mining District.	Number of Persons employed.				Number of Persons killed.				Death Rate per 1,000 men employed.			
	Above Ground.		Total.		Above Ground.		Total.		Above Ground.		Total.	
	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.	1925.	1926.
Swan ...	307	291	307	291	...	...	...	...	...	...	...	...
Roelands ...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	307	291	307	291	...	...	...	...	...	...	...	...

TABLE No. 29.

Deaths from Accidents of Persons Employed in Gold Mines during 1926, and the Death Rate per 1,000 Men Employed and per 1,000 tons of Gold Ore raised during 1925 and 1926. (Number of men taken as in Table No. 23, not including Alluvial Gold Workers.)

Goldfield.	Number of Deaths.			Death Rate per 1,000 men employed.				Number of Deaths per 1,000 tons of Gold Ore raised.	
	1926.			1926.			1925.	1926.	1925.
	Above Ground.	Under Ground.	Total.	Above Ground.	Under Ground.	Total.	Total.		
1. Kimberley	...	...	...	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...	...	...	...
3. Pilbara	...	...	...	...	...	...	...	...	...
4. West Pilbara	...	...	...	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...	...	...	...
7. Peak Hill	...	...	...	...	...	...	...	...	...
8. East Murchison	...	...	...	...	...	...	11·17	...	·389
9. Yalgoo	...	...	...	...	...	...	...	...	...
10. Mt. Margaret	...	...		...	...	...	4·18	...	·020
11. North Coolgardie	1	...	1	23·25	...	14·08	...	·817	...
12. North-East Coolgardie ...	...	...	...	...	...	...	...	...	...
13. East Coolgardie	...	6	6	...	4·88	2·67	2·97	·011	·014
14. Broad Arrow	...	...	...	...	...	...	...	...	...
15. Coolgardie	...	...	...	...	...	...	...	...	...
16. Murchison	...	...	...	...	...	...	...	...	...
17. Yilgarn	...	...	...	...	...	...	...	...	...
18. Dundas	...	...	...	...	...	...	...	...	...
19. Phillips River	...	...	...	...	...	...	...	...	...
Total	1	6	7	·48	2·62	1·60	2·46	·009	·015

The number of deaths per 1,000 men employed shows a decrease from 2·46 in 1925 to 1·60 in 1926, and that per 1,000 tons of gold ore raised shows a slight decrease, being ·009 as against ·015 for the preceding year.

Part VI.—STATE AID TO MINING.

The number of State batteries existing at the end of the year was 29.

From inception to the end of 1926 gold and tin to the value of £6,033,386 have been recovered from the State plants; 1,436,980 tons of auriferous ore have been treated, and have produced £4,901,126 by amalgamation, £764,204 by cyanidation, £265,266 worth by slimes treatment, £9,353 worth from residues; and 80,728 tons of tin ore produced tin to the value of £92,864, and in addition a sum of £572 was recovered from residues.

During the year the gold ore treated was 17,104½ tons for 16,669.29 ounces bullion.

The working expenditure for all plants for the year totalled £29,648 8s. 8d., and the revenue £19,269 6s. 7d., which shows a loss of £10,379 2s. 1d. on the year's operations.

The capital expenditure since the inception of the scheme has been £408,443 17s. 8d.—£316,462 16s. from General Loan Fund and £91,981 1s. 8d. from Consolidated Revenue.

The cost of administration for the year was £2,948 10s. 5d., as against £3,006 2s. 10d. for 1925.

The working expenditure from inception to the end of the year exceeds the revenue by £152,433 2s.

GEOLOGICAL SURVEY.

During the year 1926 less field work was undertaken than usual. This was largely due to the limited staff and the fact that Mr. Feldtmann, one of two remaining field officers, was absent on long service leave for the latter half of the year. The following reports were furnished:—

1. Progress Report on the North End of Kalgoorlie.
2. The Silver-lead Deposits at Mundijong, Cockburn Sound District, South-West Division.
3. Alunite Salt Lake Deposits, Campion, Avon District.
4. The Fire-Clay Deposits on Mineral Claim 50H, Clackline.
5. Report on Block West of 2191 and North of 1856, Collie Coalfield.

The petrological work was confined largely to the examination of the cores from the bores at Kalgoorlie, Yalgoo, Lady Shenton Mine, Menzies, and to determinations for the general public.

Both field officers are now engaged on the survey of the South end of the Boulder Belt.

ASSISTANCE UNDER MINING DEVELOPMENT ACT, 1902.

The following statement shows the sums advanced during the year 1925 under "The Mining Development Act":—

	£	s.	d.
Advanced in aid of mining work and equipment of mines with machinery	10,970	18	0
Subsidies on stone crushed for the public	149	6	0
Providing means of transport and equipment to prospectors ..	4,800	5	10
	£15,920	9	10

In addition to the above the vote was charged with £49,502 16s. 2d., rebates made to Goldfields Water Supply Branch, consequent upon reduction of the price of water on the Eastern Goldfields. This arrangement dated from 1st July, 1923. Other assistance granted from the Vote during the year on various matters totalled £14,184 7s. 11d.

The subsidies paid on stone crushed for the public amounted to £149 6s., 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 these plants totalled 1,432 tons.

The receipts under the Mining Development Act, exclusive of interest payments, amounted to £8,336 1s. 10d., and included:—

	£	s.	d.
Refunds of Advances	4,737	3	3
Sale of Securities	3,237	8	1
Miscellaneous Refunds	361	10	6
	£8,336	1	10

The mining industry has been further assisted by way of guarantees by the Government to banks on behalf of various companies, and at the end of 1926 the liability of the Government in respect of these guarantees was £54,500.

Part VII.—REMARKS ON THE GOLDFIELDS AND MINERAL DISTRICTS AND SUMMARIES OF THE WARDENS' AND OTHER OFFICERS' REPORTS.

ASHBURTON GOLDFIELD.

Ten (10) fine ounces of gold were reported, and in the preceding year eleven (11) fine ounces.

There is no mining in evidence in this field.

BROAD ARROW GOLDFIELD.

The output of gold was 1,460 fine ounces, and in the preceding year 8,242 fine ounces, a decrease of 6,782 fine ounces.

This is due to reduced outputs from the Associated Northern and other mines in the Ora Banda district consequent on the scarcity of water for milling purposes. This factor has militated against prospecting throughout this field, and until a good rainfall occurs mining will remain stagnant.

COLLIE COALFIELD.

The output of coal was 474,819 tons, and in the preceding year 437,461 tons, an increase of 37,358 tons.

As hitherto, five (5) collieries were producing, viz., the Proprietary, Co-operative, Cardiff, Westralia, and Premier. The largest output was from the Co-operative.

Preliminary action in regard to the contemplated erection of a power plant is now being taken, and it is hoped that something tangible will result before long. The district continues to progress very satisfactorily.

COOLGARDIE GOLDFIELD.

The output of gold was 5,998 fine ounces, and in the preceding year 10,309 fine ounces, a decrease of 4,311 fine ounces.

In the Kunanalling district the existing mines maintained their position, and there was little change.

At Gibraltar the Lloyd-George closed down after being worked for a while by tributers. Only one mine, the "Carlton," is now working in that district.

At Burbanks, and in the immediate vicinity of Coolgardie, matters are very quiet. The department intends carrying out a programme of boring in the near future in an endeavour to locate payable deposits.

At Widgiemooltha, a few shows are working. At St. Ives, the Ives Reward mine has not come up to anticipation, and has been let on tribute. Several other shows are being worked, but there is nothing special to record.

DUNDAS GOLDFIELD.

The output of gold was 2,682 fine ounces, and in the preceding year 2,601 fine ounces, an increase of 81 fine ounces.

The erection of machinery on the mine formerly known as the "Mararoa" was completed and crushing commenced. The owner has much confidence that this property will develop into a steady producer.

A few other shows are being worked but, generally speaking, the field was very quiet.

EAST COOLGARDIE GOLDFIELD.

The output of gold was 304,037 fine ounces, and in the preceding year 305,769 fine ounces, a decrease of 1,732 fine ounces.

Most of the large mines continued to maintain a regular production, but the Golden Horseshoe, notwithstanding very generous financial assistance by the State Government, was unfortunately compelled to close down in the middle of the year. Unless further working capital is provided it looks as though this property will have to be amalgamated with some of its neighbours. Pending something definite being arranged, the workings are being kept unwatered.

During the year a technical committee appointed by the Federal Government investigated conditions obtaining on the field with a view to advising how best to assist in reviving the industry. Its report, which is expected early in the New Year, is awaited with much interest.

A good deal of diamond drilling was carried out by the Government at the North End of the field, but nothing payable was revealed. Much prospecting was also in evidence in this locality, but with little success.

From Mount Monger, in the Bulong district, a number of good crushings from various prospecting shows were recorded.

EAST MURCHISON GOLDFIELD.

The output of gold was 5,336 fine ounces, and in the preceding year 5,399 fine ounces, a decrease of 63 fine ounces.

In the Black Range district there was a decrease, and matters were very quiet.

Towards the end of the year boring was commenced by the Department at Sandstone in the hope of locating new deposits and thus reviving interest.

In the Lawlers district small outputs were reported from the Lawlers, Mt. Sir Samuel, and Kathleen Valley centres, but the total was less than in the previous year and no improvement in activity was apparent.

In the Wiluna district there was an increase, accounted for by good results from Cole's Find, Mt. Hilda, Diorite, and Wiluna centres. At the three first mentioned a considerable amount of prospecting was going on and results were, generally speaking, encouraging. At Wiluna a vigorous development policy was being carried out on the leases held by the Wiluna Gold Mines, Limited, and it is understood the results so far are highly satisfactory. Eventual success by this company will mean a great deal to the district and the industry generally.

GASCOYNE GOLDFIELD.

Eighty-five (85) fine ounces were reported from this field, and in the preceding year three (3) fine ounces. No mining is being done.

GREENBUSHES MINERAL FIELD.

The output of black tin was 61.41 tons, valued at £10,126, and in the preceding year 55.27 tons, valued at £8,764, an increase in tonnage of 6.14 tons and in value of £1,362.

There was an improvement in the field consequent on the stability obtaining in regard to the price of tin. Several leases and dredging claims were taken up and a large amount of prospecting done.

The owners of the old Cornwall mine were actively working it and are very sanguine of ultimate success. They are being financiallly assisted by the Government in their operations. Generally, the outlook is brighter than it has been for some years.

KIMBERLEY GOLDFIELD.

Sixty-five (65) ounces of fine gold were reported, and in the preceding year twenty-nine (29) fine ounces.

Excepting for a few men engaged in alluvial mining and the taking up of two dredging claims to treat some sands, very little activity was in evidence on this field.

MOUNT MARGARET GOLDFIELD.

The output of gold was 43,628 fine ounces and in the preceding year 41,850 fine ounces, an increase of 1,778 fine ounces.

In the Mount Margaret district there was a small increase consequent on regular crushings from the King of Creation mine. The principal other producers were the Lancefield and Nil Desperandum, otherwise the district was quiet, only a small number of prospectors being out.

In the Mount Morgans district there was a decrease; the chief producers were the Westralia Mount Morgans at Mount Morgans and the Devon at Linden. Elsewhere only a small amount of prospecting was going on.

In the Mount Malcolm district there was an increase, the principal producer as hitherto being the Sons of Gwalia mine. No new finds nor good developments were reported from any outside centres where prospectors were at work.

MURCHISON GOLDFIELD.

The output of gold was 33,487 fine ounces, and in the preceding year 29,439 fine ounces, an increase of 4,048 fine ounces.

In the Meekatharra district there was a small increase, and at Meekatharra itself work proceeded steadily. In the outlying centres a fair number of prospectors were working.

In the Cue district there was also an increase, although generally speaking, mining was very quiet.

At Reidy's the Mararoa Company has been actively working its property and its outlook is very promising.

At Poona, a good deal of attention is being concentrated on a deposit of emeralds, the existence of which was first reported in 1912. Active development work is being carried out. In the other centres a small amount of prospecting was in progress.

In the Day Dawn district only three or four shows were working, but at Lake Austin a good production was reported from the "Mainland Consols."

In the Mount Magnet district there was an increase. The principal activity was at Mount Magnet and Boogardie, where several properties contributed outputs.

At Lennonville only a small amount of work was going on. At Moyagee a good crushing was reported from the "Moyagee." At Paynesville steady work was being carried out.

NORTHAMPTON MINERAL FIELD.

The output of lead ore was 23,973.35 tons valued at £72,872, and in the preceding year 37,865.99 tons valued at £119,299, a decrease in tonnage of 13,892.64 tons and in value of £46,427.

No copper was produced, but in the preceding year the output was 2,469.72 tons valued at £8,952.

Although a good deal of work was being done throughout the field, the closing down of the "Narra Tarra" at Protheroe and the "Surprise" at Galena was a great set-back. It is very problematical whether the former will re-open but the Department is considering the advisability of testing the ground at depth in the Surprise by diamond drilling as soon as a drill is available, probably early in the year.

Several small shows give promise of developing into good producers.

The principal producers of lead were the "Surprise" and "Two Boys" mines at Galena.

NORTH COOLGARDIE GOLDFIELD.

The output of gold was 2,472 fine ounces and in the preceding year 4,550 fine ounces, a decrease of 2,078 fine ounces.

In the Menzies district one or two small mines in the vicinity of Menzies had satisfactory crushings which naturally will give a stimulus to prospecting.

At Comet Vale the "Sand Queen" and "Gladsome" have been taken over by a company and active work is now in progress. It is hoped and expected that this property will early become a regular and payable producer.

At Goongarrie and Mount Ida a few prospectors were working.

In the Ularring district an effort is being made to re-open the "Riverina South" Mine, which it is thought has great possibilities. A small amount of prospecting was going on.

The Yerilla and Yarri districts remained exceedingly quiet.

NORTH-EAST COOLGARDIE GOLDFIELD.

The output of gold was 6,199 fine ounces, and in the preceding year 5,898 fine ounces, an increase of 301 fine ounces.

The position in this field was little changed and no development of note was reported.

In the Kurnalpi district prospecting was active, and a find was reported which had some promise, but shortage of water is retarding development .

PEAK HILL GOLDFIELD.

The output of gold was 2,140 fine ounces, and in the preceding year 1,636 fine ounces, an increase of 504 fine ounces.

The holdings in the immediate vicinity of Peak Hill were being vigorously developed and a good deal of activity was evidenced.

At Mt. Egerton, which has been deserted for a considerable time, some prospectors commenced operations towards the end of the year and are hopeful of results.

At Murphy's well a party is working a lease of some promise and had a satisfactory crushing.

Preliminary work is in full swing in regard to the proper development of the manganese deposits at Horseshoe, and this centre should show considerable activity in the near future.

At Yowereema a good lot of prospecting was going on. Nothing of note was reported from other centres.

PHILLIPS RIVER GOLDFIELD.

The output of gold was 19 fine ounces, and in the preceding year 27 fine ounces. Gold mining is quite at a standstill.

The low price ruling for copper, and the fact that the Copper Separation Company has not yet proved the success of its efforts to treat the ores of the district profitably, have prevented any improvement in the position in regard to copper mining, which is practically at a standstill.

PILBARA GOLDFIELD.

The output of gold was 2,376 fine ounces, and in the preceding year 2,502 fine ounces, a decrease of 126 fine ounces.

Black tin to the amount of 35.42 tons, valued at £5,446, was raised, and in the preceding year 23.96 tons, valued at £3,609, an increase in tonnage of 11.46 tons and in value of £1,837.

Asbestos to the amount of 91.45 tons, valued at £2,436, was raised, and in the preceding year 50 tons, valued at £1,619, an increase in tonnage of 41.45 tons, and in value of £817; also 19.45 tons of tantalite, valued at £2,357, and in the preceding year 6.25 tons, valued at £750, an increase in tonnage of 13.20 tons, and in value of £1,607, and 90.50 tons of silver-lead ore, valued at £1,305, against 51 tons, valued at £1,268, in the preceding year, an increase in tonnage of 39.50 tons, and in value of £37.

In gold and tin mining there was little change.

At Wodgina mining for tantalite was actively pursued.

In the Lionel centre there was an improved output of asbestos.

At Braeside the silver-lead deposits were being actively developed, and attracted a good deal of attention.

WEST PILBARA GOLDFIELD.

The output of gold was 29 fine ounces, and in the preceding year 35 fine ounces, a decrease of 6 fine ounces.

No copper was produced, but there was an output of 13.89 tons of asbestos, valued at £292, an increase in tonnage of 13.15 tons, and in value of £270, on the production of the previous year.

Mining in this field is principally for copper, hence there was little or nothing doing.

WEST KIMBERLEY GOLDFIELD.

There was no gold reported from this field.

Boring for oil by the Freney Kimberley Oil Company, Limited, which is receiving financial assistance from the Federal Government for the purpose, is being carried out.

No work has yet been done on the iron deposits at Yampi, but a move in that direction is expected in the New Year.

YALGOO GOLDFIELD.

The output of gold was 6,382 fine ounces, and in the preceding year 2,828 fine ounces, an increase of 3,554 fine ounces.

This is attributable to an increased and regular production from the "Gnow's Nest" mine.

At Field's Find the main producer was the Brown's Reward mine, but a fair number of prospectors were also at work.

In the other centres matters were very quiet, and nothing of note was reported.

At Yalgoo a good deal of boring was carried out by the Government, but without anything promising being revealed.

YILGARN GOLDFIELD.

The output of gold was 11,792 fine ounces, and in the preceding year 13,297 fine ounces, a decrease of 1,505 fine ounces.

A considerable amount of prospecting was in evidence throughout the various centres on this field.

At Burbidge the Great Victoria mine was a steady producer, but the future outlook is not too promising, and it is expected to close down in a few months.

At Westonia one or two properties have promising indications.

At Hollow's Find a good deal of activity is being shown, and very optimistic predictions are current regarding some of the mines being opened up.

At Manxman the Radio maintained a consistent production, and at Golden Valley the Valley Queen was worked regularly throughout the year, and its future is promising.

In the immediate vicinity of Southern Cross only a small amount of mining was going on.

Table 30.

Value of Mining Machinery and Number of Stamps and other Mills erected on the 31st December, 1926, compared with the previous Year.

Goldfield	District	Value of Mining Machinery. 1925.	Value of Mining Machinery. 1926.	Batteries, Number of Stamps. 1925.	Batteries, Number of Stamps. 1926.	Mills. 1925. Prospecting.	1925. Ball.	1925. Griffin.	1925. Huntington.	1925. Puddlers.	1925. Other Crushers.	1925. Flint.	1925. Grinding Pans.	Mills. 1926. Prospecting.	1926. Ball.	1926. Griffin.	1926. Huntington.	1926. Puddlers.	1926. Other Crushers.	1926. Flint.	1926. Grinding Pans.
		£	£																		
1. Kimberley	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2. West Kimberley	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3. Pilbara	Marble Bar	13,630	12,480	50	45	...	...	...	1	...	...	...	3	...	...	...	1	...	...	...	3
	Nullagine	2,692	2,192	28	18	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
4. West Pilbara	... ...	2,090	1,800	10	10	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5. Ashburton	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Gascoyne	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7. Peak Hill	... ...	2,651	3,355	10	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
8. East Murchison ...	Lawlers	15,466	11,147	30	30	...	...	...	...	...	2	...	2	...	...	...	...	...	2	...	2
	Wiluna	15,964	15,387	18	23	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Black Range	77,650	7,093	45	25	...	1	...	...	...	...	1	2	...	...	...	...	...	...	...	...
9. Murchison	Cue	23,588	21,584	50	50	...	...	...	...	...	...	1	1	...	...	...	...	...	...	1	1
	Meekatharra	40,826	36,744	70	70	...	...	...	...	...	...	...	9	...	...	...	...	...	...	...	9
	Day Dawn	2,900	1,000	13	3	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
	Mt. Magnet	6,549	7,365	25	25	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	2
10. Yalgoo	... ...	23,646	23,138	30	30	2	...	...	...	...	1	...	2	1	...	...	...	...	1	...	2
11. Mt. Margaret	Mt. Morgans	7,223	5,495	30	25	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	3
	Mt. Malcolm	283,453	279,615	75	70	...	...	...	...	...	...	4	...	...	...	...	...	...	...	4	...
	Mt. Margaret	6,317	5,977	30	30	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	5
12. North Coolgardie ...	Menzies	14,918	14,933	55	55	...	...	...	...	...	...	...	12	...	...	...	...	...	...	...	12
	Ularring	2,289	1,672	20	20	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1
	Niagara	2,199	2,045	15	15	...	1	...	...	...	...	...	3	...	1	...	...	...	...	...	3
	Yerilla	4,350	3,995	20	20	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	1
13. Broad Arrow	... ...	63,968	63,181	35	35	...	1	...	2	3	...	...	10	...	1	...	2	3	...	...	10
14. North-East Coolgardie	Kanowna	7,600	7,250	50	50	...	...	...	1	...	...	...	...	1	...	...	1	...	...	...	...
	Kurnalpi	200	200	5	5	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
15. East Coolgardie ...	East Coolgardie ...	692,737	680,241	305	265	1	44	...	3	6	19	25	100	1	44	...	3	6	20	25	97
	Bulong	...	1,000	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
16. Coolgardie	Coolgardie	30,095	27,086	58	58	...	...	...	1	...	...	...	5	...	...	...	1	...	...	...	5
	Kunanalling	6,750	6,075	25	25	1	...	...	...	...	...	...	3	1	...	...	...	...	...	...	3
17. Yilgarn	... ...	52,410	49,060	120	110	...	...	...	1	...	...	3	9	...	...	...	...	...	...	3	7
18. Dundas	... ...	2,823	4,541	15	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19. Phillips River	... ...	2,365	2,425	35	30	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
State Generally	... ...	30,100	27,090	...	...	...	1	...	...	...	1	...	...	...	1	...	...	...	1	...	...
Total, Gold-extracting Machinery		1,437,449	1,325,166	1,272	1,182	6	48	...	9	9	23	34	175	5	47	...	8	9	24	33	166
Total, Machinery, other than Gold-extracting ...		313,138	327,876	...	...	...	5	...	...	...	30	4	1	...	5	...	...	1	30	4	1
Total, Mining Machinery		1,750,587	1,653,042	1,272	1,182	6	53	...	9	9	53	38	176	5	52	...	8	10	54	37	167

PART VIII.—EXISTING LEGISLATION.

At the close of the year the Acts in force relating to mining were:—

1. The Mining Act, 1904 (as reprinted with amendments).
2. Sluicing and Dredging for Gold Act, 1899.
3. Mines Regulation Act, 1906.
4. Mines Regulation Act Amendment Act, 1915.
5. Coal Mines Regulation Act, 1902.
6. Coal Mines Regulation Act Amendment Act, 1915.
7. Coal Mines Regulation Act Amendment Act, 1926.
8. Mining Development Act, 1902.
9. Mining Development Act Amendment Act, 1924.
10. Mines and Machinery Inspection Act, 1911.
11. Gold Buyers Act, 1921.
12. Miners' Phthisis Act, 1922.
13. Miners' Phthisis Act Amendment Act, 1925.

The following alterations, etc., regarding Regulations were gazetted under the *Mining Act,* 1904:—

Additional Regulation 143a.
Additional Regulation 83a.

Mines Regulation Act, 1906:

Amendment of Division 2 of Regulation 15 under Section VIII. relating to Workmen's Inspectors of Mines.

Additional Regulations 6a, 6b, 6c.—Inspection and Examination of Persons likely to be infected with Transmissible Diseases.

Amendment of Clause 4 under Division 2 of Regulation 15, Section VIII.

Additional General Rule 45 under Regulation 4 relating to "Rises in Mines."

Amendment of Regulations 6a, 6b, 6c.

Additional Regulation 6d.

Inspection of Machinery Act, 1921:

Amendment of Regulation 10.

Coal Mines Regulation Act, 1902:

Additional Regulation 14a under Part 1, "Accident Relief Fund."

Mining Development Act, 1902:

Amendment of Regulations relating to the crushing of ore and tailings purchased at the State Batteries.

PART IX.—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 3,341 as against 3,261 total for the preceding year, showing an increase, after all adjustments, of 80 boilers.

Of the total 3,341 useful boilers, 1,820 were out of use at the end of the year; 1,536 thorough and 98 working inspections were made, and 1,519 certificates were issued.

Permanent condemnations totalled 24, and temporary condemnations 109. There were three conversions, and 12 boilers were transferred beyond the jurisdiction of the Act.

The total number of machinery groups registered was 6,332 against 6,104 for previous year, showing an increase of 228.

Inspections made total 4,825, and 4,825 certificates were granted.

Two hundred and forty-five applications for engine-drivers' and boiler attendants' certificates were received and dealt with, and 199 certificates, all classes, were granted as follows:—

Winding Competency (including certificates issued under Regulation 40 of Section 60)	3
First Class Competency (including certificates issued under Regulations 40 and 45, and Sections 60 and 63)	7
Second Class Competency (including certificates issued under Regulation 40 and Section 60)	17
Third Class Competency (including certificates issued under Regulation 45 and Section 63)	33
Locomotive Competency	11
Traction Competency	3
Internal Combustion Competency	17
Crane and Hoist Competency	9
Boiler Attendants' Competency	83
Interim	1
Copies	6
Transfers	9
Total	199

The total revenue from all sources during the year was £5,537 0s. 8d. as against £5,750 2s. 3d. for the previous year, showing a decrease of £213 1s. 7d.

The total expenditure for the year was £6,542 7s. as against £6,835 19s. 9d. for the previous year, showing a decrease of £293 12s. 9d.

Part X.—SCHOOL OF MINES.

During this, the twenty-third year of the School's existence, the closing down of one of the large mines and the continued unsettled conditions of mining, had a marked influence on the attendances of students There was little inducement for youths to follow courses of study which do not give immediate promise of profitable employment in the district. During the year a large number who joined the classes left for other parts in search of employment. The preparatory classes, which formerly were well attended, showed a decrease and this will probably have the effect of lowering the enrolment in senior class work in future years.

Students and staff did good work and the results of the annual examinations were satisfactory.

Details will be found in the report of the Director published as Division V. of this report.

The system of free assays for prospectors was continued, a total of 296 assays and mineral determinations having been made.

CONCLUSION.

In dealing with the operations of the various Departments I have only briefly commented on the principal items.

Full and detailed information will be found in the reports of the various responsible officers, published as Divisions II. to VIII. of this report.

In conclusion, I desire to acknowledge the loyal support received from all officers of the Department during the year.

I have, etc.,

M. J. CALANCHINI,

Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1927.

DIVISION II.

Report of the State Mining Engineer for the Year 1926.

Office of the State Mining Engineer,
Perth, 31st January, 1927.

The Under Secretary for Mines, Perth.

Sir,—

Report on the work of my Branch for the year 1926 is submitted for the information of the Hon. the Minister for Mines.

INSPECTION OF MINES UNDER "THE MINES REGULATION ACT, 1906," AND "THE COAL MINES REGULATION ACT, 1902-1926."

The personnel of the Inspection Staff remained the same as in the previous year. Mr. Greenard went on long service leave in October, and Mr. Phoenix was engaged most of the year on miners' phthisis work in conjunction with his other duties.

Workmen's Inspectors of Mines.—Nominations were called for the position of Workmen's Inspector of Mines for the Cue District; Mr. R. P. McMennemin being the only nominee was re-appointed for a further two years as from the 6th June, 1926.

REPORTS OF INSPECTORS OF MINES.

(The figures of production supplied in the reports of the Inspectors of Mines hereunder are those obtained by themselves from various sources and often do not correspond in the "Mining Statistics," though usually reconcilable with these when all particulars of each record are brought together.)

Report of Mr. W. Phoenix, Inspector of Mines, Kalgoorlie.

I have the honour to submit my Annual Report for the year ending 31st December, 1926.

A systematic inspection has been made of all working mines throughout the district and close attention given to all inspections required by the Mines Regulation Act.

Health conditions.

During the year efforts have been made to suppress the dust underground as well as in the dry crushing mills. The solid steel reciprocating machine has been replaced by the Water-Leyner type.

Observation with regard to the factors of dust, ventilation, and temperatures in connection with the hygiene of mining has received close attention.

The drinking water and sanitation underground are in charge of special officers, and inspections of these places are made periodically.

Dust and temperatures.

With regard to dust and temperatures, intermittent inspections have been made during the year, not with a view of securing data, but with the object of ascertaining if dust quantities are kept in check, and testing isolated sections in different mines which have Venturi Blowers and other devices for the suppression of dust. Much detailed work has been done and I hope this year to make a general inspection to ascertain the results.

The problem of diluting dust in confined spaces was urgent, and it has taken a great deal of time to introduce air in such a manner that the men at the machine face will derive the benefit.

The temperatures on the whole have been fairly low, and the air volumes, where tested, show that the miners in the general working faces and stopes are getting a good supply.

Miners' Phthisis.

During the year all employees had been examined at the Commonwealth Health Laboratory, Kalgoorlie, and the T.B. miners withdrawn and many of the advanced silicotic men have also sought employment elsewhere.

Rock Bursts.

Several earth tremors have been felt during the year, but no damage has been found in any of the present working faces. There are not sufficient data available to express an opinion on this subject. I have observed slight movement along shear planes and signs of fracturing in faces of stopes approaching a depleted portion of a mine. When nearing a shear plane or fault, noise or shocks in the strata must be due to tension or compression. I have noted that small faults are increasing at great depth. No rule can be laid down as to when pressure bursts are likely to occur.

If mining in the future is to be carried out to any great extent at depth some effective preventive measures must be considered. At present mining at great depth is only carried out in isolated sections where rich lenses of ore are found.

General Remarks.

Mining generally is depressed, but there is an improved tendency to study ways and means whereby low grade ores can be mined cheaply. If costs do not come down the payable tonnage will soon be exhausted. It is a difficult matter to replace, even gradually, any mine which has already closed down. It is to be hoped some methods will be evolved in the near future whereby low grade ore can be mined profitably, so that the economic life of the mines can be extended and a greater quantity of low grade ore mined.

The mines outside Kalgoorlie centre have been referred to in Mr. Inspector Gourley's report, who has been in close touch with them during the past year.

Report of Mr. E. J. Gourley, Inspector of Mines, Kalgoorlie.

I have the honour to submit to you my annual report for the year ended 31st December, 1926.

I have made complete inspections of the mines in the following districts:—

Kalgoorlie Mines—Great Boulder 5, Kalgurli 6, Hannans Reward 5, Horseshoe 4, Perseverance 3, South Kalgurli 4, Ivanhoe 6, Lake View 5, Hannans Star 4, Associated Mine 3, Brown Hill 4, Croesus Proprietary 3, North End Mines 3, Dry Mills 4; Norseman District Mines 7, St. Ives 8, Menzies District 9, Ora Banda 4, Kunanalling 3, Logan's Find 2, Davyhurst District 1, Waverley 3, Kanowna 3, Linden, Devon Mine 1, Broad Arrow 2, Golden Ridge 2, Mt. Monger 4, South Kurnalpi 3, Bulong and Taurus 2, Hampton Plains 2, Gladsome and Sand Queen Mines 3, Mt. Juglah 3, Mulgabbie and Kurnalpi 1, Zani 1, and Gindalbie 1.

DEVELOPMENT WORK DONE DURING THE YEAR.

Great Boulder Leases.—Driving 696 ft., cross-cutting 89 ft., winzing 182½ ft., rising chiefly to open up blind stopes 333 ft., shaft sinking 23½ ft., diamond drilling 272½ ft. The stopes on the main load are just about beat out from the 2,400ft. level up to the surface, and the ore won from this lode during the year has come from taking out the bottoms of the different levels; development work has been confined to what is known as the Contour Lode and to the Lane shaft end of the mine. Hamilton shaft workings, which are worked on the shrink stope system, are just about worked out, and the greater part of the ore drawn off. However, this shaft could be made good use of, in my opinion, to further prospect the lode which should live down coming from Morty's shaft and the Enterprise late Boulder No. 1 leases; and it would be best to cross-cut in a North-Easterly direction from the bottom or 1,900ft. level, for no work has been done on the abovementioned lodes below 1,200 ft.; in fact the Boulder No. 1 is only down 400 ft. During the past two months a large number of tributes have been let on this mine from the surface down to 500 ft., and already some of the parties have obtained good returns and quite a number are very hopeful for the new year.

On the Hannans North Mine, owned by the Great Boulder Co., 400 ft. of driving, 78 ft. of winzing, and 101 ft. of rising have been done. Regular crushings have been taken out for at least half the year; but to work the mine at all successfully the main shaft requires sinking another 200 ft. Water is fairly heavy, and it looks as if the capital could not be obtained or prospects did not warrant further work; yet from what I have seen of the assay plan values appear to me to be payable. However, the mine has been stopped, and all rails, tools, and air pipes withdrawn. Total development on this group of Mines was 2,184 ft. for 1926, and 3,790 ft. for 1925.

Lake View and Star Group.—The development done on the Lake View is as follows: Driving 1,188 ft., cross-cutting 237 ft., winzing 736 ft., rising 108 ft., or a total of 2,269 ft., the total for 1925 being 1,534 ft. This work has been done chiefly from the 1,200ft. level down to the 1,900ft., and has opened up a large quantity of pay ore. Unfortunately the bottom or 2,300ft. level has been to some extent disappointing, for there appears to me to be a change in the rock formation where the big stope, known as the Hat Stope, should come down; yet I am of the opinion that the North drive is not out far enough to intersect this big ore body, and that the strike and dip have probably been disturbed by some fault.

Ivanhoe Mine.—Very little development work has been done, viz., 213 ft. driving, chiefly on the 3,000ft. level, 32 ft. of cross-cutting, and 81 ft. of winzing. The work on this mine is confined to stoping from the 300ft. level down to the 2,400 ft. level, and then no work of any consequence has been done until the 3,000ft. level is reached, where a big stope is being worked on the shrink system, and the ventilation in this stope is over the allowed temperature; therefore 6-hour shifts are being worked, and we have no complaints from the men employed. All pumps have been done away with in this group of mines, and baling with tanks now handles the water to below the 3,000ft. level. The Ivanhoe water is being allowed to accumulate below this in the shaft, but not in the Lake View shaft.

Chaffers Mine.—The only development work done is 24 ft. of driving. This mine is in the hands of tributers, but a start has been made to unwater and clean out the shaft, in which there are 500 or 600 ft. of accumulated ore caused by the overflow when loading skips from the upper levels. They have got down to 1,500ft. level and are now busy trying to prevent the water which makes about the 1,100ft.-1,200ft. levels from entering the shaft, the idea being to further explore the bottom levels of this mine.

Star and Deep Level Mines.—All work on this mine has been confined to the upper levels, but during the year a more powerful winder has been installed and the shaft is being unwatered, so that at the present ore is being mined from the 700ft. and the 1,100ft. levels. Stopes will be ready for operation shortly.

Golden Horseshoe Mine.—The development work done during the part of the year the mine has been working is: driving 493½ ft., cross-cutting 128½ ft., rising 2ft., winzing 376½ ft.; and diamond-drilling 165 ft., being a total of 1,165½ ft; previous year, 1,982½ ft. I understand that the prospects of the mine on the 2,600ft. level No. 3 lode are very encouraging, but to do any good economical work on this lode, No. 2 shaft should be sunk from its present depth, 2,500 ft., at least 500 ft. This shaft is well situated, and with the exception of a small movement on a slide between the 1,500ft. and 1,600ft. is in good order. Probably a more powerful winder would be required. However, the mine is closed down at present.

Associated Mine.—Development work done: driving 846¾ft., rising and winzing 374½ ft., cross-cutting 98½ft., total 1,319¾ft.; previous year, 3.559 ft. Stoping on the shrink method on short and narrow lenses of ore opened up in the past year has been carried on from the 1,600ft. level up to the 1,200ft. level, but the most of the development work has been done from the 200ft. and 300ft. levels, and nothing of exceptional value has been discovered, the mine having had a hard struggle to make ends meet. One or two parties of tributers in the old working taking out pillars have done remarkably well.

South Kalgurli Mine.—The development work done on the mine is: driving 1,875 ft., shaft sinking 29 ft., cross-cutting 1,183 ft., winzing 343 ft., rising nil, and from the appearance the ore reserves have been considerably increased. There is an improvement in development work from 3,269 ft. in 1925 to 3,430 ft. in 1926. The saddle back timbering has been completed over the underhand stope below the 1,600ft. level, and this timber has been covered with mullock to form the level. This will enable the management to mine all the ore on the rich shoot between the 1,600ft. and 1,700ft. levels without leaving the usual pillar under the level. Saddle back timbering is also being put in over this 1,600ft. level, for the ore body is wide and there appears to be a junction of two stopes at this point. A new change house with up-to-date conveniences has been erected as close as possible to the collar of the main shaft, and all drills are of the wet Leyner type, therefore dust is kept down to a minimum. In addition to this, Venturi blowers have been installed in several development ends and are doing good work. The Government Laboratory Staff placed some rabbits and guinea pigs on the 1,600ft. level for experimental purposes, and these were kept down there for some months, but I understand the result did not give any information of value. A new 6-inch air main has been put in from the surface to the 1,600ft. level, which should ensure a good pressure to the rock drills.

Oroya Links Group.—On the Eclipse and Croesus Proprietary Mine the development work is: 261 ft. driving, 157½ ft. cross-cutting, rising for stopes 96½ ft., winzing 66½ ft., the chief portion of which has been done on the 900ft. and 1,000ft. levels. Average grade ore of 32s. is being mined, but the point of most interest is in the winze below the 1,000ft. level 120 ft. North, where a winze has been sunk 60 ft. almost vertical and got off the lode; so from the bottom a cross-cut was put out and proved the lode to be 17 ft. wide worth 32s. This winze has been stopped and another started 100 ft. South off shaft to prove the length. It appears to me to be a case of necessity to sink the main shaft, for it will go down in maiden country. In the meantime about 1,200 tons of ore per month are being mined from the development work and stopes from the 1,000ft. backs up to the 300ft.

Kalgurli Mine.—Driving 995½ ft., cross-cutting 325½ ft. winzing 55½ ft., rising 288 ft. This rising was necessary partly to open up stopes on isolated pipes of ore, but mostly to tap the residues for filling the stopes at 200ft., 300ft., and 400ft. levels which were started on the shrink method and afterwards found not to be economically worked by that method. These stopes are yielding good grade ore, but the development work on the lower levels, while giving encouraging values in places, has shown that shoots have been short and of no width so far.

Brown Hill Mine.—All tributes have been determined on this mine and the company have taken over the workings. They are mining some very good ore from a vein going up in the hanging wall of the old Brown Hill ore shoot. This may lead to something of importance, but it is rather difficult to pass an opinion at present. The driving and winzing has been done on this vein (24 ft.).

Oroya North Block.—There have been a few tributers at work with varying success, but no development work has been done. However, the water is being kept down under some system of subsidy. This prevents the water entering the Associated Mine at the 1,100ft. level. The development work on this group of mines is 2,270 ft. for 1926, and 1,003½ ft. for 1925.

Associated Northern—Iron Duke Lease.—This mine is entirely in the hands of tributers, and they have been sorting out, filling, and working the droopers or veins in the footwall of the Oroya Brown Hill ore shoot, making good wages but opening up nothing of consequence. No development work.

Enterprise—Late Boulder No. 1.—The syndicate has been working with four men during the year and has completed a new hauling way from the 356ft. level through to the surface, installed a friction hoist and head gear. The ore is worth about 42s. per ton, average width 6 ft., and this small mine appears to be developing very satisfactorily but requires to be worked from a deeper shaft such as Hamilton shaft on the Great Boulder Mine, but the Hainault shaft, if it could be made use of to a depth of 900 ft., would be the most efficient. Development work done: shaft sinking and rising 270 ft., driving and leading stope over 100 ft. in length, averaging 48s. 3d. at the bottom level, has been done, and a considerable quantity of oxidised ore has also been won from the 166ft. level.

Boulder Perseverance, Limited.—Driving 1,502½ ft., cross-cutting 416 ft., winzing 323½ ft., rising 120 ft., total 2,362 ft. for 1926, compared with 3,036 ft. for 1925. There is a considerable drop in the footage done by the company, but tributers have driven 116½ ft., cross-cut 81 ft., winzing 156 ft., and rising 42 ft., total 395½ ft. In addition to this the Bank of England, owned by a syndicate in which this company is interested, I understand, has done: shaft sinking 29 ft., driving 50 ft., crosscutting 192½ ft., winzing 13½ ft., grand total 2,757½ ft. The results from the Bank of England Lease have not so far produced tonnage of consequence. A larger proportion of the tributes have either been determined or the tribute blocks acquired by the company, for the tonnage treated by tributers is 24,214 tons, and by the Company 36,868 tons, and 2,184 tons have been purchased on assay value from outside sources, a considerable amount of this coming from the Enterprise or late Boulder No. 1. The ore being mined from the Perseverance from the levels No. 1 to 1,750ft. is payable, and some very rich ore has been developed on the No. 9 level near the Boulder boundary. During the greater part of the year no work was done below the 1,900ft. level backs, but during the past two months the 2,050ft. level is being further explored with encouraging results. A number of improvements are being made to the surface plants, and Holman wet drills are gradually being installed. More attention has also been given to ventilation than previously, and the results into the working places are at present very satisfactory. In addition, a number of the open shrink stopes in the upper levels have been filled with residues, more particularly around the main shaft. The mine appears to me to have a new and long lease of profitable working ahead. The management are still experimenting to obtain more efficiency in crushing by the ball mills, but no opinion can be given at present as to success.

North Kalgurli.—This mine has been in the hands of tributers, three parties working on the Eastern lode near the Paringa boundary to a depth of 120 ft. Some payable crushings have been broken, but the parcels were small. The mine has been sampled very thoroughly by the Lake View Company, and several levels by the South Kalgurli Company, but I have not been able to obtain the results. The position as present is that a few parties of tributers are at work, and the water is being kept out by the South Kalgurli Company.

Paringa.—A diagonal crosscut has been put out in a North-Eastern direction to a distance of 210 ft. A small vein was cut at 140 ft. and a crushing of 30 tons was broken for 17 dwts. to the ton, but values below and above the level are not payable. It is now proposed to further prospect the Eastern ground by diamond drilling from the 400ft. level.

New North Boulder.—This mine and plant have been acquired by a syndicate of which Mr. T. Greenhill is the chief holder. They have not started work yet except with sufficient men to hold the lease.

Hannan's Reward.—The slimes plant erected on a subsidy to bring the plant up to date and to supply the requirements of the North End of the field with crushing facilities has not been a success. The accumulated slimes were of sufficient value to pay for a time, but there was not sufficient tonnage of value, for when the old slimes from the Mt. Charlotte dump were tried they were too poor, while from the small parcels of public crushing brought to the mill the sands and slimes have not been anything near sufficient to either keep the 5-stamp mill going or the slimes plant. It will therefore be seen that, while there are a number of men prospecting and fossicking about the North End, they do not break sufficient ore to keep a 5-stamp mill going more than 12 hours a day. Also, 2,182 tons of outside ore has been bought by the Perseverance Co., but from the South End; while the Kalgurli Mine has treated 7,091 tons and Lake View 1,030 long tons. The majority of prospectors prefer to sell on assay value now, for they do not care about scraping plates if it can be avoided.

MENZIES DISTRICT.

I have visited this district on several occasions to inspect and report on work done under the Mines Development Act at the Lady Shenton, Alpha Lease, Menzies Consolidated, Sand Queen, and Gladsome Mines. The position of the *Lady Shenton Syndicate* is that they have raised sufficient capital to do some further development from the bottom level where the diamond drill cut some values. It is proposed early in the new year to sink a winze about 60 ft. to open up the reef cut. *The Menzies Consolidated* has been taken over from the company by the Government, and the machinery, stores, etc., are now being sold. *Collier and Riley* have picked up an East and West reef at 100 ft. in the old Golden Age shaft, and have obtained two very rich parcels of ore, with values still going down over a width of 3 ft. by a length of 40 ft. *Sawyer Bros.* are still working the *Warrior Mine,* and these six brothers, by breaking ore from their mine and doing all the public crushing in the district, are making a good living. There are still a few prospectors in the district, but nothing of importance has been discovered.

COMET VALE.

The *Sand Queen and Gladsome Mines* have been acquired by a syndicate, who have appointed Mr. A. Faul as manager. He has got to work quickly and has erected a 6-drill compressor, put the winder and boiler in order, erected several small buildings, and has a 10-stamp mill on the ground, which has been removed from the Boddington Mine, Goongarrie. He expects to begin unwatering the workings about the middle of January.

MT. IDA.

A party of four men are at work on the *Unexpected South Mine* but are not doing much good. Two other prospectors are at work on the North of the townsite. I assisted Mr. R. Wilson to sample the *Gold Rock and Elsie May Group* of Mines, and no doubt you have his report on hand. (See Appendix No. 3.)

WAVERLEY.

This centre has been quiet, for the majority of prospectors out there have been engaged in pulling sandalwood, and nothing of importance has been discovered.

ORA BANDA.

The *Gimlet Mine,* owned by the Associated Northern Co., has done development work as follows: driving 790 ft., crosscutting 402 ft., winzing 146 ft., rising 54 ft., and stripping 34 ft., or a total of 1,426 ft., and a considerable quantity of payable ore has been opened up. Unfortunately this district suffers periodically from shortage of water and the mine is not able to run the treatment plant continuously. This is to be regretted, for the bottom of the mine looks very encouraging. There is also the State Mill to take into consideration; this cannot be run for the same reason, and there is a good quantity of ore from the number of small mines in the district waiting for rain.

Hancock's Mine, near Grant's Patch, was under option to the *Orinda Company,* but after exploring by two winzes below the 50ft. level down to the 100ft. level, they have abandoned the option. Obviously values were not good enough to continue working, yet the mine has been a payable producer at and above the 50ft. level for the prospector, being over 100 ft. in length and an average width of 6 ft. Development work done by the Orinda Company is as follows: 120 ft. winzing, 80 ft. crosscutting.

Williams and Party—Dark Horse—are following contacts with varying success, and four other parties of prospectors are at work in this district. I visited an alluvial find near the *Dixie Mine.* Sinking was about 6 ft., but there were only two claims where pay wash was worked. This gully appears to me to fan out, and the gold is too scattered to pay.

BROAD ARROW.

There have been several parties (assisted) sent out into this district, but none of them have been successful.

The *Oversight and Tara Mines* worked by Mr. Barratt have produced from contacts some very rich ore both by dollying and crushing small parcels, but this mine only employs two men, contacts being very erratic and difficult to follow. Several bores have been put down on the South end varying in length from 20 ft. to 50 ft. Results so far are not payable.

Hawke and Lacey, at Paddington, working a large crushed quartz lode, have abandoned the area, for it is about 3 dwts. too low to pay.

KANOWNA.

The *Red Hill Mine* employs on an average 18 men, but they do not develop any ore. The method adopted is underhand stoping on the flat reef. Unfortunately water was struck during the year, and having no means of handling it economically the lower portion of the mine has been abandoned and work confined to the upper workings on the Melba and Doyle's leaders, and for the past few months values have been unpayable, but as the company has a reserve fund work is being continued.

North White Feather Mine.—The new shaft on the *Golden Cement Lease* has been sunk to 170 ft., 70 ft. driving North, South 186 ft., total 256 ft. The reef averages 15 inches in width, and 66 tons of selected ore returned 87 oz. 14 dwt., value £3 12s. 8d. per oz. In addition, 17 ozs. were dollied, value £3 14s. 6d. per oz. Unfortunately there are no backs, for tributers years ago underhand stoped this reef until the water drove them out. However, the company has installed a pump and made a start to sink another 50 ft.

Golden Valley.—The 5-stamp mill works periodically on this mine. From ore broken above the water level, yields appear satisfactory.

MT. MONGER.

McCahon's Great Hope Mine has crosscut 110 ft. at the 300ft. level, 40 ft. winzing from 235ft. to 300ft. level, 30 ft. of rising above the 300ft. level, 15 ft. driving at 200ft. level, and 18 ft. at 300ft. level. I understand that the rich shoot of ore has not been found at the 300ft. level, but some very rich ore has been taken out around the intermediate at 235ft. The cyaniding of tailings is being carried on, and crushings for the public as well. Parcels are small but values are high from the different leader claims on this field.

ST. IVES.

During the year, after the trial crushings were finished, a party of tributers took over the Ives Reward mine. They put through a satisfactory crushing from the Blue Lode, but the shoot of ore is short. with an average width of 3 feet; they have stopped these workings and are now confining their attention to the main shaft workings. They have put the gas engine in order and treated a small parcel from the 69ft. level, when the water supply from the main shaft gave out. At present they are putting the Victory water supply main and pumping engine in order.

Ives Lake View Junction.—A 5ft. Huntington Mill has been at work on this mine for the best part of the year but is now closed down, all the pay ore over the 90ft. on the main ore pipe being worked out, and further prospecting or developing will have to be done. A cyanide plant has been erected and is now at work. The initial clean up was not payable, but there may be a quantity of gold still in the solution, due to starting a new plant. *McCahon and party* on the adjoining lease North have been treating regular parcels of ore for each run of the State Battery for payable returns, but it appears to me that the shoots of ore on the South end of this field do not live below 90 ft. in depth. The North end of the field is practically deserted with the exception of Brown and Crutchett on the *Idough mine,* who are working it again after having tried the Cooee Lease under a subsidy with no success.

NORSEMAN.

Mararoa.—Mr. Nicholson has completed the erection of a 10-stamp mill, winding engine and cyanide plant, and started treatment in November, the ore at present being broken from the stopes over the 600ft. level. The plant is quite up to date from a labour-saving point of view, and this syndicate are very satisfied with their prospects.

Norseman Development Lease.—Messrs. Wojvodich and the Mathiesson Bros. have taken up this area, and have sunk two winzes from the 100ft. level on the reef, one at 60ft. North, and the other at 130ft. in the North end of the level. A parcel of 200 tons crushed from these winzes and a stope off No. 1 averaged 16 dwts. They now intend to unwater the shaft and open up another level, for they got down into the water with the two winzes. This proposition to me appears to have a good chance of success.

Viking Mine.—This mine is in the hands of a party of four good miners, and they have been breaking ore of high values all the year from the South end of the old stope from the 300ft. level up to the 200ft. They applied for a subsidy to develop the 600 ft. level North, and this, I understand, was granted to them on the £ for £ basis. but only one of the party was willing to put up his money, so that at present the work cannot be done. They have done no development work.

O.K. Mine.—Since the Great Boulder Company abandoned the mine Messrs. Fuller and Baker have taken up the property, erected a small head gear, installed a winch and boiler, and have been underhand stoping below the 300ft. level by hand labour. The reef is small and very hard, but values are high and payable. The places where the good values are being mined were determined by the assay of samples taken by Mr. Blatchford and myself, and it appears as if they will make a good living out of the mine for some time in this small way.

There were a good many prospectors in this district until the railway started, when quite a number obtained work. However, they will be back again in the near future. We had one party of assisted prospectors, Hewit and Runge, who found a good pipe of ore at the *Oversight Mine* and paid back the money advanced.

WIDGEMOOLTHA, BULONG, GOLDEN RIDGE, BARDOC, AND WAVERLEY.

In these districts the majority of prospectors have been pulling sandalwood, and while there are a number of men living in these places little or no prospecting has been done. Of course these men while wandering about the bush always have an eye on any auriferous country they pass over, but I have not heard of any new finds.

KUNANALLING.

Messrs. *Hunting and De Gracie* have obtained some very rich small contacts about half a mile North of the townsite, and are still on good ore, but small.

Messrs. Larkin and Lonsdale also discovered a new contact line near the *Sydney Mint Mine.* It was rich from the surface to 20 feet, where they lost it, and they have done a considerable amount of work trying to pick it up again. *Pearce Bros.* have started to work their lease. After the death of one of the brothers they obtained six months' exemption to fix up the estate. Very few prospectors are now at work on account of the shortage of water. This also applies to the *Carbine Mine,* which cannot re-open until rail falls. This is a serious blow to the 25 men employed for years on this mine. The returns for the year have been just above the pay mark, so that to condense water is practically impossible.

Mt. Juglah—Transville Mines.—A subsidy was granted to Messrs. *Bennit and Party* to sink the shaft below the 100ft. level, and a depth of 160ft. was reached, by 70 ft. of crosscutting and 20 ft. of driving proved a failure. This party is now breaking a crushing from the 70ft. level and carting it to Hunt's Battery on the *Sweet Nell Mine,* 9 miles West. Hunt Bros. have two men at work in the mine, but values are very erratic.

SOUTH KURNALPI.

An option has been let on the *Rising Sun Mine* to a Melbourne company. They sank two shafts on the reef, but owing to water, which is very shallow, and the rotten ground around the reef, these two shafts had to be abandoned and a new one started off East of the reef. This is down a depth of 60 ft., and is so far fairly dry. No other work is being done in the district.

KURNALPI AND MULGABBIE.

With the exception of one or two prospectors, all others are engaged in pulling sandalwood.

CONCLUSION.

I have paid attention to the condition of ropes, safety appliances on cages, and the examination of shaft timbers. Safety doors have been put on to cover the shafts on the South Kalgurli and Assosiated Mines to ensure safety when changing the skips, and during Mr. Inspector Phoenix's frequent absences from the district attention has been given to ventilation, and we have had very few complaints. I have assisted Messrs. Blatchford and Wilson, Assistant State Mining Engineers, to sample and inspect many small mines, but the results, except the Devon Mine at Linden and Nickel's Mine at Logans, do not show any promise. These trips have taken up a good deal of time.

Report of Mr. W. M. Deeble, Inspector of Mines, Cue.

I have the honour to report on the progress of the Peak Hill, Murchison, and Yalgoo Goldfields, the Black Range District of the East Murchison Goldfield, and the Northampton Mineral Field for the year ending 31st December, 1926.

In travelling over the large area contained within the boundaries of these Goldfields, although mining has not made the progress we desire, there is a noticeable general improvement.

The copper mines in the north of Peak Hill Goldfield have not been worked during the year owing to the low market price of copper, and the cost of bringing the product of these mines to the market.

Egerton.

The country around this place is again receiving the attention of prospectors, and one party picked up a rich quartz specimen, but from the latest I heard from the place the reef had not been located.

Naberu.

From near Pinyeringa Pools on the Rabbit-proof fence, north-east of Peak Hill, two small crushings were brought in at the end of the year. One brought in by S. Lyons and Baumgarten, jun., of 19.5 tons returned 83.65 ozs., and another of 19.50 tons brought in by Baumgarten, sen., 36.46 ozs. These are the first parcels of ore treated from this district.

Peak Hill.

The usual number of miners have been engaged working their own shows in and around this place, but nothing worth recording has been found during the year.

Holden's Find.

During the year two prospectors have been working the original Holden's Find, but the developments have only disclosed low grade ore.

Waterloo G.M.—It is reported that a company has been formed in Melbourne for the purpose of restarting this mine. The manager lately returned to the mine, and it is reported that the erection of new machinery will be started at an early date.

Mistletoe.

Munarra G.M.—The management has started sinking the main shaft for the purpose of opening up another block of ore. A trial crushing of 234.25 tons taken from a large dump of seconds on the mine returned 92.38 ounces of fine gold. This is too low-grade to cart thirty-two miles for treatment, and dealing with the remainder will have to be left until the new block has been proved, to show if it warrants the erection of a mill on the ground.

Belele.

Prospectors Holden and Williams have been working on a reef about five miles from Belele Station. The reef samples very well, and the ore will probably return about one ounce per ton.

Gardiner and Lyons, working to the north, were getting samples at time of visit, but there was not sufficient work done to prove anything.

Meekatharra.

Ingliston Consols Extended G.M.—The main body of workers in the district has been employed in this mine. During the year 43,859 tons have been milled for 21,872 ounces fine gold. This is a slight increase in tonnage over the previous year and the value is about the same. The treatment consists of mill amalgamation and concentration and the concentrates are sent away for treatment, so it is necessary to know the returns from these before a comparison can be made with other years.

Generally there is nothing outstanding to report in this district. The total of 44,634 tons have been milled for 22,889 fine ounces of gold.

Yaloginda.

Three crushings have been treated from this district during the year, making a total of 106 tons for 151.18 ozs.

Culculli.

The leaders at this place are small and irregular but the tonnage milled has shown high values—15.75 tons milled this year returned 233 ounces, and previous returns show 932 tons milled for a yield of 4,269.23 ozs.

Reidy's.

Emu North G.M.—During the year this mine has been employing an average of 23 men, and during the same period milled 4,637 tons for a value of £4,669 8s. 9d., and 4,228 tons of slimes cyanided for £4,648 2s. 5d., making a total of £9,317 11s. 2d. The tonnage was treated with a five-head mill and an eight-vat cyanide plant with a total capacity of 128 tons. A new main shaft 12ft. x 4ft. in the clear, close timbered and divided into three compartments, has been sunk to 100ft. depth and connected with No. 1 level.

Tuckanarra.

The usual number of prospectors have been engaged at the place, and the most promising prospect at the end of the year was P.A. 1577, from which 77 tons was treated by amalgamation for a yield of 35.39 fine ozs. The ore was taken from a large ironstone lode, and this class of ore usually gives only about 50 per cent. of its gold contents by amalgamation alone.

Cuddingwarra.

There has been an average of six men working in this district throughout the year and, although getting good prospects, they have not found a payable lode or reef. Carlyon & Son are working a lode three feet wide, out of which 28.76 tons of ore have been crushed for 42.89 ozs. by amalgamation.

Cue.

Mining has been very quiet in this part during the year. A number of men are engaged in the district working for themselves, the main mines worked being Primrose and Gem of Cue. The first produced 157 tons for 95.33 ozs., and the latter 140 tons for 200.79 ozs.

Tuckabianna.

There has been a great variation in the number of men employed around this place throughout the year.

The Buttercup, late Triplicate, treated 404.75 tons for 103.41 ozs. by amalgamation. P.A. 1560 milled 71.75 tons for 207.14 ozs. by amalgamation. This was taken out of a very large ironstone foundation which is very disturbed at surface and difficult to follow.

P.A. 1550 produced 67.50 tons for 22.77 ounces. It should be noted that in a district like this, where the lodes are mostly oxidised ironstone, only about 50 per cent. of the gold is extracted by amalgamation, and this is looked upon as the total gold contents of the ore by those not aware of the fact. The gold contained in the sands when the ore is treated at State mills is paid for in assay value, less deductions for treatment.

Day Dawn.

South Fingall G.M. has produced and milled 683.5 tons for 402.02 ounces by amalgamation. Of the ore treated 338.5 tons were taken from the surface for 99.46 ounces, and 345 tons were stoped out of No. 2 level, from which 308.31 ounces were obtained. 1,300 tons of old sands were also cyanided for 169 ounces.

Kinsella G.M.—During the latter part of the year B. Caratti produced 400 tons of ore from this mine, which returned 98.67 fine ozs. The reef is large and the ore easily obtained.

Lake Austin.

Mainland Consols G.M.—The owners, Walker Bros., picked up the shoot of ore formerly worked by Daniels Bros. and Gordon, and have been following the ore downward, with an underhand stope varying from 20ft. to 30ft. in length. The best ore has been sent to Cue State battery for treatment, and from 14 tons they obtained 271.44 ozs. by amalgamation, and from dollied stone 545.19 ozs., making a total of 816.63 ozs. There are still about 20 tons of high grade ore on the mine.

There were larger shoots of rich ore worked down to water level, but the present owners have not been able to pay attention to them since the pumping machinery has been installed.

Weld Range.

Prospector Curtis and mate have about ten tons of ore taken from a reef five miles east of Beering Pools. The ore is high grade but samples vary considerably in value, and it is difficult to give an estimate of probable yield.

Moyagee.

Moyagee G.M.—The shaft in this mine was deepened in the latter part of the year and a crushing of 37.75 tons milled for a yield of 321.62 ounces fine gold. The total yield for the year was 127.9 tons for 579.74 ozs

Lennonville.

This centre produced 30 tons of ore for 114.35 fine ounces. Although the quantity was low, the grade of the ore was high.

Mt. Magnet.

This centre produced 3,548.08 tons for 3,240.77 fine ounces. The principal producer was *Hill* 60 G.M., 2,377 tons for 901 fine ounces. There is a large ironstone lode going through this mine averaging about 15 feet in width and the mining costs are therefore low. The cyanide plant is rather under the capacity of the mill, and it is intended to put in another vat, when there will probably be an increase in the monthly output.

There is also a large reef in the *Saturn*, but unfortunately they will not be able to keep up the average of 162 tons for 207.31 ozs.

The following shows turning out good yields were: Poverty Pot, 20 tons for 360.25 ozs.; Broken Bond, 140.75 tons for 422.98 ozs.; Christmas Gift, 13 tons for 233.23 ozs.

Paynesville.

At *Mitchelton* an average of eight men have been engaged throughout the year. Some found very encouraging prospects, but nothing likely to develop into a mine. Stone dollied from the *Elsie Mine* produced 233.61 ounces of fine gold.

Black Range District.

Montagu.—At the end of the year prospectors Jones and Gaimon brought in 25 tons to the State mill, Sandstone, which gave a return of 70.03 ozs. of gold by amalgamation, the sands assaying 2 ozs. 8 dwts. per ton.

Barrambie.—Heffernan & Swanson, P.A. 947, brought in 8 tons which yielded 48.30 ozs., the sands assaying 2 ozs. 10 dwts 12 grs. per ton. There were also 56.38 ozs. dollied from this place.

Maninga Marley.

The Havilah G.M. has been re-started, and a crushing of 234 tons returned 236.77 ozs. The ore was obtained from stoping over the level driven by the late owner.

Sandstone.

The principal producers at this place were *Comedy King* 93 tons for 150.83 ounces, and *Oroya East* dollied 361.81 ozs.

Youanmi.

A number of prospectors working around the surface of the old mine produced 1,080.5 tons for a return of 424.28 ozs.

Payne's Find.

Carnation G.M.—This mine was restarted at the end of the year, when machinery was installed to enable the shaft to be sunk deeper to follow the shoot of ore downwards. During the year 41.50 tons were treated for 52.42 ozs.

Lake View Mine has been shut down for some time, but will be restarted as soon as new winding machinery can be erected. This and the adjoining mine are to be worked together. During the year 168 tons produced 222.64 ozs.

Sweet William produced 59 tons for 69.78 ozs.

Field's Find.

Brown's Reward G.M.—The lode being worked is a large ironstone formation between two irregular walls, the lode formation often splitting up and showing in sections as if it were two or more lodes. The values have averaged well throughout the year. the tonnage and results up to the end of November being 900 tons for 976.44 ozs.

The total amount of ore treated from Field's Find during the year was 1,216 tons for 1,182.24 ozs.

To the south of Field's Find there is very little to note. The year's return from *Warriedar* and *Rothsay* totalled 547.5 tons for 458.45 ozs.

Gnow's Nest.

Brilliant G.M. is the mainstay of this place; a few prospectors give the surrounding country a trial occasionally. During the year 6,739 tons were milled for 3,493.58 ozs. recovered by amalgamation. The sand resulting from this ore has been stacked for future treatment.

With the amount of development work now in hand, I learn the extraction of the gold from these is left to a later date, when it is intended to erect a treatment plant.

Early in the year an active policy of development was decided upon, and a new ten-inch Cornish pumping lift installed. The sinking of the main shaft from No. 4 level was started and taken to 30ft. deeper by the end of the year. This work, it is expected, will be completed by the end of March, 1927, and give an extra 120ft. of back to stope.

A new Kynoch gas engine, and Allan producer, of a capacity of 120 h.p., also a new Sentinel air compressor is being installed. The installation of this latter plant is expected to bring about a big reduction of running the treatment plant, and give greater facilities for development work and at a less cost.

In sinking the last lift in this mine a considerable expenditure was caused by an inadequate pumping equipment, but with the new pump this is not expected to recur.

The prospects of the mine are reported bright, and during the year the average number of men employed was thirty-four.

Melville.

The Revival G.M. has been worked throughout the year by the Nevill Bros., who are gradually opening up the mine, which has produced 93 tons for 102.15 ozs., the total from this district being 228 tons for 195.03 ozs.

A number of other prospectors are working here.

Yuin.

The only work carried out in this place was the retreatment of sand on the *Royal Standard,* 2,910 tons returning 79.70 ozs.

Warda Warra.

This place is situated about sixty miles north of Yalgoo, on the Rabbit-proof Fence. Several prospectors have been engaged here throughout the year. The total of 81 tons have been milled for 49.74 ozs.

Northampton Mineral Field.

The first discovery of copper in Western Australia is reported to be in 1842, when the Wanerenooka was discovered. In the year 1848 copper was discovered on the Murchison River and specimens sent to Adelaide for assay were found to contain copper, lead, and traces of gold, and one piece the assayer certified as being rich in silver. This place was known later as the Geraldine.

Mr. F. T. Gregory, writing in 1861, notes the discovery by some member of his party of gold in the alluvial deposits in the Bowes River.

The galena sent from the field is said to be remarkably free from the more valuable metals, but as they have been found in the district it seems to me advisable to have assays made occasionally to prove if there is any present in the concentrates, as it would make considerable difference in the value of the product.

Both copper and lead have been worked to a considerable extent, but the market price of the metals have a great effect on the mining operations, and at present only the lead mines are in operation.

There are no mines now working in and around Northampton proper, and the idea seems to exist that the metallic contents of the ore bodies do not go down.

Mr. A. Gibb Maitland, Government Geologist, commenting on the shallow mines, states:—

"There must always be local variations in the metallic contents of ore bodies, but there are no scientific grounds for believing that what may be called the shallow mines of the Northampton District have reached the limits of ore deposition."

At present mining operations are centred at Galena.

The Two Boys mine is employing 50 men since June, when a lease of the Surprise Lead Mine Mill was taken, and for the latter half of the year 7,991 tons have been milled for a recovery of 1,090.5 tons of lead concentrates, estimated to contain 796 tons metallic lead of the value of £25,200. This has all been taken from above 120ft. level.

Welcome Lease.—This lease was bought by the the Two Boys Company in October last, and an average of seven men were employed for the remainder of the year in erecting bins and head gear, installing an oil engine and friction winch, and stripping the prospectors' shaft for a hauling way. From the stripping of the shaft and the old dumps 389 tons were treated at the Company's mill for a recovery of 43.85 tons of lead concentrates, estimated to contain 29.25 tons of lead of a value of £870.

Three Sisters.—This mine was closed down at the latter end of the year, and I have not heard what the Company's future policy is. During the year 2,962 tons were treated for 468 tons of lead concentrates. The deepest level is 100ft.

Spring Vale Lead Mine.—A tonnage of 1,041 was treated during the year for a return of 151 tons of concentrates. The treatment during the greater part of the year consisted of putting the fines through a cradle and sluice box, but at the latter end of the year machinery was erected capable of dealing with a large tonnage and a better extraction. The machinery consists of 83 h.p. National Crude Oil Engine, 7 h.p. Lister Oil Engine, one Rock Drill Compressor, 100 cubic feet per minute, Gates No. 2 Rock Breaker, Concentrators capable of handling four tons per hour.

The deepest level, which is 100ft., had been driven along the line of lode for about 300ft. and the show of lead along this level indicates a large tonnage of payable ore. As only development work has been carried out the mining costs in stoping out the developed ore will probably be low, but the larger tonnage now necessary to keep the mill going must result in increased employment of miners.

Block 7 Lead Mine.—Ten men have been employed throughout the year, and 1,400 tons of ore treated for 560 tons of concentrates. The treatment consists of putting the ore through a rock breaker, then through a cradle, followed by a sluice box. The mining at my last visit was about 100ft. of stopes above the 90ft. level.

Altogether an average of twenty men have been engaged working small shows in the district, and any galena worked by them has to be handpicked to bring it up to a sufficiently high percentage to pay to send away.

Report of Mr. H. P. Rockett, Inspector of Mines, Southern Cross.

I present to you my annual report for the year 1926 on the Yilgarn and Phillips River Goldfields, and the Greenbushes, Donnybrook, and Swan Mineral Fields.

The mines and quarries were visited as frequently as possible, and careful inspections were made at each visit.

No breaches of the Mines Regulation Act are recorded, except the failure of the quarry managers in the *Swan Mineral District* to lay the dust rising from the rock-crushing plants. The crushing plant at each quarry is very dusty, that at Boya being the worst. Only at the Perth Municipal Council's quarry at *Darling Range* was any genuine attempt being made to deal effectively with this evil. I have drawn attention to the inadequate methods used, and the unsatisfactory results obtained in dealing with the dust nuisance many times during the last 4½ years. In the mines all underground working places are well ventilated and free from dust.

No fatal or serious accidents were reported for the period under review.

There were no prosecutions.

Prospecting.

Black's Find, which was reported as being near the 121 miles north of Burracoppin on the No. 1 rabbit-proof fence, was inspected but was found to give little promise of becoming a gold-producing centre.

Bremer Range received some attention during the year. Messrs. R. V. Harpur and party, who have spent the greater part of the year out there, report having made no sensational discovery of gold, but that some of their finds are encouraging. My impression is that the most promising place in that locality has been neglected. It is known as the Alluvial Patch, and is situate about nine miles south from

Maggie Haye Camp. Here, on the shore of the lake, considerable quantities of alluvial gold were obtained in the past by dryblowing, and, to a less extent, by panning in the lake. There seem to be no official or authentic records of the output from this locality. This is perhaps due to the field having been abandoned, from scarcity of water, before the passing of the Act requiring that all gold produced in the State shall be reported to the Minister for Mines. From my knowledge of the locality I am inclined to think that scarcity of water drove off the prospectors shortly after the discovery of the find, and that, knowing the local conditions, none cared to return. In these days of the motor truck this one-time insurmountable difficulty of the water shortage has disappeared; journeys of 20 or 30 miles from the camp to the nearest good water and the return trip with up to 100 gallons of water may be readily made in the same day. Nowadays, thanks to the motor truck, no part of the State is inaccessible to the prospector with sufficient mechanical aptitude to locate and repair minor defects about a motor truck.

Bremer Range is between 90 and 100 miles west from Dundas, 90 miles, more or less, north from the Bight at Fanny's Cove, and about 75 miles a little north of east from Forrestonia. Though there are tracks through to it from Dundas and Ravensthorpe, it is most readily accessible from Forrestonia via Southern Cross, from which latter it is distant about 175 miles. By cutting a track from Mt. Holland the distance from Southern Cross could be reduced to approximately 125 miles. There are several stretches, each several miles long, of drift sand to be negotiated on this track, and no one man alone should attempt the trip.

Writing of Bremer Range, Mr. C. S. Honman says in Geological Bulletin No. 59, on page 194, "The Bremer Range rocks are of the same type and general structure as the Southern Cross rocks." The Southern Cross rocks yielded over £900,000 worth of gold from along the Frazer's line alone. It seemed to me that the rainfall is probably greater at Bremer than it is to the north or east; possibly the Range is a factor in stimulating precipitation.

I am confident, from my own observation, that the country between the No. 1 Rabbit Proof Fence on the west and Bremer Range on the east is equal, for agricultural purposes, to the best of the Kondinin-Newdegate-Damnosa belt. In this Forrestonia-Bremer belt there are thousands of acres of red and yellow soil supporting forests of Salmon Gum, Gimlet, with, of course, clumps of Morrell, and also Mallee, Ti-tree and scrub. There are, too, in this area extensive sand plains on which a variety of She-oak flourishes. I have seen apparently identical soil on the Salmon Gums-Esperance road growing good crops of clover. This splendid region is probably in the track of the railway which must eventually be built to connect Esperance and the Great Southern.

During the early part of the year Messrs. Bickerton and Delaney spent some time prospecting in the neighbourhood of *Hatter's Hill,* but without any success.

On the 5th May I erected a standard rain gauge at Hatter's Hill; 18 weeks later, *i.e.,* on the 10th September, I again visited Hatter's Hill and measured 593 points of rain as having fallen in that period. To the best of my knowledge no one had visited Hatter's Hill since Mr. Bickerton left it about the end of May. The water mark stood at more than an inch higher in the tin receptacle but had evaporated. Disregarding this loss, six inches of rain had fallen over this area during five-sixths of the "growing period" of an average year.

Several parties have made flying visits to Iron Cap and *Forrestonia* and report their intention to return there when the rain falls and leaves a good supply of fresh water. At the time of writing the tank at the ten-mile from Forrestonia is nearly dry and no other water is available.

Hollow's Find has continued to develop, and with the discovery of the Glenelg Queen a mild boom started. Rich finds were reported from several places within a few miles. One alleged rich find was reported from a spot about 3 miles west from the 49-mile peg on the No. 1 rabbit-proof fence. This was known as Oliver's Find. To my mind it was reported without any justification. I failed to find any gold-bearing stone in the locality, nor could I find any man who had found gold-ore *in situ. The Sunrise Group,* or Le Feuvre's Find, situated some three miles S.E. from the townsite, was discovered a day or two only before my inspection, and except that there appeared to be a wide formation, very little could be said of it in its then stage of development. *The Glenelg Queen,* the discovery of which brought the field to prominent public notice, is situated about 1½ miles N.E. from Hollow's Reward. The show now has two shafts down to 60 feet deep, and over 80 feet of driving done on the lode, and is said to give promise of becoming a profitable mine. It is said that in the early stages considerable quantities of the rich surface "floaters" were distributed by the owners, but of that remaining 12¼ tons were gathered up and yielded by crushing at the Coolgardie State Battery 83 ounces of fine gold, or a little under 7 ounces to the ton. *Hollow's Reward* was sold by the original prospectors, Messrs. Hollow and Heaton, at the end of the year, but before disposing of the claim they crushed 21 tons and obtained therefrom 127 fine ozs.—just over 6oz. to the ton. Those shows on which a progressive policy is obviously being pursued include The Siddely Co., G.M.L., 3314; J. Smith, P.A. 1560; Kearnan & Party, P.A. 1564; The Manfred G.M.L. 3320; Mead, Robinson and Party, P.A. 1545; McDonald & Hagan, 1614; H. Hale, G.M.L. 3315; The Great Beacon, G.M.L. 3330; W. A. Whitting, G.M.L. 3334; Hollow's Reward, G.M.L. 3280; Coventry, 1602; Sunrise, 3324; Glenelg Queen G.M. 3312, Monte Carlo G.M.L. 3321; Glenelg Deeps G.M.L. 3328; Glenelg Prince 3316; Empress 3334.

Mining at *Westonia* is very quiet. Messrs. *Carman* and *Kuhn* sank a shaft in new ground on the Consolidated, and located a lode which may prove to be something of real importance. The work of rising and driving is now proceeding. To date the owner, Mr. Kuhn, (Mr. Carman sold his interest), has raised 176 tons, from which he recovered 187 ozs. The *Royal Flush* yielded 88 tons of 12dwt. ore from the 150 feet level. It is expected that the output during the current year will be much greater. The *Les Trois,* south and adjoining the Royal Flush, yielded 220 tons from the 150ft. level, from which 212 ozs. were recovered at the Greenfinch battery. At *Bullfinch* almost no mining was done outside the boundaries of the old *Bullfinch Proprietary leases.* The old Proprietary leases are now held at prospecting areas. Together they yielded 243 ounces obtained from 400 tons of ore. As most of it was crushed at Coolgardie it was not very profitable notwithstanding the extraordinarily cheap transport provided. Wither's Find has been practically deserted during the whole year. The Radio maintains an output of high grade ore yielding 2,372 ozs. gold, realising nearly £10,000. There are still considerable reserves of ore. The *New Radio,* mining on private property, produced 59 tons of ounce-stone. The *Radio Deeps,* formerly the Glideaway, crushed 204 tons for 137 ozs. Very little, if any, work was done below the 70ft. level. At Golden Valley Messrs. Glendenning and Hackett, working the *Valley Queen,* recovered 127 ozs. from 125 tons. This is the first time for some years that any show worked in this, one of the first discovered gold producing districts in the State, has proved self-supporting for more than a year. The owners have been regularly at work here for the last eighteen months or more. They predict a considerably increased output this year. At the *Great Bingin,* Marie's Find, Messrs. Lynch and party have been at work re-opening a show operated by Lynch in 1914. A shaft had been sunk to 47ft. deep, and a cross-cut was being pushed out to the lode at the time of last inspection. A party of prospectors has been examining the country within a few miles of Ennuin, but to date they have not reported any very valuable find. Almost no prospecting was done at Mt. Jackson, and only a very little at Deimel's Find. In the neighbourhood of Colleen Bawn only 5 tons carrying 27 ozs. of gold were produced.

There was very little mining at *Southern Cross.* Messrs. Puddy and party found one lucky patch of 6 tons from which they recovered 62 ozs., but a subsequent crushing from the same shaft returned only a bare half-ounce per ton for the 22 tons treated. Messrs. Ellis, Johannson, Maden, and others have tried their luck on Fraser's during the year, but their combined efforts produced only 21 ozs. At the *May Queen* Mr. Ernest Coombe has kept steadily at work, obtaining in all 202 ozs. from 89 tons of ore crushed at his own battery. The mine is nearly 300 feet deep now, and operations are hampered by a relatively heavy flow of water and hard ground. With the closing of the *Salvation Mine* due, rumour says, not entirely to shortage of pay-ore, the immediate neighbourhood of Marvel Loch practically ceased to produce gold. There remain in that vicinity nowadays only a few dryblowers regularly at work. The total output for the year was 151 oz. obtained from a number of small parcels of ore, and from treatment by cyanidation of several hundred tons of accumulated sand and slime. At *Burbidge* the *Great Victoria Mine,* at present by far the most important in the goldfield, crushed from the

Great Victoria—	21,400 tons	which	yielded		4,633oz.
Just in Time—	4,557	„	„	„	957oz.
Nevoria—	2,682	„	„	„	592oz.
Total—	28,639				6,182oz.

or an average value of 19s. 6d. per ton. It is not posible to make any reasonably certain estimate of the extent or value of the laterite deposit from which this mine draws its ore supplies, owing to the abrupt variations in thickness of the deposit and the wide differences in values obtained over short distances. It is, however, expected that the mine will continue in operation till June next. The Broncho Horseshoe, recently known as the *Resurrection G.M.,* was in course of re-equipment at the end of the year but not ready to start producing. Mr. Jenkins obtained 42 ozs. from 55 tons raised from his mine the *Banker.* The Spring Hill plant treated 483 tons of ore, including residue, and obtained 755 ozs. The *White Horse Shoe* raised 381 tons, from which 216 ozs. were extracted. This ore came from a shaft some 300ft. north of the old workings and may prove to be a northerly continuation of the lode which in past years gave consistently payable yields. Messrs. Polson Bros., have had little success at their *Scots Greys* mine, 95 tons crushed yielding only 32 ozs. This is a large low grade formation similar in many respects to that at the Broncho and Great Victoria, and might very well be worth examination by a strong company.

In the *Phillips River Goldfield* a small parcel of gold ore from the *Jim Dunn's Wonder* was crushed, but did not prove payable. The principal gold producing district in this goldfield in the past was *Kundip,* but to-day there is little mining or prospecting going on in the locality, and no ore from there was crushed during the year. It does not seem at all certain that all the payable (under normal conditions) ore in the district has already been won, but owing to the absence of crushing facilities there is little inducement for raising ore. This year more money was expended in the search for base metals, chiefly manganese, than in prospecting for gold. Messrs. Dallison Bros. and Mathews spent three months developing a manganese deposit near *Copper Mine Creek,* about 70 miles S.W. from Ravensthorpe. They sank a shaft 25ft. and did over a hundred feet of driving on one lense without much success, but in another place they located a large quantity of rich ore, several hundred tons of which may be payable even under present adverse conditions in matters of transport, etc.

Greenbushes Mineral Field.

The rise in the price of tin has had a most stimulating effect on the industry at Greenbushes.

During the year nine claims together produced 63½ tons of oxide, five of the barges working practically full time. A local syndicate, called the *Greenbushes-Cornwall Tin Mining Co.,* was formed in the latter part of the year for the purpose of unwatering and re-opening the Cornwall mine, which has been closed for many years. The shaft is down to the 100ft. level, and it is proposed to continue it to the 200ft. level and then open out. It is said that there are known ore-bodies in the mine of sufficient profitable value to repay all anticipated expenditure on development work. At the time of writing the shaft sinking has not been completed owing in a great measure to encountering rock of unexpected hardness, and the difficulty nowadays of obtaining the services of first class hammermen.

Neither the numbers of bricks produced by the several brick yards nor the tonnage of rock broken in the quarries is available at this office at date, but the list hereunder includes the principal gold producers in the districts under review.

List of the principal Gold-producing Mines in the Yilgarn Goldfield showing tons of Ore raised and Gold won during the year 1926.

Mine.	Ore. (tons)	Gold. (oz.)
Hollow's Reward	21.5	127.55
Glenelg Queen	12.25	83.69
Banker	..	5.78
Bawden	60	47.21
Barras	30	3.87
Colleen Bawn	5	27.29
Consolidated	176	188.89
Cooper (P.A. 1428)	43	15.52
„ (P.A. 1510)	74	24.79
P.A. 1491	47	22.85
Deeps Cyanide	..	117.37
Davis (P.P. 9)	37	13.06
Dalzell	11	10.88
Edna May Consols	74	27.5
Ellis	8	4.31
Flynn	10	5.93
Goodwin, A.	7	25.69
Great Victoria	21,400	4,633.74
Great Leviathan	70	18.24
Battery, Howlett's	..	152.00
Jenkins	55	42.00
Just in Time	4,497	955.52
Johannsen (P.A. 1553)	12	7.44
„ (P.A. 1517)	30	22.91
Kearns	7	7.82
Lord	67	38.01
Les Trois	222	212.8
Maden	21	6.22
May Queen	89	202.17
Myrtle Central	24	13.92
Nevoria	2,685	592.3
Nettle & Howe	30	22.91
New Radio	59	60.34
Pro Patria	5	7.87
Puddy (P.A. 1418)	22	11.76
„ (P.A. 1538)	6	62.84
Resurrection (Cyanide)	..	23.37
Royal Flush	88	54.07
Radio	652	2,372.97
Radio Deeps	137	204.00
Radio North	17	30.98
Star of the Range	89	10.78
Salvation	82	123.76
Smith & Murcheson (P.A. 1525)	42	52.50
Scots Grays	95	32.25
Spring Hill	483	755.57
Thompson, J.	10	2.58
Valley Queen	125	128.62
White Horseshoe	381	216.69

Report of Mr. A. W. Winzar, Inspector of Mines, Leonora.

I have the honour to submit my Annual Report for the year 1926 on the East Murchison, Mount Margaret, and North Coolgardie Goldfields.

There is no change to report for the year; no new finds were made.

The whole of the employees in the Fields were examined under the Miners' Phthisis Act with very satisfactory results; very few men were found to be tubercular.

The working conditions of the mines have received the usual strict attention both from a safety and health point.

Mount Malcolm District.

The *Sons of Gwalia* mine continued working throughout the year; no important developments being recorded. The efficiency of the plant was improved to a marked extent, the stamp duty showing 12 tons per stamp per 24 hours. A scoop discharge was tried on one of the tube mills with a big increase in the grinding capacity. The electrical portion of the plant is showing a record in producing cheap power and the treatment of boiler feed water continued to give fine results. The mine showed an increase of ore crushed of 1,500 tons a month; the total treated 103,627 tons for 36,569 ounces. Some thirty additional employees were put on. No actual development was carried on; a small amount of prospecting was done indicating that the lode is still showing strongly in the south end at the bottom levels.

The sand dump is disappearing and will take another four years to shift. The removal of the dump will enable a quantity of oxidised ore to be developed near the surface.

The Company have been drawing on their reserves, and will have to do considerable development work if the mine is to continue working for many years.

A few tons were treated from prospectors' holdings in the district, but nothing of importance was found.

Laverton District.

At the *King of Creation* mine 855 tons of ore were crushed for 402 ounces by amalgamation. The mine appears to have a large quantity of ore in sight which is easily mined and treated.

The treatment of residues on the *Lancefield* mine was carried out continuously, 965 ounces being obtained.

The *Nil Desperandum* at Burtville returned 298 ounces from 16 tons; this ore was got from small leaders.

At Morgans the *Westralia Mount Morgans* mine treated 12,235 tons for 4,016 ounces; all this ore was obtained from the upper levels, having been left by the original Company.

The *Devon* mine at Linden have completed their shaft from the surface to the No. 2 level, and are preparing to sink another 100 feet. An additional gas engine has been erected, and the roaster has been put in commission; trouble is experienced due to the density of the water.

In the *Niagara* and *Yerilla* Districts no change has taken place. A few small crushings were put through the State mill at *Yarri*, 427 tons being treated for 183 ounces.

Lawlers District.

Mining is practically at a standstill.

The *Vivien Gem* crushed 694 tons for 75 ounces; they have closed down and disposed of most of the plant. The ground was found to be very bad at the bottom level and the value of the rock exposed did not warrant the expenditure necessary to extract it.

The *Great Eastern* completed their cyaniding operations from which they obtained 191 ounces of gold.

At the State battery, *Sir Samuel*, 150 tons were crushed for 173 ounces, and 68 ounces were obtained from sand treatment.

Nothing was done at *Kathleen Valley.*

Wiluna District.

From *Cole's Find* 338 tons were crushed for 331 ounces. The *Black Adder* contributed 130 ounces from 111 tons, and the *Cromarty Hope* 77 ounces from 68 tons. Both these mines are below water. There are also several prospecting areas being worked for fair returns.

At *Diorite* 454 ounces were obtained from 468 tons crushed and 28 ounces were dollied. At the *Brilliant North* 62 tons returned 210 ounces, and several good crushings were obtained from other holdings.

The *Wiluna Gold Mines* carried on development work continuously during the year, and opened up big reserves of ore which is stated to be capable of showing a profit.

In the new shaft the levels at 137 feet have been extended 240 feet south and 236 feet north in average grade ore. At 290 feet the levels are in 350 feet south and 350 feet north. In the Central shaft driving has been done at the 200 feet level north, and some good ore has been developed. A pilot plant is in course of erection capable of treating 2,000 tons a month; this consists of 10-head battery, tube mill, and oil flotation unit and roaster. This plant will give them a test on a commercial scale and guide the lay out of the big plant which will be needed.

Development work so far is said to be very satisfactory, and the mine is opening up to expectations.

At the State battery the principal work has been treatment of sands and slime.

At *Corboy's Find* 1,469 ounces were obtained from 2,026 tons crushed. Good crushings were obtained and the centre is opening up well.

The *Toscana*, the 3-head mill, crushed 435 tons for 623 ounces, with about 4 dwts. left in the sands. The reef is very small and hard to follow.

The *Waratah* leases have a big tonnage of good ore on the surface, which is now being treated.

The *Waratah and Waratah South* crushed 233 tons for 208 ounces, with about 30 dwts. left in the sands, which is being stacked for treatment. The mine is being equipped with a pumping plant, and it is intended to proceed with the sinking of the shaft below water.

The 5-stamp battery erected on the *Corboy's Reward North* has crushed 831 tons for 437 ounces. Not much development has been done on this lease, the owner's time being taken up with crushing for the public.

At *Corboy's Reward* 217 tons were crushed for 144 ounces.

There has been no cyaniding of sands from the above crushings, and the gold contents can be taken at 4 dwts., except in the case of the Waratah lode material, which is worth 30 dwts.

In conclusion, the whole of the district shows an increase in gold yield, and it is probable that the coming year will also show an improvement.

Report of Mr. J. McVee, Inspector of Mines, Collie.

I beg to submit my annual report on the Collie Coal Field for the year 1926.

The following mines were producing coal during the year, viz., Proprietary, Co-operative, Westralian, Cardiff, Premier, and the Griffin. The total output from the six mines being 474,818.69 tons valued at £394,400, as against 437,461.20 tons valued at £363,203 for 1926, showing an increase of 37,357.49 tons and £31,197.

With the exception of the Premier Colliery, the other mines have shown an increase over the previous year.

The Westralian had a breakdown in their main haulage engine, which caused them to be idle for a week in September and reduced their output since that time. A new haulage engine is now being installed which will enable them to employ more men and increase their output considerably.

The Premier Colliery is now practically non-productive owing to faulting and working towards the outcrop.

Development work has been going on for some months but it has proved rather disappointing, for although they have 6 feet of coal in their new work, owing to the soft nature of the floor and bad patches of roof it has been found necessary to abandon this part of the mine and try opening out in another direction. Most of the men have been put off, but all of them have been engaged in the other mines, which are filling the Premier railway order. From present indications I think it will be some time before they reach their normal output again.

At the Griffin Colliery a fair amount of development work has been done, and about 687 tons of coal have been sent away for trial purposes to the railways and private consumers. This has had to be taken from the mine to the railway in motor lorries, as there is no railway laid to the mine yet.

The mines have worked fairly good time during the year, the prospects look bright for a continuation of same, and we should reach the half-million mark this year.

Labour troubles have been very few during the year, and with the exception of two days' stoppage at the Westralian Colliery, all the disputes have been settled without ceasing work.

The general condition of the mines has been fairly good, and when the new Coal Mines Regulation Act comes into operation I expect still further improvement.

Bathrooms have been erected at the three large mines with every facility for the men bathing and having their working clothes dried for them, a caretaker being in attendance for that purpose.

The Coal Mines Regulation Act has been fairly well complied with during the year by both companies and employees, and I have only had one prosecution. A wheeler was prosecuted for gross cruelty to a horse in the mine. He was fined and also dismissed from his employment.

As to the position of the mines, I have very little to add to last year's report, development being carried out on similar lines. The mines are fairly well equipped below ground with the necessary pumping plant, coal-cutting machines, and auxiliary haulages.

Some of the working faces are a considerable distance from the main haulage, and as the distance is too great for the economical working with horses, electric haulages have been installed and give satisfactory results.

There have been no accidents from machinery, but I have to report 252 accidents for the year; 89 serious, and 163 minor. While the number appears to be great, it is pleasing to know that we have had no fatal accidents, and none that has incapacitated a man from further work in the mines.

Sunday Labour Permits.—Nine permits were granted during the year, principally for the relaying of roadways which could not be done during the week.

The following tables show the amount of coal won and amount consumed by the railways:—

Table showing the amount of Coal produced at each Colliery during years 1925 and 1926.

Colliery.	Output in Tons. 1925.	Output in Tons. 1926.	Employees. 1925.	Employees. 1926.
Proprietary	119,134·00	131,556·4	165	172
Co-operative	120,509·96	133,343·50	181	200
Westralian	100,340·09	114,187·00	166	170
Cardiff	52,394·30	56,193·7	83	80
Premier	45,082·85	38,850·47	79	70
Griffin	...	687·62	...	6

Government Railway Order.

Month.	Large Coal Tons	cwts.	qrs.	Nut Coal. Tons.	cwts.	qrs.	Small Coal. Tons	cwt.	qrs.
1926.									
January	19,952	16	2	448	6	2	17	15	1
February	21,709	0	3	577	15	0	17	4	0
March	21,861	0	2	587	16	3	26	5	3
April	21,991	18	0	686	11	2	26	15	1
May	25,277	1	1	1,023	10	1	33	10	0
June	18,321	5	2	618	8	3	26	1	3
July	23,769	2	2	912	7	2	27	8	0
August	19,392	16	2	871	15	2	26	7	2
September	19,408	5	1	784	4	1	16	19	3
October	27,418	13	2	1,184	18	0	41	14	0
November	17,751	15	0	509	0	3	26	7	1
December	23,652	10	0	642	3	0	17	5	1
Totals	260,506	5	1	8,846	17	3	303	13	3

Total—269,656 tons 16cwt. 3qrs.

Report of Mr. T. Blatchford, B.A., Assistant State Mining Engineer.

I herewith beg to tender you my annual report for the year ending 31st December, 1926. For the portion of the year between 1st January and 31st October I retained the position of Assistant State Mining Engineer, after which, on account of the retirement of Mr. A. Gibb Maitland from the Service, I was transferred to the Geological Survey Branch, and on the 1st November received the appointment of Acting Government Geologist.

From January to June most of my work was confined to inspections and reports on various mines, made principally in investigating claims for assistance under the Mining Development Act. The following is a list of the principal mines which were inspected:—

O.K., Norseman; Ives Reward and Ives Reward Junction (my report published in 1925 Annual Report, pages 63 and 64); Mica at Chittering Brook; Bordoni and Party, P.A. 531; Waihi Mine at Davyhurst; Accident at Boya Quarry; Hannan's Reward; Braeside Mineral Belt and Ragged Hill Lead Mine; Forrest Abbey Gold Mine near Marble Bar; Lionel Asbestos, Nullagine; Golden Cement Mine, Kanowna; Lady Evelyn Mine, Ora Banda; Devon Gold Mine, Linden.

Sites for deep boring were chosen at the North End, Kalgoorlie, Yalgoo, Mt. Magnet, Cue, and Sandstone. A considerable amount of time was spent at the Ives Reward Mine in sampling and supervising the breaking of a trial crushing of 400 tons from the working stopes to check the values obtained from the reduction plant and the mine assaying.

On 23rd June I left Perth to choose a suitable site in the Poole Range area to bore for mineral oil. This work was undertaken at a request from the Prime Minister's Department, the Federal Government having granted a subsidy to the Freney Kimberley Oil Company for the purpose of boring for mineral oil. Before leaving for Kimberley I completed my report on the possibilities of obtaining oil in the Fitzroy Basin, and this report, together with my later work, is now printed in Bulletin No. 93. On my return from Derby I disembarked at Port Hedland and inspected the asbestos deposits at Sherlock, and sampled the latest developments at Jimble Bar.

I returned to Perth on 23rd September, and shortly afterwards made a second visit to Gleneig Hills to investigate the necessity of clearing a road to the new find from one of the following localities: Polson's battery, Donovan's Find, Southern Cross, or Parker's Road. An inspection was also made of certain blocks recently surveyed for agricultural purposes on the western side of the rabbit-proof fence to ascertain whether they should be reserved for mining purposes or not.

On 1st November I undertook the duties of the Government Geologist and was confined to the office editing several bulletins for the printer and usual office routine.

The reports on the various mines and mining centres enumerated may be found in Appendix 2, but for publication they have been restricted to those which are of public interest only.

Report of Mr. R. C. Wilson, B.Sc., B.E., Assistant State Mining Engineer.

I beg to submit herewith my annual report for the year ending 31st December, 1926. My work for the year included the examination of mines and mineral deposits, the investigation of supposed oil occurrences, and the location of sites for diamond drill boring.

I prepared and published in bulletin form a report on the Northampton Mineral Field, setting out such information as seemed to me would be useful to mining men in summing up the possibilities for profitable investment in that important field.

I continued to represent the Department on the Board of Control of the Surprise Lead Mine, and I took over the duties of the State Mining Engineer while he was on annual leave.

Brief details of the more important inspections made are as follows:—

The Menzies Consolidated G.M. was visited in January. I sampled and measured up the dumps of concentrate residue that it was proposed to roast and retreat. (Appendix No. 3.)

During the same month I inspected the Emu North Mine at Reidy's, owned by the Mararoa G.M., Ltd., and reported upon an application for a loan to sink a new main shaft.

A new gold find at Jimble Bar was inspected and reported upon in March. (Appendix No. 3.)

The Galena District was visited in April, and a number of matters requiring attention were attended to. Amongst other things the question of a small treatment plant on the north side of the river was discussed with the Leaseholders and Prospectors' Association. An application from Mr. Leeder for assistance to develop his prospecting area was reported upon. With the company's manager I also went into the question of assistance to erect a treatment plant on the Springvale Lead Mine, and submitted a report. (Appendix No. 3.)

The Narra Tarra Lead Mine was inspected in May, and a report made upon the general position and the possibility of profitably operating the mine. (Appendix No. 3.)

A supposed oil occurrence at Kendenup was visited and reported upon during the same month. (Appendix No. 3.)

In June a second visit was made to the Galena mines.

The Elsie May G.M. and the Gold Rock G.M., at Mount Ida, were inspected and sampled in July. A report setting out the prospects of each was submitted for the information of the Hon. the Minister. (Appendix No. 3.)

The sites for diamond drilling were fixed during August at the Mt. Zion Mine (Magnet), at the Oroya Black Range G.M. (Sandstone), and the Black Range G.M. (Sandstone).

The Vivien Gem G.M. was inspected and reported upon during the same month. (Appendix No. 3.)

I also visited and took samples from a supposed mineral oil occurrence on Lease 324H, near Rockingham. (Appendix No. 3.)

Ora Banda was visited in September, and a report made of the prospects of the district, with special reference to the question of a water supply. (Appendix No. 3.)

A third visit to Galena was made during September, and the Resurrection G.M. at Burbidge was also visited and reported upon.

Bullfinch was visited in October, and a report was submitted upon a proposal that the Government should make such additions and alterations as would be necessary to make five head of the old Bullfinch battery available for crushing prospectors' ore.

A fourth visit to the Galena mines was made in November.

During the same month I visited Kalgoorlie in company with the Acting Government Geologist and discussed the question of Federal Assistance to Mining with Mr. C. H. Clayton, a member of the Federal Commission appointed to go into the question.

The Gascoyne Mica Field near Yinnietharra was visited and reported upon in December. (Appendix No. 3.)

ACCIDENTS.

The following table gives the number of fatal accidents reported to this office as having occurred on mines, whether to persons employed on the mines or not, for the last five years:—

——	1922.	1923.	1924.	1925.	1926.
Total fatal accidents on mines reported	10	11	12	13	8
Less accidents to persons not engaged in mining, deaths in mines due to natural causes, and accidents to persons which were not due to their occupation as miners	1	1	2	1	1
Fatal accidents to men engaged in mining	9	10	10	12	7
Total men engaged in mining (average)	6,776	6,497	6,289	6,011	5,437
Accident death rate per 1,000 men engaged in mining	1·33	1·54	1·59	2·00	1·29
Total fatal accidents on Quarries reported	1	...	...	...	...
Total men engaged in quarrying	267	326	337	307	291
Accident death rate per 1,000 men engaged in quarrying	3·75	...	...	...	...

The mining accidents for the year 1926 are classified in Tables 26, 27, 28, and 29, the previous year's figures being given for comparison, and are forwarded herewith for inclusion in your annual report, together with diagram of the fatal accidents year by year, and their causes. (*See* Report of the Under Secretary for Mines, 1926.)

In Table 26 the accidents are classified according to causes. In 1926 seven were killed and 376 persons were seriously injured, as compared with 12 persons killed and 383 seriously injured during the previous year. The diagram shows graphically the totals of fatal accidents year by year since 1900. (*See* Report of the Under Secretary for Mines, 1926.)

The death rate per 1,000 persons employed on surface and underground in gold, coal, and other mines is shown in Table 27, the general average rate for 1926 being 1.29 as against 2.00 for 1925. The rates per 1,000 are based upon the figures in Table 21 (Annual Report Under Secretary for Mines, 1926), which shows a grand total for 1926 of 5,437 men employed at mines above and underground, inclusive of alluvial workers.

Table 28 gives the average number of men employed at quarries and the death rate per 1,000 persons employed thereon. The total number of men employed during 1926 was 291 as against 307 for 1925, the death rate for 1926 being nil as against nil for 1925.

Table 29 summarises all the fatal accidents for 1926 above and below ground in gold mines only, with rates per 1,000 men and per 1,000 tons of ore raised, similar figures for 1925 being given for comparison. The number of men on which these rates are based is taken from Table 23 (Annual Report Under Secretary for Mines, 1926), and does not include alluvial workers.

The following table comprises all the fatal and serious accidents reported to this office which occurred during 1926, the accidents being classified according to the gold or mineral field in which they happened, and also as to causes, the totals from each cause for 1926 are shown for comparison:—

——	Explosives.		Falls of Ground.		In Shafts.		Miscellaneous Underground.		Surface.		Machinery.		Total.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1.—East Coolgardie	...	2	5	12	1	6	...	131	...	61	...	6	6	218
2.—Mt. Margaret ...	...	3	...	3	...	...	...	18	...	12	...	2	...	38
3.—Murchison ...	...	...	...	4	...	...	...	10	...	4	...	...	...	18
4.—East Murchison	...	...	...	...	...	1	...	1	...	8	...	...	...	10
5.—Coolgardie ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6.—Yilgarn ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7.—N. Coolgardie...	...	1	...	...	...	...	...	...	...	...	1	...	1	1
8.—N.E. Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...	...	...
9.—Broad Arrow ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
10.—Dundas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
11.—Pilbara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12.—Peak Hill ...	...	...	...	...	...	...	...	...	...	1	...	...	...	1
13.—Yalgoo ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14.—Phillips River...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15.—Collie	...	...	...	21	...	...	...	60	...	8	...	...	...	89
16.—Greenbushes ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17.—Northampton ...	...	...	...	...	...	...	...	...	*1	...	...	...	*1	...
18.—W. Pilbara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
19.—Swan	...	...	...	1	...	...	...	...	...	...	...	...	...	1
20.—Ashburton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
21.—Roelands ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
22.—Kendenup ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
23.—State generally	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total for 1926 ...	...	6	5	41	1	7	...	220	*1	94	1	8	8	376
Total for 1925 ...	...	1	5	21	3	1	3	262	1	88	1	10	†13	383

* Not a "true mining" accident. † Includes 1 "not true mining" accident.

FATAL ACCIDENTS.

Brief particulars of each fatal accident reported to this Department for the year 1926 are as follows:—

Falls of Ground.

At the Ivanhoe G.M., East Coolgardie Goldfield, two men lost their lives through eight to 10 tons of ground falling from the back of a stope and burying them while they were engaged in barring down loose ground after a previous fall. A verdict of accidental death was brought in by the coroner's jury, who added the following rider:—

"We are of opinion that a bar should be kept in all working stopes, and that scalers should always use an acetylene lamp." (1764/26.)

Five days after the above accident two more men were killed in the same stope; while barring down dangerous ground about 100 tons fell from the back without warning. Two shift bosses who were visiting the deceased at the time had a very narrow escape. The coroner's jury returned a verdict of death by a fall of earth, and added the following rider:—

"We are of opinion that, in view of the previous accident and the nature of the ground, more precautions should have been taken to insure the safety of the men working in this particular place." (1845/26.)

The above two accidents, in each of which two men unfortunately lost their lives, occurred in the stopes above the 1,200ft. level of the Ivanhoe G.M. in Section 8 through heavy falls of ground. The second pair of men were trying to make the back safe after the first accident when a further heavy fall of rock killed them, two other men having very narrow escapes also. The men were experienced and careful, and there does not seem to have been any want of knowledge or care on their part or that of the shift bosses and other mine officials who directed the operations. Both accidents were very fully and carefully investigated by the coroner and his juries, and it does not appear that any blame could fairly be laid upon any person. All concerned were doing their best to carry out the work with all reasonable care and skill, and in accordance with the experience of years in these mines. It does not appear to be at all fair to blame any person, or even to suggest that less was done to maintain safety than might well have been done.

The suggestion of the jury in the first case that a bar should be kept in every stope, and that the men should be supplied with acetylene lights does not appear to be of any practical importance, and certainly not worth embodying in a regulation or general rule under the Mines Regulation Act. It was referred to at the second inquest, and witnesses appeared to be unanimous that bars and lights could be obtained by the men in the stopes at any time they might want them.

The rider of the second jury that "more precautions should have been taken to ensure the safety of the men working in this particular place" is not warranted by the evidence, which shows that the mine staff were doing all they knew to see that the work was being carried out safely.

The jury did not suggest what further precautions might have been taken, and it seems best to regard their rider rather as an insistence upon the necessity of taking all possible precautions in such cases than as an expression of opinion that sufficient precautions were not taken. The latter amounts to a charge of negligence, which would require consideration by the Crown Law Department. In the circumstances and on the evidence I could not recommend any action to prosecute any person for negligence, for it is absolutely clear that the men concerned were doing quite the best they knew to work safely.

It is easy to be wise after the event has shown that the place was more dangerous in reality than the men judged it to be, but in all such work reliance has necessarily to be placed on the judgment and experience of skilled practical men, and no rules can be laid down which would apply to all cases. All we can do is to insist that in making provision for safety any ground which is at all doubtful should be dealt with as if it were known to be much worse than it is really believed to be, and that precautions are therefore taken as a matter of regular practice in excess of those which are thought to be strictly necessary. This should be the case, particularly where the history of the place shows that unexpected falls of ground have previously happened, for there is then a presumption that some condition of strain or movement exists in the rock which is not visible to ordinary observation but which makes the ground more liable than usual to open up and fall. It is to be feared that such conditions are liable to become more and more frequently met with in the Boulder Field as the ground becomes more and more disturbed by mining operations. In the case under review the plans show that there are four or more nearly parallel lodes worked within a short distance from each other, and it is obvious that, as the ore becomes extracted, the blocks of rock between the lodes must lose a large amount of their lateral support and develop a tendency to break up. This leads to falls of rock in places where they should not be expected if the adjacent country were as solid as it appears to be from the point of view of the man in the stope, especially when he does not know of the proximity of other workings in the vicinity. The best practical preventatives are the plentiful use of timber, and the early filling up of all excavations from which ore has been removed with the most solid filling material available.

At the Lake View and Star G.M., East Coolgardie Goldfield, two members of a tribute party were working in an open cut when a rush of slimes from a dump at the edge of the open cut buried one of the men, who expired before he could be extricated. The coroner's jury brought in a verdict of death from suffocation caused by a fall of slimes; no blame being attachable to anyone. (1999/26.)

In Shafts.

A fatal accident occurred at the Dinnie G.M., East Coolgardie Goldfield. Deceased, who was working at a staging, placed a ladder in the shaft on which he stood and attempted to bore a hole with an auger but not having sufficient room to use the auger he started to use a pick, when a quantity of loose dirt fell on the staging, inflicting fatal injuries on deceased. The coroner's jury returned a verdict of accidental death, with no blame attributable to anyone, and added the following rider:—"The jury wish to point out that the drive should be cleaned out in order to avert further accidents." Instructions were issued by the Inspector of Mines in accordance with the rider. (1819/26.)

Surface.

A man was killed at the State battery, Yarri, through being struck by a belt fastener. Deceased, who was not employed at the battery, was having a crushing put through, and at the time of the accident he was taking a dangerous route through the mill in spite of a warning notice that there was no thoroughfare and to beware of belts. The coroner's jury returned a verdict of accidental death with no blame to any person, and added the following rider:—"That a guard rail should be placed in front of driving pulley where accident occurred, and that fastener bolts be cut off flush with nuts." Extra guards were placed in front of driving pulley in accordance with rider. (1667/26.)

Other Accidents.

Only one fatal accident was reported during the year which was not classified as a "True Mining" accident; particulars are as follows:—

A man, while under the influence of intoxicating liquor, fell into an open cut and was killed at the Two Boys Lead Mine, Northampton Mineral Field. He was not an employee of the mine, and had been ordered off the lease by the manager. (2135/26.)

SERIOUS ACCIDENTS.

All accidents which inflict injuries of such a nature as to incapacitate a person from carrying out his usual work in or about a mine for 14 days or more are classified as "Serious."

Of the 376 accidents during 1926, 218 occurred in the East Coolgardie Goldfield, but only 21 cases were breakages of the larger bones, permanent injury to limbs, or injuries likely to have lasting disabling effects. The balance of injuries were of a less serious nature, such as bruises, cuts, strains, scalds, burns, poisoned cuts, smaller dislocations, wrenches, jars, etc., but of a sufficiently serious nature to cause the injured person to be absent from his employment for 14 days or more.

Explosions and Explosives.

Six accidents were classified under the above heading. In one case a man was lifting a stone which rolled on to a live detonator and caused an explosion; in another case a charge was fired which blew open an air door and a piece of timber from it entered a man's arm. One man was struck by a stone from a blast being hurled a greater distance than expected, and one man received serious injuries through striking a misfired detonator with a pick. A man picked up a rod with a cap attached in a stope and while carrying it he stumbled and fell, causing the cap to explode. Another man after firing a couple of butts with a small piece of dynamite threw the remainder of the dynamite away, which rebounded and fell into a bucket the man was entering, and his trousers caught fire.

Falls of Ground.

Forty-one accidents were due to falling ground. In six cases the injuries were sustained while men were engaged in the dangerous but necessary work of pulling down loose ground after firing. In the remaining 35 cases the injuries were due to ground falling, or their being struck by falling pieces of stone or coal in the workings of the mines.

In Shafts.

Seven accidents were reported during 1926 as having occurred in shafts. One man twisted his knee against a skid, while another fell down a ladder, and two men received serious injuries while riding in runaway cages. In two instances men were struck by objects falling down shafts, and one man received a poisoned arm while timbering a shaft.

Miscellaneous Underground.

Two hundred and twenty accidents were classified under above heading during 1926. In 67 cases the injuries were sustained while handling and loading trucks and skips, through fingers and bodies being jammed against chutes and other trucks, toes and feet being run over, bodies struck by upsetting of trucks, men slipping and straining themselves while trucking or lifting derailed trucks or material into trucks, and so on; the injuries being mostly wrenches, sprains, bruises, jars, fractures of fingers and toes, and cuts.

In 36 cases the injuries were due to falling and rolling loose rocks and stones, such as runs of ore and mullock while shovelling, or stones running down rills and ore chutes; and 16 men received severe cuts and bruises while handling sharp stones; 13 men were injured handling rock drills, coal-cutting machines, and parts of same. Other falls in the workings from stages and ladders, in rills, passes, and so on caused injury to 20 persons, and 19 were hurt by falling tools and pieces of machinery. Flying splinters of stone and steel were responsible for 13 men being injured, and eight were hurt while handling timber. The remaining 21 cases were due to various accidental causes, jarring of hands and feet, blows from tools, strains, poisoned cuts, and so on.

Surface.

(including Machinery).

One hundred and two persons were seriously injured while working on the surface; seven men were burnt in various ways; 15 sustained injuries from falls in the course of their work; seven were hurt by trucks and skips, being jammed or struck by them, by their capsizing, or by men sustaining strains while working them. Flying splinters and stones injured four men, falls of timber and pieces of machinery accounted for 13 cases of injury; 22 cases were caused by machinery in motion, four of these being caused by handling belts in motion; five men were hurt by being struck by tools they were using falling or slipping. Other causes of 29 accidents were jarred and jammed hands and feet, poisoned cuts, bruises, cyanide rash, ruptures, strains, etc.

WINDING MACHINERY ACCIDENTS

(without serious injury to persons).

Seven accidents were reported during 1926 as occurring to winding machinery; brief particulars are as follows:—

Overwinding.

At the Sons of Gwalia G.M. a platman allowed a man to ride on a half filled skip to the No. 7 plat after instructing him to ring one when he left the skip, which the man states he did. The platman then rang 6 and 2, but seeing the other skip descending and not having heard any ring from No. 7 plat he concluded the man was still in the skip and would be tipped into the bin, so he rang one and stopped the skip, and after allowing the man time to get out rang 2 and the skip rapidly passed the bin and stopped suddenly. The engine-driver in charge of winding operations at the time stated that he mistook the number of revolutions still to go and thus overwound the skip.

After the inquiry into the accident the Inspector of Mines issued instructions that in future no men were to travel on loaded skips, and that a notice to that effect be posted on the brace. (1783/26.)

At the Ingliston Consols Extended G.M. a tank was overwound in the west compartment. The connecting link and flange of wheel on poppet legs were broken, and the tank fell to the bottom of shaft. (575/27.)

SKIP DERAILMENTS.

At the Sons of Gwalia Gold Mine skips became derailed on four separate occasions, particulars being as follows:—

A descending empty skip left the rails at the No. 19 bin and damaged the timbers. An examination of the skip and track failed to show the cause of the accident. (283/26.)

A skip was derailed and the flange fractured nearly half way round the wheel. There appeared to be a flaw in the casting. (284/26.)

A derailment occurred to a skip while hauling ore from some cause unknown, two legs were displaced on the side of the shaft, no other damage resulted. (1966/26.)

Another derailment occurred from some unknown cause, but no damage resulted. (47/26.)

ROPES.

At the Westralia Mt. Morgans G.M., while raising ore the rope parted at the shoe, and the cage fell to the No. 2 plat, where it gripped the skid, caught and broke the chairs, and finally became jammed in the shaft. The accident appears to have been due to a defective method of fastening the rope. The cage was twisted and the bottom buckled up. (1618/26.)

PROSECUTIONS FOR BREACHES OF THE MINES REGULATION ACTS AND REGULATIONS.

A wheeler employed at the Co-operative Colliery was proceeded against under Special Rule 54 under "The Coal Mines Regulation Act, 1902," for gross cruelty to a horse he was driving in the mine. The case was proved and the man fined £1 and costs. The Company dismissed him from their employment. (525/26.)

EXEMPTIONS FROM SECTION 31, SUBSECTION 4, OF "THE MINES REGULATION ACT, 1906."

Eight exemption permits were issued during the year, four being for mines in the East Coolgardie, one in the Dundas, one in the Yilgarn, and two in the North-East Coolgardie Goldfields.

No permits were issued without the Inspector of Mines first satisfying himself that the applicants were capable of handling the particular machinery to which the exemption applied, and that it was not reasonably practicable to insist on the employment of a certificated driver.

SUNDAY LABOUR ON MINES.

In the Collie Coalfield the Westralian Colliery was granted permits to work on Sundays on four separate occasions during 1926, the work for which these permits were issued being as follows:—

Laying a new plat in No. 2 West; re-laying portion of main tunnel with heavy rails; removing and re-erecting auxiliary fan in No. 3 East; re-laying road into No. 3 East slant dip.

Four permits were granted to the Co-operative Colliery for timbering and re-laying No. 5 right flat; removal and re-erection of small haulage winch in No. 1 right district; renewing bars on main haulage road; laying flat in No. 5 East.

One permit was granted the Premier Colliery for the purpose of repairing main road in top section of the mine.

AMENDMENTS AND ADDITIONS DURING 1926 TO THE REGULATIONS UNDER "THE MINES REGULATION ACT, 1906"; "THE MINES REGULATION AMENDMENT ACT, 1915"; "THE COAL MINES REGULATION ACT, 1902-1926," AND "THE MINING DEVELOPMENT ACT, 1902."

"The Mines Regulation Act, 1906."

Cancellation of Part 2 of Regulation 15, Section 8, and substitution of new regulations dealing with Election and Appointment of Workmen's Inspectors of Mines. (Gazetted 5/2/1926.)

Cancellation of *Gazette* notices of 31st March, 1916, and 11th December, 1925, relating to Workmen's Inspectors of Mines Districts and substitution of new Districts. (Gazetted 5/2/1926.)

Cancellation of Clause 4, Division 2 of Regulation 15, Section 8, gazetted 5/2/1926, and substitution of Clause 4 detailing the powers of Workmen's Inspectors of Mines. (Gazetted 16/2/1926.)

New General Rule No. 45. Limiting the height of Rises to 10ft. unless otherwise approved in writing by an Inspector of Mines. (Gazetted 30/4/1926.)

"Mining Development Act, 1902."

Amendment of Regulations gazetted 27/11/1925 and substitution of new Regulations Nos. 1 to 16, under which ore will be crushed and tailings purchased at State batteries.

"Coal Mines Regulation Act, 1902-26."

Additional Regulation under Part 1, "Accident Relief Fund," to be 14a, prohibiting persons while drawing relief funds from engaging in any kind of work. (Gazetted 1/4/1926.)

The Act itself was amended by "The Coal Mines Regulation Act Amendment Act, 1926,"

ADVANCES ON ORES.

The policy of making advances on ores continued during 1926, but owing to the low price of the base metals very little of these was sent away. Several parcels of Asbestos and Mica, however, were sent to England to be sold. The transactions are tabulated hereunder:—

ADVANCES ON ORES.

STATEMENT OF TRANSACTIONS FOR YEAR 1926.

Miscellaneous Minerals.

Mineral.	File No.	Tonnage.	Amount Advanced	Shipping Expenses, etc.	Balance of proceeds remitted to Owners.	Total Amount realised during year.	Remarks.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	
Asbestos	1953/25	2·8	73 0 0	21 1 7	69 2 10	163 4 5	
Do.	1953/25	1·387	15 9 10	16 2 4	15 19 7	47 11 11	
Do.	1968/25	11·6125	180 5 0	55 15 10	333 12 11	572 13 9	Tonnage and portion of advances previously shown.
Do.	1968/25	4·5	43 0 0	26 19 1	67 18 10	137 17 11	
Do.	1968/25	3·0375	31 15 0	22 11 2	68 4 7	122 10 9	
Do.	2009/25	5·5025	74 0 0	43 2 3	82 10 3	199 12 6	
Do.	2009/25	9·3875	156 0 0	54 5 5	192 9 1	402 14 6	do. do.
Do.	2009/25	3·275	47 8 9	28 19 7	33 10 2	109 18 6	do. do.
Do.	2009/25	1·7	16 10 0	12 8 6	18 14 0	47 12 6	
Do.	2043/25	4·9	89 0 0	80 18 0	236 14 4	406 12 4	
Do.	2043/25	1·3	23 10 0	11 16 0	6 18 8	42 4 8	
Do.	2043/25	2·35	39 11 3	22 14 7	40 8 10	102 14 8	
Do.	2043/25	1·40	...	...	...	21 16 6	Not complete.
Do.	296/26	4·35	150 5 0	38 8 11	71 10 1	260 4 0	
Do.	296/26	2·65	63 15 0	14 18 7	52 17 4	131 10 11	
Do.	296/26	3·4	16 15 0	11 2 2	47 2 10	75 0 0	
Do.	296/26	1·5	7 10 0	5 4 4	19 8 8	32 3 0	
Do.	296/26	4·7	115 5 0	46 1 3	84 1 2	245 7 5	
Do.	296/26	4·25	20 15 0	13 9 0	64 15 3	98 19 3	
Do.	384/26	2·05	65 0 0	10 12 6	30 6 2	108 18 8	
Do.	384/26	2·05	10 0 0	6 17 7	31 7 2	48 4 9	
Do.	571/26	1·355	23 0 0	8 11 0	41 4 8	72 15 8	
Do.	571/26	1·6	7 15 0	5 14 7	23 17 2	37 6 9	
Do.	571/26	3·2	94 0 0	19 9 8	77 17 0	191 6 8	
Do.	571/26	1·9	9 10 0	6 10 6	21 9 0	37 9 6	
Do.	571/26	3·75	50 0 0	21 11 3	117 14 9	189 6 0	
Do.	571/26	3·7	...	11 15 8	74 1 1	85 16 9	
Do.	1288/26	1·25	41 0 0	7 0 3	...	68 8 10	Not complete.
Do.	1288/26	1·5	17 10 0	5 16 3	11 6 10	34 13 1	
Do.	1288/26	1·05	21 0 0	6 1 10	...	45 15 4	Not complete.
Do.	1288/26	·55	5 10 0	2 14 6	4 10 0	12 14 6	
Antimony ...	...	4·4	35 0 0	26 11 3	22 6 9	83 18 0	
Lead Ore	697/26	3·3	...	6 17 8	21 5 10	28 3 6	
Asbestos	1782/26	6·56	272 0 0	32 9 11	...	353 6 11	Not complete.
Do.	1782/26	8·45	77 10 0	27 12 0	86 6 6	191 8 6	
Do.	1898/26	1·66	62 0 0	3 5 1	...	92 10 11	Not complete.
Do.	1898/26	1·8	17 10 0	7 3 11	21 7 2	46 1 1	
Mica	625/26	1·0	650 0 0	2 13 6	...	...	Not complete.
Asbestos	2204/26	4·05	83 10 0	...	...	...	do.
Do.	2204/26	6·1	42 5 0	4 0 8	...	109 16 5	do.
Do.	2204/26	·85	13 2 6	...	...	...	do.
Do.	2204/26	·35	2 15 0	...	...	8 6 11	do.
Do.	2254/26	2·85	56 10 0	...	...	...	do.
Do.	2254/26	2·35	23 0 0	...	...	...	do.
Do.	291/27	1·975	21 0 0	...	...	...	do.
Do.	291/27	2·4	13 0 0	...	...	...	do.
Do.	291/27	1·3	29 0 0	...	...	...	do.
Do.	291/27	1·1	10 10 0	...	...	...	do.

LOANS AND SUBSIDIES UNDER "THE MINING DEVELOPMENT ACT, 1902," AND FROM THE MINING DEVELOPMENT VOTE.

The transactions under this heading always involve a large amount of investigation and field work, most of which has been carried out by the Assistant State Mining Engineers and the District Inspectors of Mines. A number of the more interesting investigations have been referred to in the foregoing reports of Messrs. Blatchford and Wilson, some of which are put up hereunder as appendices to this report. Tabulated statements of the expenditure on transactions for 1926 in aid of mining development are in Appendix No. 1 hereunder.

As usual for now many years past the demands of administrative office business have prevented me from visiting the gold and mineral fields nearly as frequently as is desirable, and visits when made have had to be very hurried. Short visits were made, however, to the Menzies Consolidated Mine at Yunndaga and Sons of Gwalia Mine at Leonora; Kalgoorlie, and Collie. The following notes on a few of the more interesting matters dealt with may be of some general information:—

RESEARCH LABORATORY OF THE KALGOORLIE SCHOOL OF MINES OF WESTERN AUSTRALIA.

Attention is called to three publications of the School of Mines of Western Australia covering work done during the years 1924 to 1926, additional to those in the Annual Reports of the Department of Mines for 1924 and 1925. Three special Bulletins have been issued on—

> The Flotation Processes, etc., in use at Broken Hill (1926); and Bulletins 1 and 2 of Reports of Investigations conducted in the Metallurgical Laboratory (1927).

The two latter, though printed in 1927, relate to work completed to end of 1926, and are appended to the School of Mines' Report for 1926. These investigations and publications are proving to be very valuable to metallurgists engaged in trying to make the most of our various minerals. In this connection it may be noted that there has been a proposal brought forward during 1926 (Mines File 1863/26) "to form an ore-dressing laboratory at the University of Melbourne, where considerable facilities already exist, in association with the Commonwealth Council for Scientific and Industrial Research. The object of the laboratory would be to select suitable treatment for complex ores sent in from small mines and prospecting syndicates, and to carry out researches which may require equipment beyond that available on a mining field." The assistance of this department was requested in ascertaining the extent of the field open in this State for such research, giving information as to "the existence of a number of known deposits, the treatment of which was either impossible, expensive, or not very satisfactory," and in supporting the proposal before the Commonwealth Council. The suggestion was discussed departmentally and referred to the Western Australian State Committee of the Council for Scientific and Industrial Research, which supported the departmental view that it was probably best in the first instance to work out such problems as much as possible on and near the mines concerned, as is being done at the Western Australian School of Mines Experimental Laboratory at Kalgoorlie, so far as its equipment and funds permit. Improvements in details of existing metallurgical practice resulting in savings of even only a few pence per ton through reductions of costs and improvement of metal recoveries are really of more importance than the devising of methods of treating complex and difficult ores.

MINE DUST.

In view of the opinion now very generally held by authorities on the effects of dust in mines that the most dangerous portion of the dust is that which consists of free quartz not combined with bases to form silicates, and that the latter combinations are more or less innocuous in causing silicosis of the lungs, much interest attaches to an investigation made by Dr. Simpson, Government Mineralogist and Analyst, of a sample of dust collected from the rafters of the South Kalgurli dry-crushing mill. It was found that 23 per cent. of this dust was of **under 10** microns (1 micron $= \frac{1}{25000}$ths inch) in diameter, this being the only portion of the dust which actually reaches the lung tissues, all coarser dust being arrested earlier in the nasal and bronchial passages, and the approximate mineral composition of this finest dust was calculated to be:—

Sericite ...	... 30·10%	=	Quartz ...	18·99%
Quartz ...	... 18·99%		Silicates ...	56·96%
Albite ...	... 16·57%		Carbonates	22·55%
Carbonates (mostly ankerite)	... 22·55%		Sulphides ...	1·50%
Chlorite	... 9·88%			100·00
Pyrite ...	... 1·50%			
Zoisite ...	... ·41%			
	100·00			

The Analyst's report is given more fully in his Annual Report for 1926.

The total silica, both free and combined, was 43.58 per cent., but it will be seen that the *free* quartz was only 19 per cent. This is a condition much more favourable to health of the miners than when the dust is almost entirely free quartz, as in the Rand mines and the sewerage tunnelling in Sydney in hard sandstones.

The above analysis may be compared with that on page 170 of Annual Report Department of Mines for 1925, made earlier by the Government Analyst of dust from the Boya Quarry, which showed 31 per cent. of free silica.

MENZIES CONSOLIDATED GOLD MINES LTD., YUNNDAGA.

This mine, which for thirty years has been one of the most important in the Menzies District, ceased active underground operations in 1925, but was still struggling to keep going for some months in 1926. I visited it in January of the latter year, and my report thereon is attached hereto as Appendix No. 5. As it proved impossible for the Company to provide any more capital and the roasting and retreatment of concentrates did not clear expenses, the mine had to be closed down entirely at the middle of April, 1926. The company went into liquidation in London, and the mine and assets thereon were taken by the Government by foreclosure under their mortgage security for loans of £6,196 6s. 10d., and interest £415 6s. 2d.; total £6,611 13s. The assets have since been in process of realisation.

SONS OF GWALIA MINE, LEONORA.

For some three years past a variety of negotiations have gone on between the Sons of Gwalia Company and the Government with regard to assistance to the Company in the equipment and development of the mine. The development of the mine is admittedly very much behindhand and unless it can be carried on intensively for a considerable time, to enable the ore-reserves to be opened up well ahead of the mill demands, an early cessation of the Company's operations seems inevitable.

In January, 1926, I made a visit to the mine and went into the position of its affairs with the manager and his staff, results of which were embodied in a report dated 18th February, 1926, which, however, was designed for Departmental and Ministerial rather than public information, and has therefore not been issued in printed form. Unfortunately it has not yet been found possible for the Company and the Government to agree as to the extent and terms of the assistance which the latter is willing to grant, and no arrangement had been come to between them by the end of 1926.

GOLDEN HORSESHOE ESTATES COMPANY LTD.

At the end of 1925, the sum of £25,000 had been advanced to the Golden Horseshoe Company by the Bank of New South Wales on a guarantee from the Government, and it was agreed to extend the guarantee to a total of £50,000 on security of a mortgage over the mine and plant, to enable the general operations of the mine and a further amount of development to be carried on, in order to give the Company an opportunity of raising further capital. Though London advices showed that everything possible was done to bring in more capital, all efforts to do so proved fruitless, and meantime the mine made losses month after month, to the detriment of development. The further loan was exhausted in June, 1926, and the mine had to be closed, the only work carried on underground being repairs and maintenance of the shaft and levels and keeping the mine unwatered. On surface a clean-up all round the mill was instituted which enabled these restricted operations to be continued till the end of the year. Repeated efforts have been made to bring in more capital by various schemes of combination with adjoining mines, but none of these came to any result during 1926.

For the first six months of 1926, there were treated 38,920 standard tons of ore returning gold to the value of £67,862 0s. 3d., or 34s. 10d. per ton. All expenses, including London, came to £89,698 13s. 1d., or 46s. 1d. per ton, making a loss of £21,836 12s. 10d., or 11s. 3d. per ton. The development footage was 1,165½ feet, costing £6,142 2s. 3d., or 3s. 2d. per ton crushed. The total tonnage treated by the company from its inception to 30th June, 1926, is given by the Manager as 4,308,517 tons of an average grade of 12.94 dwt. per ton, equal to a value of 54s. 11.9d. per ton. The average cost at the mine over the whole period has been 35s. 3.64d. per ton, and on the average 651 men have been employed.

The unwatering of the mine has to be done in two stages, from the bottom level of the main shaft to the 2,000 feet level, and then all the water from the 2,000 feet level to surface. For the year 1926 the amounts of water raised to 23rd June, 1926, was 9,307,350 gallons, and from 24th June, to 3rd January, 1927, it was 9,445,050 gallons, the total for 1926 being 18,752,400 gallons, or at the rate of 50,958 gallons per day for the year.

The returns from the cleaning-up operations gave enough profit during second half of 1926 to pay all expenses of carrying on the unwatering and maintenance work.

MANGANESE KNOB, MINERAL LEASE 321H.

Referring to Mr. Blatchford's report on the occurrence of manganese ore on the south coast, on page 66 of the annual report of the Department of Mines for 1925, a number of analyses not then available have in this year's annual report (1926) been published in the annual report of the Chemical Branch. During 1926 a certain amount of development work has been done by the owners of the lease with the aid of a small loan under the Mining Development Act, and some of the ore obtained was of very excellent quality (see Analyses 3061, 3062, 3063 in Chemical Branch report). This deposit of manganese is favourably situated in being within fairly easy reach of the coast, where there is a possible shipping place at Point Ann, and a fairly good one at Doubtful Island Bay, which could be opened up for a large output if development should prove that the deposits of manganese are of sufficient magnitude to warrant the expense of port equipment. The prospects that the quantity of available ore will be found satisfactory are rather promisiing.

COPPER MINING DURING 1926.

Owing to the low price of copper there was practically no copper mining in the State during 1926. Experiments were carried on at Whim Creek on the Pilbara Copper Fields, Ltd., Mine, on leaching the oxidised ores with a solution of ferrous sulphate and salt, and were repeated in the Kalgoorlie School of Mines. The results showed that satisfactory extractions could be obtained from the Whim Creek oxidised copper ores by this method, but it was not possible during the year to arrange for the work to be undertaken on a working scale.

The Copper Separation, Ltd., has been making further experiments during 1926 with an improved machine for application of the process, and at the end of the year the patentee, Mr. P. W. Nevill, left for England to demonstrate the new machine there and to try to introduce the process.

LEAD MINING DURING 1926.

The fall in the price of lead during 1926 from £35 to £28 a ton has had a very depressing effect on lead mining and in addition the failure of the Surprise and Three Sisters Mines at Galena to find payable ore in their lower levels led to these mines being shut down. The Two Boys Mine, however, leased the Surprise dressing mill and carried on to the end of the year, and near Ajana, the Springvale Mine was equipped with a new dressing-mill, which was just ready to start at the end of the year.

The Fremantle Trading Company's operations also unfortunately came to an end in 1926, and the company's properties were offered for sale by its creditors. These included the Fremantle Smelting Works, which has now, therefore, apparently finished its career of usefulness unless taken in hand by a proprietary powerful enough to undertake extensive repairs to the plant and finance of smelting operations. At present there is no expectation of any early resuscitation of the smelting industry.

Developments of the lead mines in the Braeside district of the Pilbara Goldfield during 1926 have been dealt with elsewhere in Mr. Blatchford's report.

Tin Mining during 1926 has been almost entirely confined to Greenbushes, where a certain amount of tin-dredging goes on very steadily. The Cornwall Syndicate have been making a strong effort to revive the old Cornwall lode workings, but have been greatly frustrated by water and hard ground.

In the Pilbara Goldfield a good deal of attention is being given to the alluvial gravels at Moolyella and Cooglegong, but little was done during the year to get to actual working, and next year's report should be able to say more about these enterprises.

BORING FOR COAL AT ERADU.

In March, 1926, it was decided by the Hon. the Minister to put down a number of Calyx bores in the vicinity of Eradu to test the coal-bearing beds there to a depth of 1,000 feet, if necessary. A site was chosen on the Railway Reserve on the west side of the Greenough River, and boring was commenced on 24th June. At 170ft. to 180ft. 3in. a seam of very dirty coal 10ft. 3in. thick was passed through, also 1ft. 6in. of carbonaceous matter at 181ft. 6in. to 183ft., and another bed 1ft. 11in. thick at 188ft. 4in. to 190ft. 3in. The bore was then continued to 829ft., passing through a succession of dark sandstones and shales, but without any sign of another coal horizon, and it was thought best to discontinue boring, and the plant was dismantled by 15th December, 1926.

The Permo-Carboniferous formation was not bored completely through, and its full depth is therefore yet unknown. The depth reached, however, makes it very probable that the coal-bearing beds at this locality, as at Collie and Wilga, are in a "sunkland" area faulted down into a depression in the surrounding Archaean rocks. The work has been continued during 1927.

There is some reason to think that the coal seam may have been cut only a short distance below its buried outcrop, and that the overlying beds belong to the Jurassic series so widely spread in this district. This would account for the coal seam having become extremely weathered and "perished" near the outcrop edge, and as it dips deeper into the Permo-Carboniferous beds to which it belongs, it may improve greatly in quality. The dip of the coal seam, however, is at present quite unknown, and on it will greatly depend the chances of getting workable coal seams in this locality. It may prove that the Permo-Carboniferous beds were eroded away below the coal horizon quite generally over the district before the Jurassic beds were deposited on the coal-measures, in which case the search for coal would be rather hopeless. The habit of the coal-bearing strata, however, at Collie, Wilga, and the Irwin River is that the strata dip at inclinations of about 1 in 6 on an average, and if this same feature should recur at Eradu, there is quite a considerable possibility that there may be quite large areas of ground in which the coal seams are still preserved. The value to the State of a coalfield at this point, close to the port of Geraldton and the railway lines converging thereto, justifies considerable expenditure in trying out the possibility by boring.

The seams cut in this first bore are altogether too impure to be workable at the quality shown by the bore cores. Two sets of analyses have been made, one of samples sent to Perth by the drill foreman, and the other of samples selected by the Acting Government Geologist, Mr. Blatchford:—

Samples taken by Drill Foreman at Eradu.

L. No.	2304/26.	2305/26.	2306/26.
Mark	170ft. to 180ft. 3in.	181ft. 6in. to 183ft.	188ft. 4in. to 190ft. 3ins.
Proximate Analysis:	%	%	%
Water lost on air drying for 24 hours	8·14	·73	2·78
Water lost at 105°C	17·08	6·06	16·42
Volatile matter ...	22·51	12·49	27·19
Fixed carbon ...	16·02	9·78	35·49
Ash	36·25	70·94	18·12
	100·00	100·00	100·00

Colour of ash ... Creamy white Light buff White.
Calorific Value B.T.U. 6911

H. BOWLEY,
Senior Mineralogist and Chemist.

Samples taken by Mr. T. Blatchford, Acting Government Geologist.

L. No.	3096/26.	3097/26.	3098/26.
Depth	170ft. to 180ft. 3in.	181ft. 6in. to 183ft.	188ft. 4in. to 190ft 3in.
Proximate Analysis:	%	%	%
Moisture ...	13·66	10·67	7·78
Volatile matter	36·41	31·32	26·65
Fixed carbon ...	24·74	30·69	29·00
Ash	25·19	27·32	36·57
	100·00	100·00	100·00

Calorific value, B.T.U. ... 5,493 ...
Colour of ash ... Light brown Dirty white Brownish-white.

EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

The strata passed through in this bore are described as follows, by Mr. Blatchford:

Log of Bore Cores raised from No. 1 Calyx Bore at Eradu, one mile west from Eradu Siding on Railway Reserve.

No. of Sample.	Depth of Core.		Description.
	ft. in.	ft. in.	
1	30 0	64 0	White gritty sandstone.
2	64 0	75 0	Finer grained yellow sandstone.
3	75 0	98 0	Similar to No. 1 sample.
4	130 0	140 0	Fine-grained argillaceous sandstone.
5	140 0	157 0	Coarse-grained red sandstone.
6	159 0	170 0	Micaceous shale.
7	164 0	166 0	A band of darker shale.
	170 0	180 3	Coal (?)
	181 6	183 0	Coal (?)
8	183 0	188 4	Grey shale.
	184 4	190 3	Coal (?)
9	190 3	199 0	Grey shale.
10	199 0	204 0	Coarse sandstone.
	207 0	240 0	Conglomerate.
11	240 0	244 0	Shale, contains organic matter—possibly plant remains.
12	244 0	344 0	Soft sandstone. Practically no core.
13	344 0	345 0	Shale.
14	408 0	464 0	Friable sandstone.
	464 0	470 0	Soft friable shale.
15	470 0	544 0	Friable sandstone with minor bands of shale similar to 464–470.
16	544 0	550 0	Shale.
	550 0	580 0	Similar to 16.
	580 0	587 0	Similar to 16.
	587 0	637 0	No core, sandstones.
17	637 0	640 0	Dark shale.
18	640 0	663 9	Sandstone with shale bands.
	663 0	668 0	Dark shale similar to shale bands in 18.
	668 0	686 0	Soft friable sandstone with minor bands of shale.
	686 0	695 0	Shale similar to 18.
	695 0	803 9	Sandstones with minor bands of shale.
	803 9	804 1	Band of pyrite.
19	804 1	832 0	Fine grey shale to bottom of hole.

All the coal core was forwarded direct to Dr. Simpson for analyses.

BORING ON THE GOLDFIELDS.

Early in 1926 the Hon. the Minister decided to undertake a scheme of diamond drill boring at the State expense on unoccupied lands on the goldfields on which there might appear to be good prospects that valuable information might be obtained thereby. The scheme included boring at the North End of the Kalgoorlie field, at Coolgardie, Yalgoo, Mt. Magnet, Sandstone, Cue, and Meekatharra, and it was proposed to use three diamond drills. The work was let on contract to the Goldfields Diamond Drilling Company, but only two drills could be made available during 1926.

The boring done during 1926 has been fully described by the Government Petrologist, Dr. Larcombe, in the annual report of the Government Geologist for 1926. Three bores were made at Williamstown near the Hidden Secret Mine with very interesting geological results, but without discovery of any payable lodes, and towards the end of the year the drill was removed to Coolgardie and commenced boring there. At Yalgoo four bores were made, also described in Dr. Larcombe's report, with very little result, and the drill was then removed to Sandstone, where it was boring at end of the year.

VISIT TO COLLIE.

In November, 1926, I made a short visit to Collie to examine the new "Griffin" Colliery, and also went to see the Premier Mine, but the reports thereon were of a departmental character, without much interest from the point of view of public information, and have not therefore been put forward herewith for publication. The "Griffin" bids fair to be a very useful and important colliery when fully opened up, equipped, and connected with the Collie Railway Station by a siding.

FROTH-FLOTATION CONCENTRATION OF GOLD ORES.

This method of recovery of gold values continues to be tested more or less by most people interested, and during 1926 no less than three separate propositions were put forward by large companies requesting Government assistance in putting up plant for trying out the method on a full working scale. One of the proposals was to erect such a plant to treat about 5,000 tons of ore a month for a year in strict comparison with an equal quantity passing through the existing dry-crushing, roasting and cyanide plant, the ore as raised from the mine going in equal quantities to each portion of the mill, so that a complete comparative trial could be made of each process. No conclusion was reached on the matter, however, owing very much to deferment of final consideration in the expectation that the report of the Development and Migration Commission might deal with it, and that this report would at least indicate the Commission's recommendations on the financial aspect of Federal and State monetary assistance to such projects. There is no progress, therefore, to report in 1926.

ELECTRIC POWER SCHEME FOR KALGOORLIE MINES.

In April, 1926, the Hon. the Premier announced the willingness of the Government to finance the establishment of a Central Power Station at Kalgoorlie with the object of bringing about a very material reduction in the costs of power in all mining operations, following the recommendations of the Royal Commissioner, Mr. C. Kingsley Thomas, in the previous year. A Departmental Committee consisting of Messrs W. H. Taylor, General Manager of the Government Tramways and Electricity Supply, A. M. Howe, Superintendent of State Batteries, and myself, State Mining Engineer, was appointed to consider the scheme and report upon it. The Committee made two visits to Kalgoorlie, and had several sittings in Perth in discussion of the matter, and submitted its report at the end of July, recommending the erection by the Government of a Central Power Station at Kalgoorlie suitable for a continuous output of 20,000,000 kilowatt-hours per annum, at an estimated cost of £227,000. The Report of the Committee, wtih a Memorandum by myself on the Prospects of Maintenance of Gold Production in the Kalgoorlie District, are attached to this report as Appendix No. 4.

TECHNICAL MINING COMMITTEE OF THE FEDERAL DEVELOPMENT AND MIGRATION COMMISSION.

In August, 1926, the (Federal) Development and Migration Commission was instructed by the Right Hon. the Prime Minister "to have an investigation of the present position of the Gold Mining Industry in Australia undertaken, and to make recommendations as to any action which it considers desirable to place the Industry on a better footing, and for Co-operation between the Commonwealth and the States to this end." To investigate the position in Western Australia, the Commission appointed a Technical Committee consisting of Mr. W. E. Wainwright, General Manager of the Broken Hill South, Ltd., with, as Technical Advisers, Messrs. A. J. Gibson, C. H. J. Clayton, and A. W. Hutchin. This Committee visited Kalgoorlie and the Sons of Gwalia Mine in October, 1926, but its report was not made available in this State till May, 1927, and discussion of it does not come, therefore, into the present year's report. I visited Kalgoorlie to meet the Committee and facilitate its mission, and later on met it in Perth when making its inquiries there.

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

The year 1926 was notable as registering the first meeting in Western Australia of this Association, which had a very successful session. Several papers were contributed at the meetings by members of the staff of the Mines Department, and they also took part in the preparation of the Handbook and Review of Science in Western Australia, prepared for and distributed at the meeting. My own contribution to this was two papers, viz.: "The Mining Industry and Mineral Resources of Western Australia," and "Special Legislation on Safety and Welfare of Miners."

I have, etc.,

A. MONTGOMERY, M.A., F.G.S.,
State Mining Engineer,

APPENDIX No. 1.

Summary of Expenditure from Mines Development Vote from 1st January to 31st December, 1926.

Advances in aid of Mining Work and Equipment.

	£	s.	d.
Lillies and Davey	52	13	8
Job, T. E.	173	5	6
Cook, Harse & Wakefield	27	16	8
North White Feather	671	7	5
Lady Shenton G.M.	44	11	4
Purdy, M. H. & P.	30	0	0
Menzies Consolidated	851	17	0
Murphy & Mooney	15	0	0
De Paoli	11	0	0
Cairns & Heydon	3	2	5
Jenkin & Party	451	4	3
Bordoni, J.	397	5	0
Wearmouth & Paull	68	6	8
Watson & Wellington	32	0	0
Wright, C. R.	152	0	0
Sons of Gwalia	1,736	1	3
Garland, J. P.	404	13	5
Ive's Reward	918	12	7
Barker, W. E.	91	0	0
Trembath & Baker	50	0	0
Swan & Party	206	10	0
McKiernan, J.	40	0	0
Ives, Bray & Millett	513	15	0
Westgarth & Valli	69	16	10
Mararoa G.M.	369	17	1
Anderson & O'Neill	150	0	0
Tamblyn & Party	133	15	9
Arden, A. M.	80	0	0
Hansen & Schachtschabel	145	10	0
Greenbushes-Cornwall T.M. Co.	733	17	4
Lynch, M.	210	14	8
Robinson & Horne	60	0	0
Bennit & Party	200	0	0
Rose Doreen	50	0	0
Tarcoola Blocks	1,350	0	0
Farrar & Party	21	4	2
Caddy & Party	100	0	0
Hough, Clark & Pearsall	150	0	0
Grist & Hallman	150	0	0
McMurray & Woodward	21	0	0
O'Leary, J.	14	0	0
Flynn & Flynn	19	0	0
	£10,970	18	0

Boring.

	£	s.	d.
Eradu	1,494	15	0
Kalgoorlie	1,935	17	6
Yalgoo	1,467	8	11
Dryman's Patch	311	7	6
Sandstone	681	11	1
	£5,891	0	0

	£	s.	d.
Providing transport and equipment to Prospectors	£4,800	5	10

Water Supplies.

	£	s.	d.
Reduced price of water, Southern Cross Eastwards	49,502	16	2
Glenelg Hills	668	15	5
Hatters Hill	50	0	0
	£50,221	11	7

	£	s.	d.
Rebates to Prospectors crushing at War Rates...	613	5	8
Subsidy, Development Work	57	12	6

Subsidies to Batteries.

	£	s.	d.
Grant, W. R., 455 tons, Westonia	68	5	0
Howlett, G. H., 705 tons, Marvel Loch ...	52	17	6
McHugh & Corboy, 233 tons, Mt. Vernon ...	23	6	0
Nevill, A. M., 39 tons, Yalgoo	4	17	6
	£149	6	0

Miscellaneous Expenditure.

	£	s.	d.
Preliminary Investigation, Sampling Mines ...	352	6	1
Maintenance of Securities	567	0	1
Recoup to P.W.D.—Half-rent Boring Plant loaned to Freney Oil Co....	292	2	10
Cartage Boring plant, C. J. LeMesurier ...	1	12	8
Cartage Boring Plant, J. Elias	10	0	0
Supply of Explosives to Prospectors	3	1	3
Subsidy on Ore railed to State Battery, Cue	4	0	6
Subsidy towards freight, Coongan to Fremantle	133	7	1
Whim Well, Ore leaching test	87	19	11
Repairs to 20-mile Sandy Battery	1,270	10	8
McHugh & Corboy, transfer of plant ...	15	19	9
Crushing for Public at Two Boys Battery ...	23	3	0
Subsidy on freight, J. Nicholson plant to Norseman	400	0	0
Subsidies, carting long distances to Batteries	3,742	10	6
	£6,903	14	4

	£	s.	d.
Total (according to Net Treasury figures for the year)	£79,607	13	11

Refund of Advances, January-December, 1926.

	£	s.	d.
Brilliant G.M.	1,071	16	11
Cairns & Heydon	70	14	0
Cook, Harse & Wakefield	79	6	8
De Paoli	6	19	3
Greenbushes, Cornwall T.M. Co.	16	13	4
Hancock, J.	58	9	3
Ives, Bray & Millett	91	3	11
Jenkins Syndicate	1	9	3
Ive's Reward	444	11	7
Mararoa G.M.	705	10	7
Nevill, A. M.	23	2	7
North White Feather	6	8	9
Patterson, W. A.	28	13	5
Prior, R. G.	450	10	0
Parkinson & Dunn	1,149	19	1
Ray & Hall	4	12	11
Sawyer, C. E.	4	9	0
Smitheram & Waller	23	14	6
Trembath & Baker	3	3	9
Walker, C. H. & E.	289	16	3
Great Victoria	240	0	0
J. Thompson	1	0	0
Thorley & Fox	1	2	2
Scotson Party	14	16	1
Hansen & Schachtschabel	3	0	0
	£4,737	3	3

Proceeds, Sale of Securities, January-December, 1926.

	£	s.	d.
Bullfinch	1,198	15	0
De Gracie	10	0	0
Daisy Queen	17	18	1
Golden Hope G.M.	550	0	0
Holzmann & Korsunski	226	0	0
Ive's Reward	17	2	8
J. Leitch	330	9	9
Menzies Consolidated	121	4	2
Marrin Prospecting Co.	180	19	0
Mt. Rankin G.M. Co.	2	2	0
Thring & Durya	500	0	0
Smith, C. N. B.	26	1	5
Greenhills G.M. Co.	5	10	0
Farraday & Tasker	6	0	0
Mott & Matthews	30	0	0
North, Hartley & Borwick	2	6	0
Phillips & Barrymore	13	0	0
	£3,237	8	1

	£	s.	d.
Miscellaneous Refunds	2	0	0
Prospecting	359	10	6

The Mining Development Act, 1902—Advances written off to 31st December, 1926:—

	£	s.	d.
Previously reported	41,842	9	8
Year 1926	1,618	10	8
	£43,461	0	4

MINING DEVELOPMENT EXPENDITURE.

Advances Outstanding, 31st December, 1926.

Name of Lease, Mine, or Borrower.	No. of Lease.	District.	Amount authorised.	Principal Moneys advanced		Principal Moneys		Interest		Total Principal and Interest outstanding at 31st December, 1926.
				Previously to 1926.	During 1926.	Repaid, including Sale of Securities, etc.	Balance outstanding.	Paid.	Outstanding.	
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Alicia	254F	Mt. Morgans	245 0 0	195 0 0	...	...	195 0 0	4 2 6	54 14 8	249 14 8
Anderson & O'Neil	P.A. 811	Norseman	150 0 0	...	150 0 0	...	150 0 0	...	3 6 11	153 6 11
Arden, A. M.	P.A. 2066E	Kalgoorlie	150 0 0	...	80 0 0	...	80 0 0	...	1 2 7	81 2 7
Ard Patrick	197	Phillips River	1,331 16 4	1,331 16 4	...	...	1,331 16 4	...	105 11 11	1,437 8 3
Ard Patrick	197	Phillips River	270 0 0	268 8 8	...	...	268 8 8	...	32 4 9	300 13 5
Ajana Lead Mines, Ltd.	153	Northampton	1,500 0 0	1,380 5 10	...	...	1,380 5 10	138 2 9	33 3 8	1,413 9 6
Barker, W. E.	M.L. 294	Marble Bar	250 0 0	...	91 0 0	...	91 0 0	...	4 11 9	95 11 9
Bullarton	795	Marble Bar	600 0 0	456 1 0	...	26 18 10	429 2 2	50 5 2	96 19 10	526 2 0
Baneygo, North	2113T	Laverton	200 15 0	200 15 0	...	...	200 15 0	14 5 3	56 8 2	257 3 2
Brittannia	953M	Mt. Magnet	150 0 0	114 12 6	...	43 10 0	71 2 6	...	9 4 6	80 7 0
Bickerton, Geo.	378	Phillips River	150 0 0	148 12 6	...	...	148 12 6	...	14 18 2	163 10 8
Bull Oak	1179Y	Bulong	60 0 0	27 2 6	...	...	27 2 6	...	2 1 7	29 4 1
British Flag	5310E, 5316E, 5324E, 5334E, 5354E, 5355E, 5364E, 5365E, 5366E, 5352E	Kalgoorlie	750 0 0	750 0 0	...	282 12 10	467 7 2	3 13 1	138 11 11	605 19 1
Bayley's Reward	5127	Coolgardie	100 0 0	99 9 10	...	...	99 9 10	1 18 10	6 8 0	105 17 10
Brilliant G.M. Co., N.L.	880, 897	Yalgoo	2,000 0 0	2,000 0 0	...	1,082 7 5	917 12 7	177 7 0	47 17 6	965 10 0
Brilliant G.M. Co., N.L.	880, 897	Yalgoo	1,000 0 0	1,000 0 0	...	...	1,000 0 0	65 0 0	32 15 4	1,032 15 4
Brilliant G.M. Co., N.L.	880, 897	Yalgoo	1,000 0 0	1,000 0 0	...	...	1,000 0 0	62 18 4	32 15 4	1,032 15 4
Bandinette, C. C.	P.A. 2040E	Kalgoorlie	100 0 0	100 0 0	...	...	100 0 0	0 3 0	2 16 4	102 16 4
Brown & Erceg	P.A. 2128E	Kalgoorlie	180 0 0	180 0 0	...	0 16 6	179 3 6	2 11 4	17 0 5	196 3 11
Bullfinch Prop. (1919), Ltd.	1517Z, 1576Z	Yundaga	4,000 0 0	4,000 0 0	...	...	4,000 0 0	46 0 0	229 7 4	4,229 7 4
Bullfinch Prop. (1919), Ltd.	1517Z, 1576Z	Yundaga	3,000 0 0	3,000 0 0	...	1,290 10 0	1,709 10 0	...	62 16 9	1,772 6 9
Bordoni, J.	P.A. 531S	Coolgardie	525 0 0	63 14 2	397 5 0	...	460 19 2	...	18 9 7	479 8 9
Carnation	M. 878	Yalgoo	150 0 0	...	150 0 0	...	150 0 0	...	0 8 10	150 8 10
Champion, South	817N, 1039N	Nannine	400 0 0	400 0 0	...	358 0 0	42 0 0	29 11 8	19 19 8	61 19 8
Clarkson & Son	P.A. 186	Ravensthorpe	150 0 0	119 7 6	...	...	119 7 6	...	16 19 8	136 7 2
Chrysotile, Nos. 1 and 2	274, 275	Pilbara	250 0 0	250 0 0	...	50 3 4	199 16 8	7 16 5	60 10 2	260 6 10
Coolgardie Redemption	5212, 5213	Coolgardie	1,003 8 6	...	1,003 8 6	...	1,003 8 6	...	1 15 8	1,005 4 2
Central	5251E	Kalgoorlie	1,000 0 0	1,000 0 0	...	210 6 2	789 13 10	132 15 9	31 18 2	821 12 0
Christie, J. M.	Dry Dredge Area 1W	Waverley	100 0 0	100 0 0	...	...	100 0 0	...	26 0 4	126 0 4
Copper Separation	Mach. Lease No. 11	Phillips River	4,000 0 0	4,000 0 0	...	...	4,000 0 0	...	628 15 4	4,628 15 4
Copper Separation, Ltd.	Mach. Lease No. 11	Phillips River	400 0 0	400 0 0	...	...	400 0 0	...	33 19 7	433 19 7
Copper Separation, Ltd.	Mach. Lease No. 11	Phillips River	1,000 0 0	1,000 0 0	...	...	1,000 0 0	...	83 3 3	1,083 3 3
Coombes & Ring	589J	Wiluna	60 0 0	60 0 0	...	...	60 0 0	...	5 1 6	65 1 6
Dawn of Hope	1504C	Leonora	100 0 0	100 0 0	...	...	100 0 0	0 3 11	...	100 0 0
Dreadnought	4555, 4561, 5190	Coolgardie	750 0 0	692 17 6	27 16 8	79 6 8	641 7 6	24 0 5	20 18 8	662 6 2
Diggers Luck	1243W	Cane Grass	175 0 0	174 0 8	...	76 6 8	97 14 0	1 8 10	...	97 14 0
Daisy Queen G.M., N.L.	1212, 1221	Lawlers	4,000 0 0	4,000 0 0	...	972 9 1	3,027 10 11	...	245 16 4	3,273 7 3
Duffy, J. G.	P.A. 1018M	Lennonville	100 0 0	89 0 0	...	...	89 0 0	0 12 2	11 9 5	100 9 5
Dalzell, John	P.A. 1527	Yilgarn	100 0 0	100 0 0	...	...	100 0 0	4 0 0	3 13 7	103 13 7
Emily	1510	Cue	400 0 0	372 1 9	...	...	372 1 9	...	44 7 10	416 9 7
Edna May Battler	3170, 911, 71	Yilgarn	3,000 0 0	2,539 12 9	...	13 6 8	2,526 6 1	86 18 9	310 5 5	2,836 11 6
Eclipse	1047X	Gindalbie	498 19 1	498 19 1	...	267 5 0	231 14 1	62 8 11	...	231 14 1
East Collie Coal Mining Briquetting Co.	294/299, 300/303	Collie	1,000 0 0	790 5 2	...	...	790 5 2	98 15 6	173 4 0	963 9 2
Ellis, J. T.	Reserve 368H	Kalgoorlie	75 0 0	75 0 0	...	6 0 0	69 0 0	...	...	69 0 0
Egan & Sadlier	P.A. 1559E	Kalgoorlie	100 0 0	100 0 0	...	...	100 0 0	...	1 7 5	101 7 5
Farrar & Party	P.A. 131	Galena	100 0 0	...	21 4 2	...	21 4 2	...	0 2 5	21 6 7
Firelight & Undaunted	3217/3222	Yilgarn	464 11 0	391 10 3	...	0 5 0	391 5 3	3 2 0	64 1 0	455 6 3
Field's Find & Extended	902	Yalgoo	361 2 3	361 2 3	...	99 19 0	261 3 3	22 8 3	77 15 6	338 18 9
Flag Leases	136, 137, 138	Phillips River	3,500 0 0	3,080 18 9	...	408 3 9	2,672 15 0	...	177 9 6	2,850 4 6
Flag Tributers (Grant & Edwards)	...	Phillips River	450 0 0	450 0 0	...	0 13 1	449 6 11	15 8 0	38 13 1	488 0 0
Flag Tributers (Grant & Edwards)	...	Phillips River	150 0 0	148 16 10	...	16 12 3	132 4 7	1 2 9	4 7 6	136 12 1
Flynn & Flynn	P.A. 2125E	Kalgoorlie	130 0 0	80 0 0	19 0 0	...	99 0 0	0 9 6	7 2 1	106 2 1
Globe	912N	Nannine	500 0 0	444 12 9	...	171 1 6	273 11 3	77 17 10	15 8 1	288 19 4
Gallagher, H. J.	M.L. 145	Northampton	50 0 0	25 0 0	...	...	25 0 0	9 17 1	2 6 11	27 6 11
Gem	184	Phillips River	500 0 0	500 0 0	...	52 9 5	447 10 7	84 14 8	110 3 11	557 14 6
Golden Lizard	1067R	Edjudina	366 7 4	366 7 4	...	...	366 7 4	45 18 6	35 17 8	402 5 0
Great Bingin	3311	Yilgarn	400 0 0	...	210 14 8	...	210 14 8	...	2 1 9	212 16 5

Great Southern	2909	Yilgarn	630 0 0	630 0 0	...	100 0 0	530 0 0	9 18 5	181 15 10	711 15 10
Great Southern	2909	Yilgarn	800 0 0	761 3 4	...	...	761 3 4	...	51 11 0	812 14 4
Great Southern	2909	Yilgarn	500 0 0	500 0 0	...	...	500 0 0	...	58 19 0	558 19 0
Greenbushes Cornwall T.M. Co.	627 M.L.	Greenbushes	1,000 0 0	...	733 17 4	...	733 17 4	...	8 9 9	742 7 1
Greenbushes Cornwall T.M. Co.	627 M.L.	Greenbushes	60 0 0	...	60 0 0	16 13 4	43 6 8	...	...	43 6 8
Griffin Syndicate	306/313	Collie	348 0 7	348 0 7	...	...	348 0 7	90 10 11	11 8 0	359 8 7
Griffin Syndicate	306/313	Collie	250 0 0	247 15 0	...	8 0 0	239 15 0	41 3 5	14 19 11	254 14 11
Greenhills G.M. Co., N.L.	383F	Linden	350 0 0	286 0 8	...	5 10 0	280 10 8	15 3 10	18 1 9	298 12 5
Greenhills G.M. Co., N.L.	383F	Linden	225 0 0	171 10 0	...	...	171 10 0	...	4 3 5	175 13 5
Golden Promise	P.A. 2053	Coolgardie	300 0 0	300 0 0	...	...	300 0 0	...	40 4 7	340 4 7
Garden Gully	5147, 5148	Coolgardie	300 0 0	112 10 0	...	...	112 10 0	...	16 12 2	129 2 2
Griffiths G.M.	4567...	Coolgardie	1,000 0 0	1,000 0 0	...	...	1,000 0 0	10 2 4	218 16 3	1,218 16 3
Golden Hope G.M., N.L.	63, 86	Hampton Plains	2,000 0 0	2,000 0 0	...	550 0 0	1,450 0 0	310 11 5	87 12 3	1,537 12 3
Goddard & Dawe	P.A. 1100Z	Menzies	200 0 0	194 8 11	...	1 10 3	192 18 8	...	4 2 6	197 1 2
Golding & Gill	557D	Cue	75 0 0	62 0 0	...	23 12 5	38 7 7	1 9 10	2 18 5	41 6 0
Graham & Crain	5370E	Kalgoorlie	210 0 0	179 18 10	...	1 7 3	178 11 7	2 14 6	17 6 9	195 18 4
Great Empress of Coolgardie	5197	Coolgardie	140 0 0	87 6 4	52 13 8	...	140 0 0	1 10 7	6 0 2	146 0 2
Havilah	345B	Black Range	600 0 0	553 2 1	...	465 10 10	87 11 3	181 14 2	6 13 0	94 4 3
Havilah	345B	Black Range	500 0 0	496 9 6	...	...	496 9 6	85 6 4	46 13 5	543 2 11
Hawk	725G	Desdemona	120 0 0	116 12 2	...	22 5 11	94 6 3	3 7 10	...	94 6 3
Harbour View Gold Copper Co., Ltd.	M.L. 52, 94	Kundip	2,886 11 0	2,886 11 0	...	74 16 7	2,811 14 5	8 18 11	620 18 3	3,432 12 8
Hamilton & Congdon	Tributer's Flag Mine	Ravensthorpe	150 0 0	150 0 0	...	...	150 0 0	...	13 3 8	163 3 8
Hamerston, O. A.	P.A. 188	Ravensthorpe	100 0 0	100 0 0	...	...	100 0 0	...	...	100 0 0
Hobby & Party	514B	Youanmi	125 0 0	117 15 10	...	11 0 0	106 15 10	...	...	106 15 10
Humphries & Reid	Dry Dredge Area	Bulong	100 0 0	100 0 0	...	...	100 0 0	4 4 0	9 16 1	109 16 1
Heydon & Laws	2040	Cue	150 0 0	56 5 0	...	...	56 5 0	0 17 2	5 9 9	61 14 9
Hill 60	1215M	Mt. Magnet	660 0 0	660 0 0	...	...	660 0 0	...	...	660 0 0
Hill 60	1215M	Mt. Magnet	150 0 0	...	150 0 0	...	150 0 0	...	1 2 5	151 2 5
Hill 60	1215M	Mt. Magnet	28 15 0	...	28 15 0	...	28 15 0	...	0 5 4	29 0 4
Ingliston Junction G.M. Co., N.L.	1475N, 1491N	Nannine	200 0 0	98 7 6	...	14 0 0	84 7 6	3 4 10	...	84 7 6
Ive's Lake View Reward Junction	5154, 4732	St. Ives	500 0 0	86 10 0	173 5 6	51 0 0	208 15 6	4 11 1	4 6 4	213 1 10
Invincible	5358E	Kalgoorlie	75 0 0	75 0 0	...	7 1 1	67 18 11	1 16 7	6 15 1	74 14 0
Johnston & Stennett	P.A. 198	Ravensthorpe	150 0 0	150 0 0	...	0 17 3	149 2 9	17 14 2	4 12 8	153 15 5
Jewell & Bartholomew	P.A. 1024M	Mt. Magnet	187 10 0	164 0 0	...	...	164 0 0	...	18 1 6	182 1 6
Kays, Alfred	Temp. Reserve 438H	...	100 0 0	...	100 0 0	...	100 0 0	...	...	100 0 0
Kuhlmann & Buckie (Ironclad Tribute)	Reserve 196H	Ravensthorpe	300 0 0	263 8 0	...	...	263 8 0	18 8 0	2 17 3	266 5 3
Kuhlmann & Buckie (Ironclad Tribute)	Reserve 196H	Ravensthorpe	403 17 3	403 17 3	...	6 1 0	397 16 3	...	...	397 16 3
Kingdom Come	M.L. 112	Northampton	204 14 0	204 14 0	...	110 0 0	94 14 0	5 8 0	15 11 0	110 5 0
Klondike Boulder	604	Warrawoona	1,000 0 0	999 10 7	...	187 5 6	812 5 1	34 5 4	150 12 7	962 17 8
Kapanga	M.L. 515	Greenbushes	80 0 0	60 0 0	...	26 11 0	33 9 0	5 16 8	2 4 7	35 13 7
Lake View Extended	4536E	Kalgoorlie	1,050 0 0	892 15 5	...	803 0 0	89 15 5	...	54 11 1	144 6 6
Lady Carmen	4546	Coolgardie	500 0 0	500 0 0	...	95 0 0	405 0 0	12 19 1	46 12 2	451 12 2
Lloyd George G.M. Co., N.L.	4580, 4726, 4727	Coolgardie	1,750 0 0	1,750 0 0	...	775 18 9	974 1 3	346 7 10	98 0 3	1,072 1 6
Lloyd George G.M. Co., N.L.	5124, 5156, 5157	Coolgardie	2,000 0 0	1,624 19 11	...	...	1,624 19 11	8 3 1	147 0 6	1,772 0 5
Laver, J.	P.A. 2152E	Kalgoorlie	282 12 10	...	282 12 10	...	282 12 10	...	9 4 10	291 17 8
Lake View Reward	4720, 4721, 4722, W.R. 553, 554, 555	St. Ives	5,657 0 0	5,630 11 5	...	102 14 9	5,527 16 8	152 6 10	905 2 0	6,432 18 8
Lake View Reward	4720, 4721, 4722, W.R. 553, 554, 555	St. Ives	1,000 0 0	1,000 0 0	...	...	1,000 0 0	...	136 15 2	1,136 15 2
Lake View Reward	4720, 4721, 4722, W.R. 553, 554, 555	St. Ives	900 0 0	...	918 12 7	461 14 3	456 18 4	...	28 19 6	485 17 10
Lonsdale & Howard	1822E	Kalgoorlie	100 0 0	100 0 0	...	0 19 10	99 0 2	0 9 11	6 3 10	105 4 0
Lake View	5410Z	Comet Vale	100 0 0	100 0 0	...	...	100 0 0	...	23 14 2	123 14 2
Lady Shenton G.M. Syndicate, Menzies N.L.	5423Z, 5485Z	Menzies	1,000 0 0	914 19 5	44 11 4	...	959 10 9	8 16 4	93 0 1	1,052 10 10
Lady Shenton G.M. Syndicate, Menzies, N.L.	5423Z, 5485Z	Menzies	90 0 0	90 0 0	...	22 10 0	67 10 0	...	1 10 0	69 0 0
Lady Sampson Lead Mine	M.L. 27 P.P.	Northern Gully	700 0 0	166 2 9	451 4 3	1 9 3	615 17 9	8 10 9	15 6 8	631 4 5
Mindoolah	1518	Mindoolah	300 0 0	198 17 0	...	10 0 0	188 17 0	...	8 1 1	196 18 1
Mt. Rankin G.M., N.L.	3135, 3136	Yilgarn	1,000 0 0	911 19 9	...	117 15 11	794 3 10	...	47 8 4	841 12 2
Mt. Iron	198	Kundip	200 0 0	194 0 0	...	...	194 0 0	...	35 3 7	229 3 7
Melba	1053R	Yerilla	575 0 0	496 18 10	...	90 0 0	406 18 10	...	43 2 9	450 1 7
Mott & Matthews	P.A. 164	Roebourne	750 0 0	483 6 6	...	98 15 11	384 10 7	1 1 10	45 10 7	430 1 2
Mt. Magnet Prospecting Development Syndicate	1190M	Mt. Magnet	250 0 0	122 5 6	...	6 15 6	115 10 0	7 11 0	3 12 9	119 2 9
Mohr, John	P.A. 1522E	Kalgoorlie	150 0 0	143 5 7	...	...	143 5 7	0 7 6	47 1 3	190 6 10
Moyle, W.	2055E	Kalgoorlie	75 0 0	75 0 0	...	...	75 0 0	...	9 7 6	84 7 6
Mararoa G.M. Co., N.L.	...	Wiluna	1,000 0 0	710 2 10	...	...	710 2 10	66 4 9	23 6 7	733 9 5
Mararoa G.M. Co., N.L.	1977, 1981, 2030, 2033, 2038, 2044/2045	Cue	900 0 0	900 0 0	...	236 8 3	663 11 9	67 1 3	28 0 2	691 11 11
Mararoa G.M. Co., N.L.	1977, 1981, 2030, 2033, 2038, 2044/2045	Cue	1,000 0 0	...	369 17 1	...	369 17 1	0 4 7	10 3 11	380 1 0
Murrin Proprietary G.M. Co., N.L.	372F	Mt. Morgans	550 0 0	550 0 0	...	221 1 0	328 19 0	...	54 8 6	383 7 6
Murrin Proprietary G.M. Co., N.L.	372F	Mt. Morgans	413 3 6	413 3 6	...	85 1 6	328 2 0	...	36 11 6	364 13 6

MINING DEVELOPMENT EXPENDITURE—*Advances Outstanding 31st December, 1926*—continued.

Name of Lease, Mine, or Borrower.	No. of Lease.	District.	Amount authorised.	Principal Moneys advanced: Previously to 1926.	Principal Moneys advanced: During 1926.	Principal Moneys: Repaid, including Sale of Securities, etc.	Principal Moneys: Balance outstanding.	Interest: Paid.	Interest: Outstanding.	Total Principal and Interest outstanding at 31st December, 1926.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Mt. Zion	1113M, 1183M, 1189W	Mt. Magnet ...	2,000 0 0	1,959 13 1	...	458 3 0	1,501 10 1	82 2 7	172 5 5	1,673 15 6
Mt. Zion	1113M, 1183M, 1189W	Mt. Magnet ...	500 0 0	500 0 0	...	...	500 0 0	9 15 9	45 18 8	545 18 8
Menzies Consolidated G.M., Ltd.	4931Z, 4934Z, 4935Z, 4936Z, 5074Z, 5075Z, 5260Z, 5315Z, 5261Z, Garden Area 25Z, 35Z, Tailing Area 55Z	Yundaga ...	5,000 0 0	3,357 1 10	...	121 4 2	3,235 17 8	167 0 11	314 1 6	3,549 19 2
Menzies Consolidated G.M., Ltd.	4931Z, 4934Z, 4935Z, 4936Z, 5074Z, 5075Z, 5260Z, 5315Z, 5261Z, Garden Area 25Z, 35Z, Tailing Area 55Z	Yundaga ...	4,000 0 0	1,987 8 0	851 17 0	...	2,839 5 0	...	101 4 8	2,940 9 8
Moyagee	1217M	Mt. Magnet ...	365 0 0	198 16 1	3 2 5	10 14 0	191 4 6	1 6 2	12 17 10	204 2 4
Mopoke Syndicate	P.A. 1182W ...	Broad Arrow ...	200 0 0	194 8 4	...	52 19 2	141 9 2	5 12 5	8 19 1	150 8 3
McLelland, Rowe & Hehir	P.A. 2162	Coolgardie ...	60 0 0	60 0 0	...	...	60 0 0	...	1 5 0	61 5 0
Munarra	1502N	... ...	500 0 0	...	100 0 0	...	100 0 0	...	0 13 4	100 13 4
McMurray & Woodward	2155E	Kalgoorlie ...	100 0 0	...	21 0 0	...	21 0 0	...	0 1 4	21 1 4
McKiernan, J.	P.A. 1147C ...	Leonora	40 0 0	...	40 0 0	...	40 0 0	...	1 12 7	41 12 7
North Harbour View	M.L. 370	Phillips River ...	100 0 0	100 0 0	...	...	100 0 0	6 8 1	33 16 4	133 16 4
North End	4632E	Kalgoorlie ...	150 0 0	149 5 0	...	...	149 5 0	...	47 15 6	197 0 6
Norma	1460N	Nannine	220 0 0	220 0 0	...	44 14 7	175 5 5	15 7 3	22 4 10	197 10 3
New Victory	5159	St. Ives	300 0 0	150 10 0	...	...	150 10 0	...	6 13 10	157 3 10
New Victory	5159	St. Ives	115 0 0	93 15 5	...	...	93 15 5	...	3 9 9	97 5 2
North White Feather G.M., Ltd.	12X, 13X, 1438X, 1443X	Kanowna ...	2,500 0 0	1,237 5 10	671 7 5	6 8 9	1,902 4 6	110 18 3	55 12 6	1,957 17 0
Oates & Party	P.A. 1022Z ...	Menzies	90 0 0	90 0 0	...	4 19 6	85 0 6	...	...	85 0 6
Owen & Brown	M.L. 184	West Pilbara ...	100 0 0	60 19 0	...	24 15 3	36 3 9	9 10 5	2 3 5	38 7 2
Orr & Richards	3249	Yilgarn	50 0 0	50 0 0	...	...	50 0 0	...	1 1 4	51 1 4
Pearl	1095M	Mt. Magnet ...	76 0 0	76 0 0	...	...	76 0 0	...	24 18 2	100 18 2
Pyx	789B	Sandstone ...	600 0 0	571 4 8	...	87 10 7	483 14 1	12 14 5	24 15 0	508 9 1
Pilgrim's Rest G.M. Co., Ltd.	165 M.A. 14 ...	West Pilbara ...	1,500 0 0	503 12 6	...	503 12 6	...	...	102 18 6	102 18 6
Pinder, A.	2102T	Duketon ...	100 0 0	100 0 0	...	2 2 0	97 18 0	...	28 9 0	126 7 0
Petergen, C. G.	P.A. 1109C ...	Malcolm	20 0 0	20 0 0	...	10 4 6	9 15 6	2 9 7	0 18 2	10 13 8
Pearce, J. A.	P.A. 1315	Yilgarn	60 0 0	60 0 0	...	...	60 0 0	0 13 0	9 15 4	69 15 4
Prohibition South	1532M	... ...	180 0 0	...	133 15 9	...	133 15 9	...	3 4 3	137 0 0
Purdy & Purdy	5208	Coolgardie ...	150 0 0	120 0 0	30 0 0	4 16 10	145 3 2	0 17 11	7 4 8	152 7 10
Ragged Hill	M.L. 288	Pilbara	500 0 0	...	176 10 0	...	176 10 0	...	5 7 6	181 17 6
Resurrection	3281	Yilgarn	100 0 0	89 0 0	11 0 0	16 9 3	83 10 9	0 12 9	5 10 0	89 0 9
Roy & Halls	P.A. 1986E... ...	Kalgoorlie ...	150 0 0	101 0 0	...	4 12 11	96 7 1	0 15 9	6 7 11	102 15 0
Rainbow G.M. Co., N.L.	5091	Coolgardie ...	230 0 0	182 10 0	...	1 8 4	181 1 8	6 1 7	38 13 0	219 14 8
Rich and Wigglesworth (Sub-Leases) ...	863B, 864B, 942B, 943B	Black Range ...	2,500 0 0	500 0 0	...	...	500 0 0	...	7 6 0	507 6 0
Robinson & Home	... ...	Galena	60 0 0	...	60 0 0	...	60 0 0	...	0 18 11	60 18 11
Rose Doreen	5210	Coolgardie ...	175 0 0	...	50 0 0	...	50 0 0	...	0 11 11	50 11 11
South Cornwall	M.L. 567	Greenbushes ...	1,170 2 0	1,170 2 0	...	154 0 0	1,016 2 0	...	...	1,016 2 0
Stanley	1271X	Kanowna ...	150 0 0	112 0 0	...	...	112 0 0	2 6 0	39 14 8	151 14 8
Scots Greys	2801	Yilgarn	200 0 0	200 0 0	...	...	200 0 0	18 0 0	79 7 3	279 7 3
Scots Greys	2801	Yilgarn	200 0 0	200 0 0	...	...	200 0 0	...	99 17 2	299 17 2
Scots Greys	2801	Yilgarn	120 0 0	101 15 0	...	0 10 0	101 5 0	...	15 12 1	116 17 1
Scots Greys	2801	Yilgarn	50 0 0	40 10 0	...	...	40 10 0	...	3 13 0	44 3 0
Sons of Gwalia	... ...	... ...	1,736 1 3	...	1,736 1 3	...	1,736 1 3	...	...	1,736 1 3
Surprise	M.L. 342	Ravensthorpe ...	600 0 0	327 4 1	...	11 9 0	315 15 1	1 5 1	28 5 0	344 0 1
Snellgrove & Mendis	P.A. 1880	Widgiemooltha ...	100 0 0	100 0 0	...	...	100 0 0	...	0 10 4	100 10 4
Springvale	24 P.P.	Northampton ...	1,500 0 0	...	1,350 0 0	...	1,350 0 0	...	7 16 7	1,357 16 7
Stevens & Party (Tributers)	... ...	Curran's Find ...	1,285 0 0	1,253 12 7	...	465 0 0	788 12 7	22 0 3	90 17 7	879 10 2
Stevens & Party (Tributers)	... ...	Curran's Find ...	1,047 13 0	1,047 13 0	...	...	1,047 13 0	17 3 10	119 3 9	1,166 16 9
Stevens & Party (Tributers)	... ...	Curran's Find ...	200 0 0	200 0 0	...	49 6 8	150 13 4	26 0 0	...	150 13 4
South Fingal	G.M.L. 569D ...	Day Dawn ...	1,750 0 0	1,750 0 0	...	90 11 9	1,659 8 3	67 4 10	113 15 8	1,773 3 11
Sydney Mint	895S	Kunanalling ...	200 0 0	170 11 2	...	10 0 0	160 11 2	4 12 3	16 13 5	177 4 7
Surprise Lead Mine	M.L. 148, 150, 154, 158, 20 P.P.	Northampton ...	25,000 0 0	20,000 0 0	...	...	20,000 0 0	4,619 9 11	110 8 3	20,110 8 3
Shamrock	219L	Nullagine ...	100 0 0	70 10 0	...	10 8 7	60 1 5	2 11 5	6 0 7	66 2 0
Thomas & McDonald (Tributers)	... ...	Kalgoorlie ...	40 0 0	35 0 0	...	...	35 0 0	...	3 10 9	38 10 9
Thorn, A.	P.A. 1913	Widgiemooltha ...	50 0 0	50 0 0	...	...	50 0 0	1 13 10	1 11 6	51 11 6

Transville	1198Y	Bulong	360 0 0	...	200 0 0	...	200 0 0	...	3 2 9	203 2 9
Triffet & Winter	P.A. 1452	Tuckabianna ...	150 0 0	141 0 0	...	...	141 0 0	0 13 11	2 10 0	143 10 0
Triffet & Winter	P.A. 1452	Tuckabianna ...	75 0 0	75 0 0	...	...	75 0 0	...	...	75 0 0
Trembath & Baker	P.A. 2139E... ...	Kalgoorlie ...	50 0 0	...	50 0 0	3 3 9	46 16 3	1 1 3	1 11 7	48 7 10
Unexpected	81Z, 5480	Mt. Ida	640 0 0	644 15 0	...	15 4 0	629 11 0	121 10 8	75 11 1	705 2 1
Varradium	M.L. 291	Pilbara	100 0 0	...	30 0 0	...	30 0 0	...	0 4 4	30 4 4
V's United G.M. Co., N.L.	271F	Mt. Morgans ...	500 0 0	406 14 1	...	...	406 14 1	1 11 2	25 7 9	432 1 10
V's United G.M. Co., N.L.	271F	Mt. Morgans ...	172 2 0	172 2 0	...	170 0 0	2 2 0	...	9 6 4	11 8 4
Venture	5160	St. Ives	100 0 0	59 4 2	...	...	59 4 2	0 3 1	3 13 10	62 18 0
Victory	P.A. 1382	Marvel Loch ...	26 13 4	26 13 4	...	...	26 13 4	...	...	26 13 4
Viking	851	Pilbara	175 0 0	...	145 10 0	3 0 0	142 10 0	...	2 5 3	144 15 3
Waterloo	1291N	... ...	1,250 0 0	...	404 13 5	...	404 13 5	...	19 8 11	424 2 4
Waratah	947B	Sandstone ...	220 0 0	...	152 0 0	...	152 0 0	...	7 7 5	159 7 5
Williamson & Pender	... ...	Kanowna ...	180 0 0	180 0 0	...	...	180 0 0	7 0 0	12 18 1	192 18 1
Wheal May	Loc. 6	Northampton ...	302 4 6	302 4 6	...	50 0 0	252 4 6	5 15 9	14 9 8	266 14 2
Wilson & Son	P.A. 1103W ...	Broad Arrow ...	26 0 0	26 0 0	...	...	26 0 0	...	0 16 0	26 16 0
Wilga Proprietary Coal Prospecting Co., Ltd.	406H M.L.	Wilga	1,000 0 0	734 8 4	...	...	734 8 4	...	158 16 5	893 4 9
Wheal Ina	M 23 P.P.	Northampton ...	200 0 0	112 3 6	...	52 13 9	59 9 9	2 17 0	6 16 10	66 6 7
Warrior	5484Z	Menzies	200 0 0	200 0 0	...	63 2 0	136 18 0	18 5 9	4 10 5	141 8 5
Wearmouth & Paull	P.A. 2131	Coolgardie ...	120 0 0	51 13 4	68 6 8	...	120 0 0	...	2 3 8	122 3 8
Westgarth & Valli	P.A. 2129E ...	Kalgoorlie ...	70 0 0	...	69 16 10	...	69 16 10	...	2 1 5	71 18 3
Total	... ...	... ...	...	114,310 1 9	11,870 19 4	11,402 18 5	114,778 2 8	8,136 14 1	9,057 9 3	123,835 11 11
ASSISTANCE IN ERECTING BATTERIES AND TREATMENT PLANTS TO BE USED FOR CRUSHING FOR THE PUBLIC.										
Big Stone	357F, 369F ...	Yundamindera ...	1,438 0 0	1,438 0 0	...	898 16 0	539 4 0	...	384 6 3	923 10 3
Big Stone	357F, 369F ...	Yundamindera ...	500 0 0	484 2 1	...	1 6 2	482 15 11	37 18 0	60 11 10	543 7 9
Butcher Bird No. 1	1933	Yilgarn	1,863 14 2	1,863 14 2	...	17 16 2	1,845 18 0	172 3 10	89 6 5	1,935 4 5
Butcher Bird Tributers (E. A. Cox) ...	... ...	... ...	76 8 4	76 8 4	...	26 4 9	50 3 7	...	...	50 3 7
Butcher Bird Tributers (Jones & Party) ...	... ...	... ...	12 0 3	12 0 3	...	...	12 0 3	...	...	12 0 3
Butcher Bird Tributers (Ogden & James) ...	... ...	... ...	26 4 9	26 4 9	...	...	26 4 9	...	...	26 4 9
Chunderloo	148N	Nannine	2,032 12 0	1,730 10 2	...	671 4 2	1,059 6 0	...	218 16 2	1,278 2 2
Donovan's Find	768	Yilgarn	1,000 10 0	1,000 10 0	...	306 4 8	694 5 9	647 3 4	17 9 10	711 15 7
Donovan's Find	768	Yilgarn	150 0 0	150 0 0	...	...	150 0 0	65 5 9	4 14 6	154 14 6
Donovan's Find	768	Yilgarn	433 0 0	433 0 0	...	...	433 0 0	123 1 10	29 11 0	462 11 0
Donovan's Find	768	Yilgarn	100 0 0	78 0 9	...	...	78 0 9	17 14 5	7 6 8	85 7 5
Frazer's Central	3228, 3232 ...	Yilgarn	2,971 16 4	2,976 16 4	...	45 0 0	2,931 16 4	44 12 2	468 16 8	3,400 13 0
Fraser's Central	3228, 3232 ...	Yilgarn	636 17 8	636 17 8	...	...	636 17 8	...	83 6 11	720 4 7
Fraser's Central	3228, 3232 ...	Yilgarn	891 6 0	891 6 0	...	...	891 6 0	...	47 13 7	938 19 7
Fraser's Central	3228, 3232 ...	Yilgarn	650 0 0	650 0 0	...	8 3 10	641 16 2	...	8 16 5	650 12 7
Great Victoria	719, 944, 945, 1227	Yilgarn	2,000 0 0	1,643 3 0	...	243 3 0	1,400 0 0	81 14 3	36 8 7	1,436 8 7
Great Southern	2909	Yilgarn	...	3,977 12 7	...	...	3,977 12 7	13 0 0	926 3 6	4,903 16 1
Hodder, E.	M.A. 64Y	Bulong	253 3 2	253 3 2	...	148 13 0	104 10 2	6 8 4	35 11 3	140 1 5
Hunt, W.	... ...	Kalgoorlie ...	795 0 0	795 0 0	...	36 17 6	758 2 6	41 14 8	49 5 5	807 7 11
Kirton's South	M.L. 127	Northampton ...	2,050 0 0	2,028 12 9	...	730 12 4	1,298 0 5	537 3 10	146 3 0	1,444 3 5
Kirton's South	M.L. 127	Northampton ...	200 0 0	200 0 0	...	...	200 0 0	15 8 5	14 19 9	214 19 9
Kirton's South	M.L. 127	Northampton ...	500 0 0	500 0 0	...	...	500 0 0	8 14 1	46 16 8	546 16 8
Lalla Rookh	112, 786, T.A.10 ...	Marble Bar ...	3,176 1 6	3,176 1 6	...	459 13 11	2,716 7 7	622 10 6	234 3 3	2,950 10 10
Malcolm Prospecting Co.	1175C	Mt. Malcolm ...	1,550 0 0	1,550 0 0	...	15 0 0	1,535 0 0	410 6 10	723 4 9	2,258 4 9
McCahon & Party	... ...	Mt. Ida	400 0 0	400 0 0	...	7 0 0	393 0 0	...	27 14 5	420 14 5
Myrtle Central	3269, 3271 ...	Yilgarn	519 7 4	519 7 4	...	91 11 5	427 15 11	18 8 3	25 17 10	453 13 9
Neta	1011R	Edjudina ...	200 0 0	200 0 0	...	17 11 7	182 8 5	44 19 2	67 12 2	250 0 7
Nevill, A. M.	910	Yalgoo	67 10 0	67 10 0	...	50 19 1	16 10 11	6 3 4	1 13 11	18 4 10
Phoenix	622N	Quinns	250 0 0	250 0 0	...	39 12 0	210 8 0	17 12 1	17 5 11	227 13 11
Randwick	978C	Mt. Malcolm ...	584 14 0	577 3 5	...	54 4 6	522 18 11	...	45 3 5	568 2 4
Red, White & Blue	641B	Curran's Find ...	2,676 9 0	2,676 9 0	...	1,216 5 2	1,460 3 10	856 18 10	121 10 1	1,581 13 11
Rocklee	... ...	Yaloginda ...	350 0 0	350 0 0	...	38 0 0	312 0 0	12 2 0	21 14 1	333 14 1
Ravensthorpe Battery Co.	... ...	Ravensthorpe ...	1,300 0 0	1,038 8 2	...	125 0 0	913 8 2	...	326 1 2	1,239 9 4

MINING DEVELOPMENT EXPENDITURE—*Advances Outstanding 31st December, 1926*—continued.

Name of Lease, Mine, or Borrower.	No. of Lease.	District.	Amount Authorised.	Principal Moneys advanced. Previously to 1926.	Principal Moneys advanced. During 1926.	Principal Moneys. Repaid, including Sale of Securities, etc.	Principal Moneys. Balance outstanding.	Interest. Paid.	Interest. Outstanding.	Total Principal and Interest outstanding at 31st December, 1926.
			£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Springhill Leases	724, 268	Parker's Range	655 16 5	655 16 5	...	559 10 10	96 5 7	590 5 3	2 12 11	98 18 6
Southern Cross Leases	1067Y, 1076Y ...	Bulong	1,000 0 0	1,000 0 0	...	770 15 3	229 4 9	78 9 6	155 11 10	384 16 7
Triplicate	1914	Tuckabianna ...	730 0 0	608 17 7	...	171 13 10	437 3 9	51 0 8	39 14 7	476 18 4
Total	... ...	... ...	...	34,914 15 5	...	6,750 18 9	28,163 16 8	4,520 19 4	4,486 4 9	32,650 1 5
MISCELLANEOUS.										
W.A. Coal Mining Briquetting and Bi-Products Co., Ltd.	... ...	Collie	100 0 0	100 0 0	...	...	100 0 0	...	11 18 6	111 18 6
Duggan, Flynn and Worrington	P.A. 890	Youanmi ...	150 0 0	150 0 0	...	54 11 4	95 8 8	...	...	95 8 8
Ives, Bray & Millett	... ...	Nullagine ...	513 15 0	...	513 15 0	91 3 11	422 11 1	...	25 17 1	448 8 2
Prior, R. G.	... ...	Nullagine ...	498 7 6	498 7 6	...	250 10 0	247 17 6	30 14 1	11 9 7	259 7 1
Total	... ...	... ...	...	748 7 6	513 15 0	396 5 3	865 17 3	30 14 1	49 5 2	915 2 5
D.—BORING.										
Irwin River	... ...	... ...	3,817 5 10	...	...	3,817 5 10	...	...	3,817 5 10	...
Wilga	... ...	... ...	6,037 12 5	...	...	6,037 12 5	...	...	6,037 12 5	...
Golden Mile Ore Channel Extended, Ltd. ...	... ...	Kalgoorlie ...	3,471 11 5	...	...	3,471 11 5	...	...	3,471 11 5	...
A. H. Williams, Boring, "Lady of Lake" ...	... ...	Kalgoorlie ...	1,100 0 0	...	...	1,100 0 0	...	...	1,100 0 0	...
Totals	... ...	... ...	14,426 9 8	...	...	14,426 9 8	...	...	14,426 9 8	...
A.—PIONEER MINING AND PROSPECTING ...	... ...	... ...	...	114,310 1 9	11,870 19 4	11,402 18 5	114,778 2 8	8,136 14 1	9,057 9 3	123,835 11 11
B.—ASSISTANCE ERECTING BATTERIES, ETC.	... ...	... ...	...	34,914 15 5	...	6,750 18 9	28,163 16 8	4,520 19 4	4,486 4 9	32,650 1 5
C.—MISCELLANEOUS	... ...	... ...	...	748 7 6	513 15 0	396 5 3	865 17 3	30 14 1	49 5 2	915 2 5
D.—BORING	... ...	... ...	...	14,426 9 8	...	...	14,426 9 8	...	...	14,426 9 8
Totals	... ...	... ...	...	164,379 14 4	12,384 14 4	18,550 2 5	158,234 6 3	12,688 7 6	13,592 19 2	171,827 5 5

APPENDIX No. 2.

Sundry Reports by T. Blatchford, Esq., B.A., Asistant State Mining Engineer.

These are mostly excerpts from reports on the various mines, to which reference is made, which have been examined in connection with applications for loan assistance under the Mining Development Act. The portions published are such as give information as to the mines which may be of public interest:—

1.—J. A. NICKEL'S MINE, LOGAN'S FIND.
(8/2/1926.)

With Inspector Gourley, I visited this mine on the 6th February, 1926.

It appears that Nickel has found gold values on the surface over a distance of 180 feet, mostly in quartz leaders. He has sunk a winze in the ore channel from a crosscut to a depth of 165 feet from the surface. Owing to difficulties in raising ore, he is now enlarging this winze from the surface, turning it into a main hauling shaft. He has completed this work from the surface to a depth of 75 feet.

The lower workings were not accessible, so we were unable to do any sampling. Nickel will advise the Inspector when he has reached the bottom. He maintains there is a well-defined reef at the bottom carrying good values, but that the ground is too hard for hand labour. At present no action is necessary until he has completed the enlarging of the winze.

2.—O.K. MINE, DUNDAS GOLDFIELD.
(10/3/1926.)

Attached is a sketch plan* of the two winzes which Messrs. Baker and Fuller wish to work. The lode is a narrow quartz reef which up to the present has yielded quite good returns.

There is no doubt that the high gold values occur in rather narrow shoots and are at best erratic.

The present sampling shows the bottom of the east winze, over a length of 40 feet and 15 inches wide, of approximately one ounce, with good values on the west side. The values in the west winze are too erratic to be of much use.

There is no doubt that there is some rich stone which can be won, but the owners consider the ground too hard for hand labour and wish to instal a small steam plant for pulling the dirt and providing air. There are two other winzes which contain payable values (according to the sampling of the Great Boulder Mine), and only require unwatering.

3.—MICA NEAR BULLSBROOK.
(16/3/1926.)

A very limited amount of muscovite mica has been dug out of a shallow hole on the side of a hill some quarter of a mile behind Mr. King's house, which lies 5 miles up from Bullsbrook on the Chittering Brook Road. The unaltered rock from which the mica is derived is not exposed, but there is little doubt that it is a pegmatite. The mica is small, the largest pieces not being more than two inches across. Though some of the plates are clear and faultless, much of the mineral is smoky, and very often the plates are wrinkled. There is no inducement at present for further prospecting, as the indications for a good supply are not nearly so promising as may be found in numerous other localities.

Mr. King also showed me the supposed arsenical pyrites lode. This turned out ot be a very small acid vein passing through the gneiss. Small patches of cubical pyrites were found, but none of the arsenical group. The occurrence does not warrant any further notice.

4.—BORING ON THE RESERVE AT WILLIAMSTOWN, NEAR KALGOORLIE.
(25/3/1926.)

This report shows site for a diamond drill to cut the "Hidden Secret" line of lode at about 1,000 feet, and remarks: "The chances of finding fresh lodes in the bore are remote, but it will be the means of intersecting the country still further west from the bottom of the bore from the Old A.W.U. Lease, and will also pierce country hitherto unprospected."

5.—BORDONI AND PARTY, P.A. 531S.
(25/3/1926.)

I have inspected the above mine in company with Inspector Gourley.

The new shaft has been sunk to a depth of 185 feet about 60 feet south-west of the old shaft. The old shaft is not accessible, neither are any of the surface workings.

I questioned Bordoni closely on his reason for sinking the new shaft. He states that the water was very heavy in the old shaft, and he thought he would get soft country where the new shaft was sunk and could reach a deeper level more cheaply, from which he could open out the lode. He has a very fixed idea that the gold values are steadily improving with depth. Unfortunately he struck a very hard dyke from which came a fairly heavy flow of water. This, coupled with the hard country below the 130ft. level, has made him alter his programme, and he has shown considerable pluck in trying to get down to the 250ft. level before opening out. The pumping plant he has bought from Hunt Bros. consists of a 12 h.p. Tangye engine and top gear for a ram pump capable of throwing some 3,000 gallons. With ordinary use the plant would be sufficient for the purpose.

6.—E. TAYLOR—WAIHI G.M., DAVYHURST.
(25/3/1926.)

With Taylor and Inspector Gourley, I went through the workings of the Waihi to the 100ft. level. Water was just covering the plat at this level. From what we could see it appears that the ore mined came from a series of narrow parallel pipes which cut out at, or no great distance below, the 100ft. level.

The body which Taylor wanted to prospect is close to the main shaft. His idea was that a fault cut the lode off a few feet above the 100ft. level, and he wished to drive and pick up the faulted portion. Taylor failed to convince either of us that the fault existed.

* Not printed.

7.—HANNANS REWARD.
(26/3/1926.)

Messrs. Hunt Bros., owners of the Hannans Reward Mine, report that public crushing has been slack:—

March, 1926—66 tons and 200 tons booked.
February, 1926—170 tons.
January, 1926—90 tons.
December, 1925—410 tons.
November, 1925—173 tons.

They receive no subsidy for this crushing, as many other plants do, but still keep the charges low.

Over 100 tons, 6s. per ton.
20 tons and up to 100, 8s. per ton.
Tailing charges similar to State Batteries.

There is no doubt that this party is assisting what prospecting there is in the North End, and most likely saving the Department the cost of erecting a State Mill there.

They propose to sink a shaft close to their battery bins. Inspector Gourley says there is a big block of ore untouched between the 100 and 200 levels, but does not know the values. The first 100 feet above this block has been mostly opencut and crushed, and further north mined to the 200ft. level and treated with payable results.

The owners maintain that a shaft would be necessary to effect cheap mining costs, and that the tonnage, 100,000 tons, 300ft. x 100ft. x 40 ft., warrants the expenditure. This block could be sampled from the bottom of the 100ft. level, but is not developed below.

8.—FORREST ABBEY G.M.L. 819.
(23/4/1926.)

I visited this mine, which is being held by the Forrest Bros.

Six shafts have been sunk along two lines of quartz reefs. The country rock is a much weathered fine-grained greenstone.

In the most northern shaft (A), sinking is in progress, and the reef is just showing in the bottom of the shaft.

In shaft (B) a quartz vein is visible in the bottom of the shaft, and is 12 inches wide. A sample was taken from the vein and gave the return by assay of 1 oz. 5 dwts. 6 grs. per ton.

The main shaft (C), which is the deepest shaft on the lease, has been sunk to a depth of 46 feet.

At the bottom of the shaft a little driving has been done on a quartz vein, the largest sections of which are from 1ft. 6in. to 1ft. 9in.

The reef shows in the south face, but is cut off in the north by a fault which strikes more or less north and south, and pitches to the south-west. It seems very likely that there is overthrusting to the north-east. Near the shaft the reef forms a sharp bend, but has not actually faulted. Samples (1) were broken from the northern portion and the south face (2), the results of which are as follows: (1) 17 dwts. 18 grs., (2) 13 dwts. 12 grs.

From (D) shaft, the sides have been stoped, and ore raised from three small leaders which are reputed to have produced some highly payable ore.

At shaft (E) a small quartz vein is showing, but has not been prospected to any extent.

Though the veins are small, the returns have yielded quite high values, and are as follows: 131 tons for 139 fine ounces over the plates, and 35 tons of tailings valued at 24 dwts. 17 grs., and 96 tons valued 10 dwts. per ton. When held at P.A. 457, in 1921, 11 tons gave a return of 4 ozs. 13 dwts. 13 grs. by amalgamation, with 19 dwts. 16 grs. of fine gold in the tailings.

From the foregoing figures it is apparent that there has been some rich ore won in the past, but the reefs in all cases are small and faulted.

There is little likelihood of obtaining any appreciable tonnage, and though the mine may be profitably worked by a small party, it would not be suitable for flotation into a company.

9.—LIONEL ASBESTOS.
(23/4/1926.)

I went out to Lionel and found Prior's plant and mines abandoned. On enquiry the reason given was that, being Easter time, all hands had ceased work and gone for a holiday to 20 Mile Sandy. I therefore started for 20 Mile Sandy and met Prior some 6 miles east of Nullagine. As the roads further on were considered practically impassable for cars, we did not continue our journey. Prior was not able to return with us to his mine. He informed me that the prospectors were very satisfied with the prices for the asbestos which had been shipped, and he appreciated the fact that delays in realisation were unavoidable. He, however, emphasised that the average prospector often could not wait for his money, and several had therefore left the field. He suggested that a more liberal advance be made at Marble Bar, and considered that if £10 for the lower grade and £20 for the higher be made, it would most likely bring the old hands back, and may encourage further prospecting by others.

In my opinion we might increase the advances at Marble Bar, subject as usual to the Warden's inspection, to £10 on Rivervale grade, and £20 on the better classes which are sent to London. I had a look over Prior's plant and it had every appearance of being in good running order and repair.

I was unable to inspect the bottom of the mine, as the water had risen. In the old stopes there was some fair asbestos showing, but the mine wants more development.

10.—GOLDEN CEMENT G.M.
(29/4/1926.)

As requested, I made further enquiries with Mr. Bone and the manager, Mr. Willmott, as to the conditions of the Golden Cement Mine at Kanowna. It appears that, knowing Chisholm and party had recovered a lot of payable stone from their workings south of the 300ft. level of the old Reward Mine, the new shaft was set to strike the reef below where the ore was taken out, presuming the water level to be 130 feet. Unfortunately, it was not taken into consideration that the water had been lowered by drainage into the deeper workings of the Reward Mine. This accounts for the shaft striking the old working at the 155ft. level.

Mr. Willmott now wants to continue the shaft to 200 feet and, if the reef proves payable, unwater the new main shaft on the Reward and drive from the south end of the 300ft. level and connect.

In my opinion, the proposition is quite a good one, and far more worthy of support than most. Moreover, the directors of the company have proved really good spenders, and have been doing quite a lot of development work in other mines in Kanowna, without receiving any dividends for years past.

11.—LADY EVELYN MINE, ORA BANDA.

(17/6/1926.)

In company with Inspector Gourley I inspected the mine and took samples where development work is proposed to be carried on. The list of assays is appended.

The samples are very low grade, and taken as a whole are most unpromising. The underlay varies from 38° to 40°.

On the other hand, as practically all the ore has been worked out above the No. 2 level south of the main underlay shaft to No. 2 south shaft, it seems remarkable that better values were not obtained.

The owners wish to equip No. 2 shaft and connect with the intermediate level. They state that to winze and haul the dirt to their present shaft would mean double handling during development, and, in the event of success, the extra expense of equipping the shaft would still be necessary.

In spite of the poverty of the samples it seems improbable that the values have cut out altogether, when it is considered that in the north end they have continued a further depth of three levels.

List of Samples, Lady Evelyn Mine, Ora Banda.

		dwts.	grs.
1.	Across bottom of winze over 2ft. 6in.	1	5
2.	South side of winze over 3ft. 0in. (quartz)	0	3
3.	North side of winze over 1ft. 6in. (quartz)	0	17
4.	Across reef in south end of intermediate drive over 12in.	0	17
5.	Bottom of south face No. 1 south shaft over 3ft. 6in.	0	5
6.	Back of short stope over sample 5 over 3ft. 6in.	0	5
7.	North side of shaft 25 feet below No. 2 level	13	10

12.—LOCATING BORING SITES AT MOUNT MAGNET.

(18/6/1926.)

In company with the local Inspector of Mines, Mr. Deeble, I visited Mount Magnet and interviewed any of the "old hands" I could find who would be likely to give reliable evidence as to the conditions of any of the important mines when work on them ceased. I have now perused the files in the office, and Geological Bulletins of the geological survey, mining statistics, etc. Though considerable useful information has been obtained, the question of locating the most likely boring sites is by no means an easy matter, and I consider the best course is to rely mainly on a report on page 95, 4093/12, written by J. T. Jutson, on the possibilities of boring in the Mount Magnet field, as he was in a better position to form an opinion, for when he made his report many mines were in active operation which he was able to inspect.

In his report, Jutson has classified the gold-bearing ores under three main headings:—

1. Quartz reefs.
2. Quartzite lodes.
3. Fault lodes.

He does not favour quartz reefs for boring, for he points out that the main ones continued to the lower levels, were not faulted, and had every appearance of permanency. He considers the best way to prospect such ore bodies would be to sink and prospect them from the existing workings. In no case were there examples of faulting which would necessitate prospecting by boring. With regard to the quartz reefs, I have made close enquiries about the Morning Star Mine, which is most favourably considered for boring by local people. The mine has been a good producer, and according to the manager's report (page 8, 888/12) still has considerable payable ore developed. The assay plans of the mine which have been lent me by Mr. V. Shallcross show the gold values to be very erratic in occurrence. Mr. Shallcross informs me that such was the history of the mine: very low grade for the most part, and occasional very rich patches. Such occurrences are not very desirable for boring, and as bores, to do any good, would have to be set to intersect the lode at a considerable depth, the proposition in my opinion does not present much inducement for boring, but would be a more likely undertaking for ordinary mining development.

Quartzite Lodes.—With regard to quartzite lodes, Jutson has the opinion in common with most observers as regards the permanency of the gold values. As a rule the payable gold values have been observed to diminish rapidly with depth. On the other hand, this class of lode is seldom developed below the depth to which the surface gold values extend, and as there is still a chance that by boring both the lode and payable gold contents might continue, I consider it would be good prospecting to test one of them to greater depths. We have a very good example of a lode more or less of this class in the Mount Zion or Sirdar Mine. Here quite good values have been followed to a shallow depth and over a considerable width. If boring is to be undertaken in the district, I would recommend boring on this mine in preference to any other, and in consequence attach a plan * showing a suitable position for two bores which should intersect the ore body at a depth of about 300 feet. The bore should be continued a further 50 feet at least, or until the ore channel was cut across from wall to wall.

Fault Lodes.—The rich fault lodes which are such conspicuous gold producers are both irregular and abnormal, and Jutson is of opinion that boring for a continuation of these would not be likely to be of any value. I am of the same opinion.

I therefore recommend that the boring at Mount Magnet be at present confined to two bores on the Mount Zion Mine, the position being set out on the accompanying plan.*

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* Not published.

13.—PROPOSED BORING AT SANDSTONE.
(18/6/1926.)

In the Sandstone district a considerable amount of mining has been carried on, particularly near the Sandstone townsite. Here two mines, the Black Range and Oroya Black Range mine, produced large tonnages of ore of quite a high grade.

Records show that in neither of these mines was ore broken over any extent at a depth commeasurable with the length. The length of workings in the first was 2,700 feet and practically no ore was broken below the 600-feet level, while in the second, ore was broken over a length of 3,000 feet to a depth of only 400 feet.

Both of these mines offer such splendid opportunities for further prospecting that it seems unnecessary to look further afield for the present boring campaign.

Black Range Mine.—The plans and sections show that this mine and the adjoining Black Range West Mine operated extensively to a vertical depth of between 500 and 600 feet. The main shaft of the big mine reached a total depth of 1,100 feet, and short levels were driven south in low grade stone. In an interview with the last underground manager, Mr. Meacham, he informed me that although the gold values were low in these lower workings, there was plenty of stone, some of which might pay to mine if it was cheaply handled. The most important area to prospect, however, is the southern section, where payable stone still exists, and which gives every promise of going down. It appears from his evidence that as the Black Range West possessed the deep ground, prospecting in the south end of the Black Range Mine was stopped, though good values were known to exist in the No. 3 Winze South, which has been sunk 270 feet below the 350ft. level. Eventually the Black Range West Company abandoned their mine on account of being unable to cope with the water, although the bottom (545 feet) level was in good pay ore.

I consider it would be excellent prospecting to sink three bore holes in the positions marked on the accompanying plan.* This would mean prospecting south of the southern jasper bar, which is also shown. The actual bore sites should be fixed by actual survey. Water for boring could be obtained from the main shaft of the Black Range West. The water level is approximately 90 feet. Fresh water for steaming can be obtained from the town supply.

Oroya Black Range.—As the stoping and assay plans show, this mine has been extensively worked to a depth of 400 feet only. Below that level the gold values became so low that the ore became unpayable. It is a phenomenal instance of such a long line of payable reef losing its gold values at such a shallow depth that the possibility of a zone of impoverishment naturally suggests itself. As such zones have been known to occur in other rich mines, *e.g.*, Great Fingall, Great Boulder, etc., and the gold values make again, boring to prospect the Sandstone reef at greater depths appears to me to be quite a reasonable undertaking, and although I certainly recommend boring at the Oroya Black Range in preference, it would, in my opinion, be a pity not to bore for the Sandstone reef also.

Almost anywhere along the dip of the lode would do, provided the site was chosen so that the bore would intersect the lode at, say, 700 feet. As the richest ore was obtained from north of the Doolette shaft it might be preferable to start from that end, and place successive holes (say, three in all) at regular intervals to the south. I have tentatively fixed three sites which should be marked on the ground by actual survey.

The returns from the two mines are shown in the Mining Statistics. Detailed accounts of the two mines may be found in Bulletin 62.

14.—DEVON MINE, LINDEN.
(22/6/1926.)

I have inspected the mine and sampled the portions at the 200ft. level which were accessible. The ore has all been stoped from the 95ft. level to the surface. Unfortunately, the workings north of the main underlay shaft at the 200ft. level were closed with the strippings from the incline shaft which was almost completed to the 200ft. level. It will therefore be necessary for the Inspector of Mines to re-visit the mine and complete the sampling when the north level is again opened. The positions from which the samples were broken are shown on the accompanying section,* and the descriptions are appended.

Where exposed underground, the lode was fairly uniform in width with more or less regular walls. The highest values are apparently in that portion of the ore body where the sulphides predominate. As a rule the sulphides occur in more or less irregular narrow veins which make and break, so the values in the samples are likely to be erratic.

In the South face of the 200ft. level the ore body is well defined, but Mr. Hill tells me the gold values are poor on account of the absence of sulphides. It will be interesting to see when the assay returns come to hand whether his predictions are correct.

The history of the mine above the 95ft. level in the south end is that the ore broken was some of the highest grade in the mine. Driving the 200ft. level south should, therefore, be good development work; also sinking the incline shaft to the 300ft. and opening out a new level is absolutely essential, for at present there is little ore left above the 200ft. level to keep a mill running constantly.

The new shaft (incline) has been stripped to the 200ft. level, and is an excellent piece of mining, being well graded and securely timbered, and should be in working order very shortly.

It is too late to criticise the work of previous managers, but it is necessary to state that the layout of the old plant and the mining in general has, up to the present, been far from good. The present manager seems to be taking a good grip of the whole concern and is setting out with a definite object in view, viz., to lay out any new plant he is erecting so that it will work in with a new treatment plant which he hopes to be able to erect after his mine is developed further. In the meantime he is altering the old plant, so that it will at least work continuously and as inexpensively as possible, which is by no means an easy undertaking. Summing the situation up, it appears that, provided the gold values are in the mine, the present management will prove quite satisfactory. The following is a list of the existing plant:—

65 H.P. Hornsby producer gas engine.
5 head Fraser and Chalmer stamp mill (1,250lbs. stamps erected).
10 head (stamps on the ground—all timber of 10 head useless).
1 Forward Down pan in good order.

* Not published.

1 Sandycroft breaker, 22in. jaws, in good order.
1 belt driven Ingersoll Rand Compressor 3 drill, 350 cubic feet air per minute.
1 new 100 H.P. Crossley variable type producer gas engine.
1 30 H.P. Commonwealth producer.
1 3-hearth Merton roasting furnace.
5 rabbles, capacity 25 tons per 24 hours.
4 wooden cyanide vats, 3 33-tons capacity, 1 25-ton capacity.

There are numerous pieces of scrap machinery lying about which would be practically valueless.

DESCRIPTION OF SAMPLES.

No.		ozs.	dwt.	grs.
1	South face 200 feet level, Hangingwall over 2ft. 3in.	0	1	12
2	South face 200 feet level, Footwall over 2ft. 3in.	0	0	10
3	9 feet north of south face over 3ft. 3in.	0	10	14
4	South brow of winze 17ft. North of South face over 2ft. 6in. ...	3	14	15
5	30ft. north of south face Footwall over 2ft. 6in.	0	0	10
6	30ft. north of south face Hangingwall over 2ft. 6in.	0	0	10
7	5ft. south of incline shaft over 4ft. 0in.	0	6	18
8	10ft. south of No. 7 over 3ft. 6in. ...	1	12	1
9	10ft. south of No. 8 over 3ft. 6in. ...	0	13	12
10	17ft. south of No. 9 over 3ft. 6in. ...	0	19	9
11	10ft. south of No. 10 over 3ft. 6in. ...	0	19	14
12	10ft. south of No. 11 over 3ft. 6in. ...	0	4	1
13	10ft. south of No. 12 over 3ft. 6in. ...	0	8	12
14	South side Gernson's winze over 2ft. 6in., 15ft. above No. 2 Level ...	0	0	14
15	13ft. above No. 14 over 3ft. 6in. ...	4	14	8
16	North side of winze 45ft. above No. 2 Level over 4ft. 6in. ...	2	11	14
17	South side winze 10ft. above No. 15 over 4ft.	2	3	16
18	6ft. above No. 17 over 2ft. 6in. ...	0	19	17
19	North Stope north end Hangingwall over No. 2 Pass over 2ft. 6in. ...	0	1	7
20	Footwall section of No. 19 (mullock ?) over 2ft.	0	0	10
21	10ft. above No. 19 and 20 Hangingwall over 2ft.	0	10	11
22	10ft. above No. 19 Footwall over 2ft.	0	0	5
23	Top of end of Stope 7ft. above 21 and 22, over 2ft. 6in.	0	1	21
24	10ft. south of face across back of stope over 2ft. 6in.	2	2	19
25	10ft. south of No. 24 over 3ft. 0in.	0	14	17
26	10ft. south of No. 25 over 3ft. 0in.	1	16	6
27	10ft. south of No. 26 over 3ft. 0in.	0	3	9
28	10ft. south of No. 27 over 2ft. 3in.	1	11	21
29	Brow of stope north side of shaft 3ft. 0in.	0	1	23

Note.—North stope 40ft. above No. 2 level, 60ft. from shaft to north end of stope.

15.—BORING AT CUE.

(22/6/1926.)

I visited Cue with Inspector Deeble and collected what evidence I could gather from local authorities on previous mining and boring.

Since my return I have read through the office files and Geological Bulletins.

I also called on the manager of Bewick, Moreing, at Kalgoorlie, and he showed me the correspondence in connection with the boring carried out by the Great Fingal Company at Day Dawn.

It appears when all the evidence is sifted that although a considerable number of bores have been put down both at Day Dawn and Cue, the results as a whole have proved unsatisfactory, and although in two instances at least payable stone was struck no further action was taken in the form of shaft sinking etc., to follow up the discovery.

The following are the records of the two bores which struck reported payable gold values.

At the corner of Austin and Robinson Streets in Cue, near the Fire Brigade Station, a bore 876 feet deep was, according to the *Murchison Times,* completed in August, 1907. The report sent to London reads as follows:—

"Struck sulphide ore Tindal's Gold Mine No. 1 hole, cable drill hole struck ore body 10 feet wide at 500 feet assaying 21 dwts."

A second cable reads as follows:—

"No. 2, 200 feet north of above, 1,000 feet, passed through ore body at 500 feet."

No values are mentioned as regards the second hole.

On Volunteer Flat a vein was cut by a bore at a depth of 760 feet vertical. This vein was quartz 18 inches thick, the last six inches assaying 5ozs. 12 dwts., *vide* file 53/03, p. 55. No further action was taken to exploit this discovery.

If it is definitely decided to bore in the vicinity of Cue, the best sites I can suggest are near the two holes in which payable lodes have already been discovered by the previous boring. Before this work is undertaken it might be possible to open up the old holes, clean them out, and first test the values by using a deflection plug, and obtaining a second sample. It is not possible to say at present whether this is possible, as the holes may be too far gone to be cleared, but it would, in my opinion, be worth a trial.

On the other hand, there is a mine at Reedy's, "The Emu Lease," which is struggling hard to keep working, and which might benefit very greatly by being bored at greater depths than the present workings. This mine, when I saw it, impressed me as one with a promising future if it could be better equipped at the surface and underground development continued. The manager told me that, much as he would like to exploit the sulphide zone by boring, it would be impossible for him to find the necessary capital; on the other hand, if three bores were put down to tap the lode at, say, 300 feet (1,000 feet of boring in all) and the gold values were maintained, there would be a good chance of raising more capital to instal a new treatment plant, and continue sinking the new main shaft.

As an alternative scheme to the two bores suggested in Cue, I would therefore recommend that three bores be put down on the Emu Lease at regular intervals, to test the sulphide zone at 300 feet.

16.—OIL BORING AT POOLE RANGE.

Report on the Poole Range, with special reference to choosing a site for deep boring, is included in Geological Survey Bulletin No. 93, as Appendix No. 11, pages 49, 50, and 51.

17.—SHERLOCK ASBESTOS GREENHILL REWARD M.L. 215.

(8/10/1926.)

According to your instructions, I got in touch with Mr. Phillipson, and inspected the workings and developments on the Greenhill Reward lease since Mr. Wilson's inspection in 1921. Mr. Wilson's report is on page 114 of the Annual Report of the Department of Mines for 1921. As he has dealt fully with the geology and general features of the deposit, no further reference is necessary here, and my report will be on the new workings only, which consist of four shafts marked 1-4 on a copy of Mr. Wilson's plan.

No. 1 *Shaft.*—The vertical depth of this shaft is 52 ft., and a vein of asbestic rock is exposed from near the surface to the bottom of the shaft. The vein varies in width from 1-2 feet, and though it would produce a certain amount of marketable asbestos both by hand picking or crushing, the percentage of payable material likely to be obtained would not, in my opinion, warrant further development.

No. 2 *Shaft.*—This shaft has also been sunk on a vein similar to that found in No. 1 shaft to a depth of 32 feet. By hand picking a limited amount of pay rock could no doubt also be obtained here, but likewise at too great a cost.

No. 3 *Shaft.*—More development work has been done in this shaft than in any of the others. It has a vertical depth of 53ft., and been opened up by two drives 12ft. south and 20ft. north from the 47ft level. The width of asbestic rock varies from 2ft. 6in. to 5ft.; a little long fibre occurs irregularly on the eastern wall, but the rest of the vein is hard, and only limited portions will produce marketable fibre.

To ascertain to what degree the vein would produce fibre a sample was broken across the south face over 3 feet (No. 1), and (No. 2) across the back of the north drive over 3ft. 6in., some 10 feet from the north face. A section was also broken across the lode at the shaft over 4ft. 6in., and the sample divided into two.

No. 3—over 1ft. 6in., western section.

No. 4—over 3ft., eastern section.

All four samples were treated, the results of treatment showing in the report hereunder.

I went with Mr. Phillipson to the asbestos company's works at Rivervale, and interviewed the manager, Mr. Henderson, discussing with him the value of the products obtained from the samples. He pointed out that the fibre from the best sample (No. 3) was very much weaker than the African or Lionel product; furthermore, that after pulping the Sherlock fibre was liable to choke the screens on the main rollers in the plant, and though he would buy limited quantities—not more than 2 to 3 tons per month—he could not promise to take more than that amount each month. As the quantity of the longer fibre which could be hand picked is too small, it looks as if the lode in No. 3 shaft is an unpayable proposition, unless a considerable improvement in quality occurs in the vein either at a greater depth or by driving north or south.

As the same quality of asbestic rock is found in No. 4 shaft, which is sunk on the same vein some 72 feet further to the north-east, the prospect of obtaining marketable fibre seems very remote, and it would be preferable, if further prospecting is intended, to confine the operations to some of the larger veins containing a better class fibre already described in Mr. Wilson's report.

P.S.—Since writing the foregoing, I have seen Mr. Reid, the General Manager of the Asbestos Company in the East, and he has promised to have further experiments carried out on the parcel of Sherlock rock now lying at the Rivervale works. When these are completed, he promised to advise us and Mr. Phillipson as to whether he can possibly offer a fixed price for similar material.

Grading Tests of Four Samples of Asbestos Ore.
(1/10/1926.)

The four samples of asbestos ore from Sherlock submitted have been graded according to the method laid down in "Marketing of Metals and Minerals," by Spurr and Wormser, yielding the following figures.

The ore was crushed through rolls and screened on 2-mesh, 4-mesh, and 8-mesh sieves and shaken for two minutes at 300 revolutions per minute.

No.	Mark.	Grade.			
		> 2 mesh.	> 4 mesh.	> 8 mesh.	< 8 mesh.
		Ounces per lb.			
2614/26 No. 1	... ...	0	Trace	1/4	15¾
2615 No. 2	... ...	0	0	1	15
2616 No. 3	Lode Asbestos	0	3	8	5
2617 No. 4	Lode Rock ...	0	0	2	14

EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

18.—JIMBLE BAR SOUTH EXTENDED G.M.L. 36H.

(13/10/1926.)

Practically no work has been done on this lease since Mr. Wilson reported.

In the shallow costeans in the northern end of the lease payable gold values were proved to exist, but on the whole the sampling was not too satisfactory in this respect.

In addition to Mr. Wilson's sampling, I broke three samples, each over 3 ft., at a spot some 120 feet from the northern boundary of the lease, and across the line of lode coming through from the Jimble Bar South.

The result of these samples was as follows:—

Western Section over 3 ft., 8 dwts. 17 grs.

Central Section over 3 ft., 2 dwts 21 grs.

Eastern Section over 3 ft., 12 dwts. 4 grs.

The owners propose to sink a shaft 40 ft. deep and intersect the formation carrying these values, then drive 20 feet each way. Or, in the event of not cutting values in the shaft, to crosscut and deduct the footage from the 40 ft. set aside for driving.

19.—JIMBLE BAR SOUTH G.M.

(16/10/1926.)

It is proposed to sink two shafts, presumably on G.M.L. 33H, to a depth of 80 feet, or the equivalent footage in driving or crosscutting. The intention is to sink one shaft on G.M.L. 33H and a second one on G.M.L. 36H. Both leases belong to the same party.

Jimble Bar South G.M.L. 33H.

Very little work has been done on this lease. A prospecting shaft, situated 75 feet from the north boundary and about midway between the east and west boundary, has been sunk to a vertical depth of 34 feet.

A costean lying to the west of the shaft exposes lode material which gave an assay value of 8 dwts. 1 gr. over a width of 5 feet. This lode is underlying towards the shaft, and should be intersected by the latter at a depth of from 40 to 50 feet. The owners wish to go on sinking to that depth, and if they strike the lode, drive 20ft. each way, or, if necessary, crosscut first and then drive.

The shaft is well situated, and the intended work would be excellent prospecting.

20.—JIMBLE BAR FIELD.

(16/10/1926.)

Acting on official instructions received at Port Hedland, I visited Jimble Bar and made a general inspection of the field. Apparently the main points at issue are:—

1. To what extent the development of the field had advanced since Mr. Wilson's report, and particularly whether the gold values were surface enrichments, or had been proved to continue to appreciable depths.

2. Whether the expenditure of £300 to improve the road through Sylvania was warranted.

3. Whether financial assistance should be given to the owners of the Jimble Bar South and Jimble Bar South Extended to sink shafts and develop their lodes at depth.

1. Since Mr. Wilson's report in May last there has not been very much prospecting work done, the reason being partly that some of the leases were held under option and work was thereby delayed, and partly that owing to the inaccessibility of the field from crushing facilities some of the parties spent much time in loaming, etc., to try and find ore which they could treat by hand, and thus finance themselves.

Prospecting has also probably stagnated to a considerable degree through an unfavourable report by a representative of Eastern capital. It is reported locally that his reason for forming an unfavourable impression of the field was largely due to the surface gold values falling away in the south shaft of the Jimble Bar lease, which at the time was the deepest working on the field. Since his departure, however, the prospectors on this lease continued sinking the shaft, and the request for a Government officer to make a second report was mainly due to their considering that the gold values at the bottom of the shaft (40 ft.) were sufficiently high to disprove the idea that the gold was merely a surface enrichment. Be this as it may, at their request I sampled both walls at the bottom of the shaft, and also 4 feet higher up the shaft where the owners maintained the gold values had started to improve. A drill hole was also put into the hanging wall for a distance of 2 feet, each foot of drilling being sampled separately. The following are the assay results of these samples:—

Sample No.	Description.	Assay value.
		dwt. grs.
7	Bottom of shaft across north end over 3ft.	18 22
9	„ „ „ south „ 4ft.	19 7
8	Four feet up shaft across north end over 3ft.	7 2
10	Four feet up shaft across south end over 2ft.	2 18
11	Drillings from first foot	18 0
12	„ „ second foot	0 21

The results obtained undoubtedly confirm the opinion of the prospectors that payable gold exists at a depth of at least 40 feet below the surface, and that for a width of 4ft. 6in. the average gold content is 19 dwts. Whether these values will continue, and whether the width of the gold-bearing lode material is wider, can alone be determined by further sinking, crosscutting, and driving.

A costean, cut since Mr. Wilson reported, 20 feet south of the south shaft was sampled over 12 feet with the following result: eastern section over 6 ft., 1 oz. 9 dwts. 19 grs.; western section over 6 ft., 1 oz. 11 dwts. 8 grs. These results are also very encouraging, and confirm those previously obtained from the costeans further north.

Referring to the field generally, some small but extremely rich veins have been found and mined by Gee and party on the south end of the leases, 61 ounces of gold being dollied by them from a very small quantity of stone. About 1½ miles north-west from the main camp Slavin and his mate have discovered a quartz vein which, though only a few inches thick, also carries high gold values.

Two or three other parties were finding gold-bearing floaters in this vicinity, but had not located the parent reefs.

These discoveries in the north end are important in that they prove the existence of gold-bearing material away from the main line, and offer inducement for more extensive prospecting. The future of the field, however, will largely depend on whether the values found on the surface workings represent short shoots such as are found in similar formations in centres like Boogardie and Tuckabianna, or whether they represent payable lodes of considerable length. This can only be proved by sinking and driving, and in my opinion the surface values undoubtedly warrant such.

2. Whether the expenditure of £300 to improve the road through Sylvania is warranted naturally depends on the prospects of the field. As far as can be seen as present, there seems quite a reasonable chance that payable gold in quantity will be eventually found if prospecting is continued. Up to the present, however, no definite tonnage has been exposed, and will not be until there is considerable further development.

A fair road exists between the field and the No. 43 well on the Marble Bar-Meekatharra Road. The length of this road is 9 miles, but the motor trucks apparently require extra payment to bring in mails and loading from their usual route. The prospectors affirm that to send in themselves entails a loss of time of two days for one man and horse weekly.

If the road past Sylvania, which is 13 miles distant, was repaired the trucks would come through weekly without extra charge, and the distance from Meekatharra would be slightly lessened.

If developments had been advanced a little more, and had proved satisfactory, I would have had no hesitation in recommending the expenditure necessary to repair the road, but at present it appears to me to be more reasonable to wait until further work is done.

21.—GLENELG HILLS.
(29/10/1926.)

Acting under your instructions, I visited and inspected the Glenelg Hills area with special reference to the following:—

(1) The desirability of clearing a road from—
- (a) Polson's battery,
- (b) Donovan's Find (Howlett's battery),
- (c) Southern Cross,
- (d) Parker's Road.

(2) The withholding for mining purposes of a group of blocks surveyed on the western side of the rabbit-proof fence for agricultural purposes between the 50 and 60 mile posts.

Roads.—Two quite good roads connect the new field to the railways: one *via* Narembeen, the second to Burracoppin *via* the rabbit-proof fence. In my opinion these roads are sufficient for present requirements, and are the shortest routes unless the Merredin-Narembeen railway be cut at Gramphorne or Wogarl, which would shorten the distance to Narembeen considerably. A regular motor truck service has already been started from Burracoppin, and food-stuffs are taken out regularly twice a week.

The question as to which is the best road to open for ore transport is not quite so apparent. Polson's battery is the closest by some 10 miles, but objections have been raised—
- (a) that the battery water supply is limited,
- (b) the battery is not equipped with a cyanide plant,
- (c) the absence of transport.

Battery Water.—At present there is no evidence that large quantities of ore will be available for crushing. In fact, the managers of the most important shows assured me they had no intention of crushing large quantities of ore at outside mills, but that their intention was to develop their mines and appraise the values by sampling; if successful, plants would be erected on the spot.

Polson's have sufficient water to crush 500 tons per month, which should be ample.

Transport.—Howlett possesses horses and drays for transport. I do not think these can compete against motor trucks. The parcel from Hollow's which was lately sent to Narembeen cost 1s. per ton per mile, and the quote for the next parcel is 9d. per ton per mile.

There should be no trouble in making a good motor track to Polson's, for the track as far as Skeleton Rocks (from Polson's end) is good country for motor transport. Howlett's crushing charges might be slightly lower, but the extra carting charges would more than neutralise this advantage.

Both Howlett and Polson Bros. have excellent reputations as battery men, and their integrity is unquestionable.

Finally, the route to Polson's would cross the southern end of the greenstone belt in which the new discoveries have been made, and a cleared track might stimulate prospecting in the south end of the field.

If it is decided to make a road to a battery, I certainly favour Polson's, for the reasons stated above.

22.—RAGGED HILL G.M.
(12/11/1926.)

In accordance with your instructions received on my arrival at Port Hedland, I inspected the further work of Mr. Thomson's Syndicate at Braeside.

Ragged Hill, South Shaft.—This shaft had reached a total depth of 113 feet and followed the course of the lode from the surface. At the bottom of the shaft both walls had been fired out, exposing a face of a total width of 14 feet. Three samples were broken across the face as follows:—

No. 1. From East wall over a distance of five feet towards the west. This assayed: Lead, 1.35 per cent.; Silver, 3 dwts. 16 grains per ton.

No. 2. Central section over five feet: Lead, 50.24 per cent. Silver, 7 ozs. 1 dwt. 13 grains per ton.

No. 3. From east end of central section to west wall: Lead, 10.81 per cent.; Silver, 18 dwts. 22 grains per ton.

No. 1 sample was disappointing, and I expected a higher result as there appeared to be quite an appreciable amount of galena scattered through the wall rock, which is no doubt a vesicular lava.

No. 2 section shows a high grade galena ore with still a little carbonate. The silica has diminished considerably, and when the carbonates vanish the grade of this section of the lode should rise appreciably.

The western section is a mixture of lode stuff and wall rock charged with veins of galena. The return of 10.81 per cent. lead is distinctly encouraging.

I was very disappointed that the eastern crosscut had not been extended for 40 to 50 feet.

On the surface the lode on which the shaft has been sunk does not give much more promise of carrying lead values than the other large quartz veins lying some 40 to 50 feet to the east. There appears to me quite a reasonable chance, therefore, that if these eastern veins were cut at depth they might be found to carry payable ore. I have discussed this matter with Mr. Thomson, and he intends crosscutting in the near future.

Two samples from the north shaft at a depth of 50 feet gave the following results:—

No. 1. Eastern section over five feet: Lead, 26.46 per cent.; Silver, 1 oz. 8 dwts. 2 grains per ton.

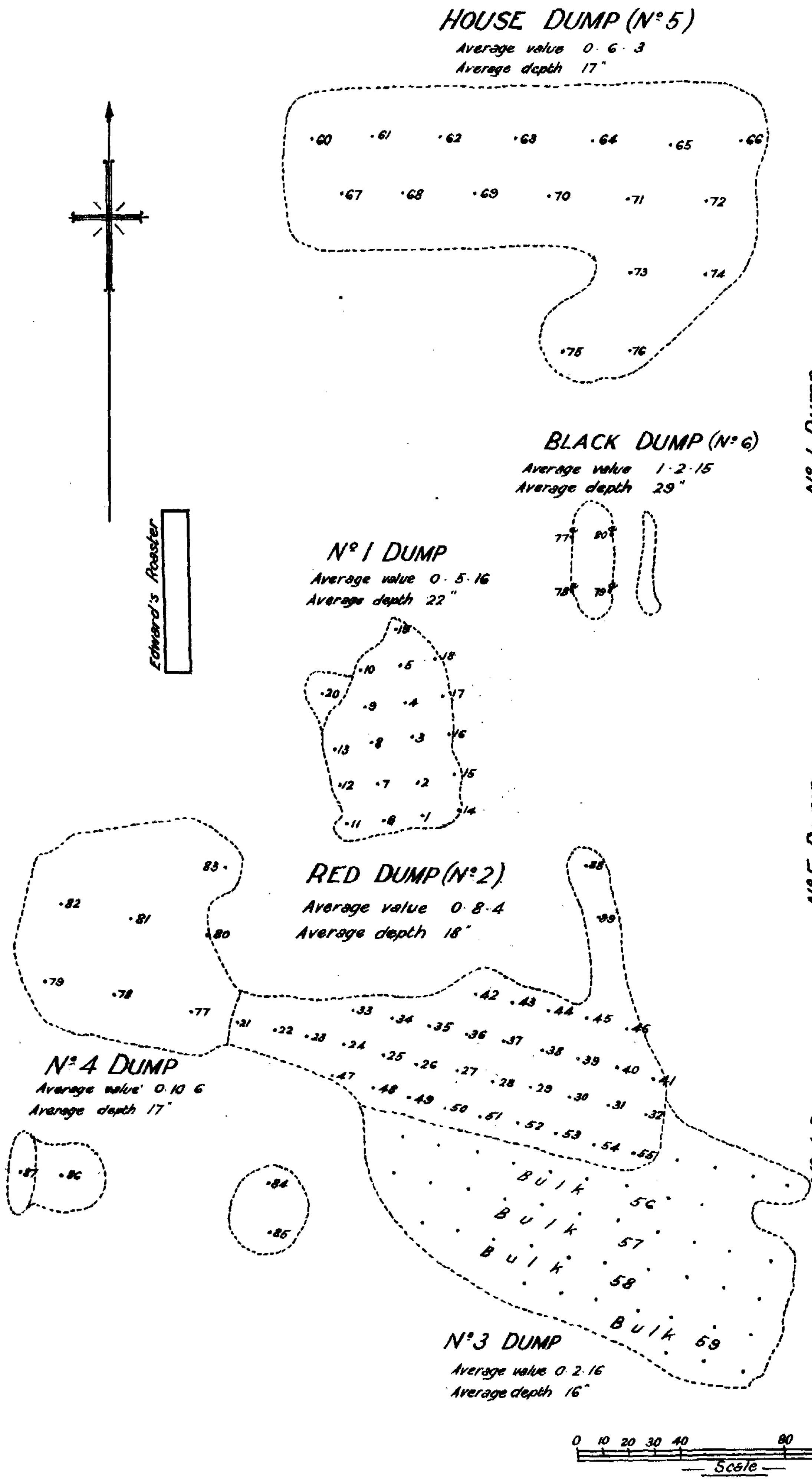
No. 2. Western section over 3ft. 6in.: Lead, 19.23 per cent.; Silver, 1 oz. 19 dwts. 5 grains per ton.

The lode at this depth is still much carbonated, but galena is coming in rapidly, and the lead contents should increase with depth until the carbonates are wholly replaced.

The prospecting urgently needed at Ragged Hill is the sinking of the two shafts until the oxidised ore completely vanishes, crosscuts from wall to wall, and a considerable amount of driving on any lode or lodes found in the crosscuts.

— MENZIES CONSOLIDATED G.M. —

— Cyanided Concentrate Dumps —



Samples

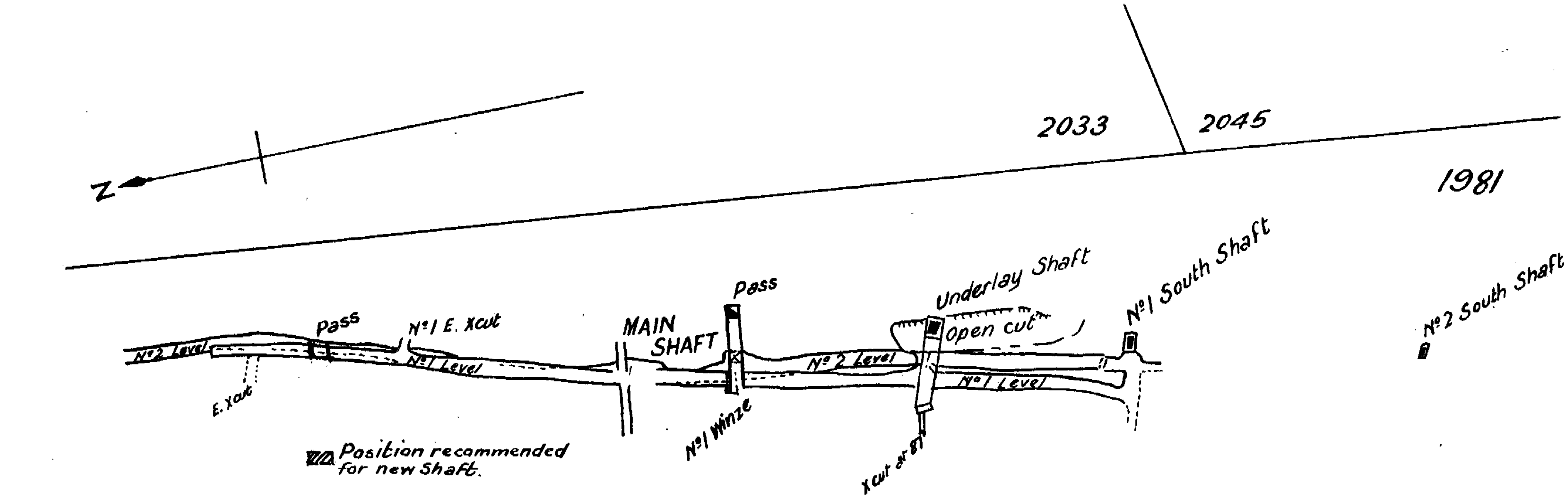
Dump	N°	Width	Value
N° 1 Dump	1	24"	0·7·20
	2	26"	0·1·18
	3	12"	0·4·1
	4	15"	0·3·9
	5	18"	0·5·9
	6	24"	0·10·11
	7	26"	0·1·21
	8	24"	0·2·9
	9	20"	0·1·18
	10	20"	0·1·18
	11	12"	0·12·2
	12	20"	0·13·16
	13	24"	0·0·14
	14	30"	0·15·11
	15	15"	0·0·17
	16	18"	0·2·12
	17	18"	0·1·12
	18	14"	0·3·11
	19	27"	0·4·22
	20	18"	0·17·20
N° 5 Dump	60	28"	0·6·3
	61	25"	0·4·3
	62	12"	0·6·13
	63	12"	0·12·7
	64	12"	0·4·19
	65	15"	0·4·17
	66	18"	0·2·18
	67	21"	0·5·16
	68	18"	0·12·12
	69	15"	0·6·18
	70	20"	0·3·9
	71	14"	0·3·1
	72	15"	0·3·6
	73	12"	0·9·6
	74	12"	0·6·18
	75	20"	0·5·21
	76	18"	0·6·16
N° 4 Dump	77	12"	1·11·11
	78	12"	0·2·12
	79	18"	0·5·14
	80	28"	0·8·7
	81	18"	0·5·21
	82	18"	0·12·2
	83	12"	0·6·3
	84	16"	0·6·13
	85	14"	0·5·21
	86	18"	0·6·13
	87	29"	0·5·21

Samples

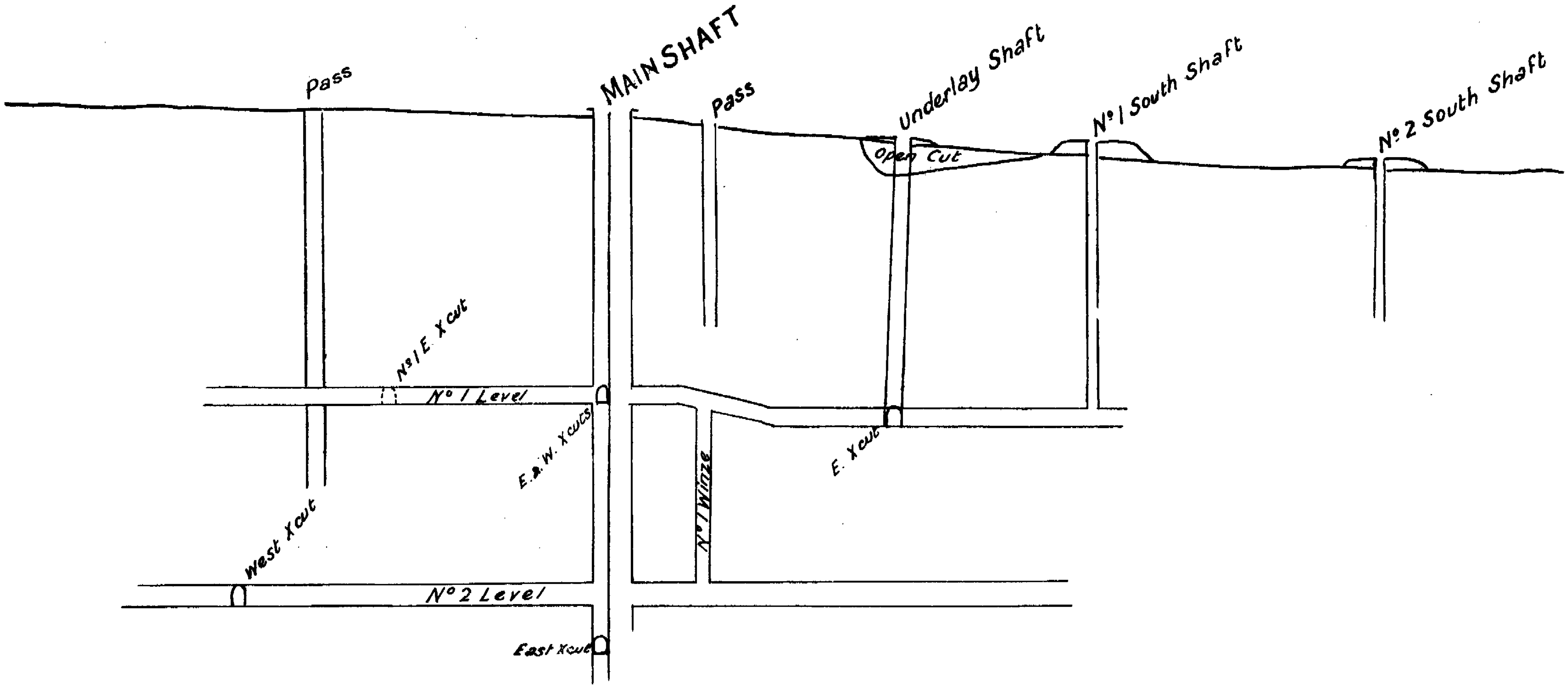
Dump	N°	Width	Value
N° 2 Dump (Red Dump)	21	6"	0·8·20
	22	18"	0 7 13
	23	18"	0 5 9
	24	12"	0 5 19
	25	15"	0 6 23
	26	15"	0 10 14
	27	16"	0 5 16
	28	16"	0 11 5
	29	18"	0 6 23
	30	18"	0 7 3
	31	18"	0 9 17
	32	12"	0 9 7
	33	24"	0 6 13
	34	24"	0 6 13
	35	24"	0 15 19
	36	18"	0 9 7
	37	20"	0 7 3
	38	24"	0 7 15
	39	24"	0 8 12
	40	27"	0 6 16
	41	15"	0 7 3
	42	18"	0 7 15
	43	20"	0 4 23
	44	24"	0 6 23
	45	24"	0 9 0
	46	15"	0 6 3
	47	12"	0 3 6
	48	15"	0 5 19
	49	18"	0 8 14
	50	20"	0 5 14
	51	18"	0 7 10
	52	14"	0 7 3
	53	14"	0 8 10
	54	12"	0 6 0
	55	12"	0 7 3
	88	20"	0 18 17
	89	18"	0 18 10
N° 3 Dump	56	13"	0 3 16
	57	15"	0 2 9
	58	18"	0 1 16
	59	17"	0 3 1
N° 6 Dump	77a	34"	1 5 17
	78a	28"	1 11 1
	79a	28"	0 19 11
	80a	28"	0 14 7

— MARAROA G.M. C° —

— Scale:- 457 ft = 1 inch —



— Plan of Workings —



— Longitudinal Section —

APPENDIX No. 3.

SUNDRY REPORTS BY R. C. WILSON, ESQ., B.Sc., B.E., ASSISTANT STATE MINING ENGINEER.

These are mostly excerpts from reports on the various mines to which reference is made which have been examined in connection with applications for loan assistance under the Mining Development Act. The portions published are such as give information as to the mines which may be of public interest:—

1.—MENZIES CONSOLIDATED G.M. (14/1/1926.)

As instructed, I visited this mine on 31st December and 1st January last, and looked into the general position. I also sampled the dumps of cyanided concentrates which are now being roasted and cyanided again.

The present unsatisfactory position is owing, in the first place, to the capacity of the roaster only being 16 tons per day, instead of 25 to 30 tons as specified by the contractors, and, in the second place, to the values in the concentrates being over-estimated. The company will be unable to make enough profit to pay their proportion of the cost of the proposed further development of the mine. Very little, if any, profit seems likely to be made.

Details of my sampling results are given on the plan attached.

The heaps of concentrates were very scattered, and consequently difficult to sample and measure. My results show that a tonnage of about 2,000 tons, averaging 8dwts. or 34s. per ton, is all that can be relied upon.

The loss of weight on roasting is roughly 10 per cent., so that the value of the roasted ore may be expected to be higher by this amount, making its value 37.4s. per ton.

Assuming the roaster to put out 16 tons of roasted ore per day, having an extractable value of 29s. per ton, a month's operations might be somewhat as follows:—

16 tons x 30 days = 480 tons; 29s. extractable value; £696 gold won.

The present expenses are a little over £700 per month, so that a small loss would result. Consequently, unless expenses can be reduced, only the best of the concentrate will pay to treat.

The roaster is a simplex Edwards roaster with 15 rabbles and a hearth area of 58ft. x 6ft., or 348 square feet (as nearly as I could measure it while the roaster was operating).

On page 132 of "Westralian Metallurgical Practice," published by the Chamber of Mines of Western Australia, it is stated that three Edwards roasting furnaces on the Lake View Consols Mine, each of hearth area of 345 square feet, had a capacity of 12 tons of concentrates per 24 hours.

In evidence before the recent Royal Commission Mr. Blackett gave the capacity of a 32 rabble duplex roaster 67ft. x 11ft. on the Horseshoe Mine as 20 tons per day of concentrates containing 14 per cent. of moisture.

It will thus be seen that it is unreasonable to expect the smaller simplex roaster to treat anything approaching 25 to 30 tons of concentrates a day.

The mine looks very encouraging at the bottom, but, as will be noted by reference to Mines File 212/24, page 187, an estimated amount of £19,500 will require to be expended on development and alterations to plant before the mine can be put upon a profitable basis, being as follows:—

	£
Development, first six months	6,000
Other expenses during same period ..	500
Alterations to plant four months after six months' development	8,000
Mine development during three of above four months	3,000
Contingencies	2,000
Total	£19,500

The company is now without funds and has replied to a cable that there is no possibility of raising any.

It has now put forward a proposal that the Department finance the whole of the £6,000 necessary to do six months' development work.

Three courses of action are open to be taken—

(1) To refuse the application and allow the mine to be abandoned.
(2) To grant the application.
(3) To take over the mine and develop it departmentally.

Under ordinary circumstances, I would recommend that the application be refused and let matters take their course.

In the present instance we have to remember that, owing to the unusually soft nature of the walls, if the mine is allowed to fill with water, the workings will probably collapse to such an extent that it will be impracticable to ever re-open it.

At the bottom level, No. 21 (vertical depth 2,051 feet), the reef averages 15.7 dwts. per ton in value and 41 inches in width for a length of 458 feet. Owing to the fact that the machinery and plant are obsolete and costly to work, this ore cannot be profitably taken out and there is insufficient ore proved to warrant the expenditure necessary to put the plant in order.

If the mine was further developed and it proved to be as good below the No. 21 level as at this level the necessary alterations to plant to make it efficient would, I consider, be justified and the mine would continue to be a producer.

2.—THE MARAROA G.M. CO., LTD., G.M.L. 1981, "EMU NORTH." (25/1/1926.)

As instructed, I visited the property on 20th January, 1926.

A general description of the mine is given in my previous report of September, 1924. (*See* Annual Report—Department of Mines, 1924, page 57.)

Development.—It will be noted that at the 100 feet level a shoot of ore 255 feet in length, 50s. per ton in value, and 39 inches in width had at that time been proved and that at the bottom level (170 feet) 80 feet of driving had been done averaging 41.6s.

per ton for a width of 49 inches. Since that date this level (170 feet) has been driven a distance of 255 feet north of the present main shaft and 185 feet south, or a total distance of 440 feet. Mr. Mathers states that for this whole length the lode will average 48s. per ton in value and 8 feet in width.

Ore Treated.	Value per ton shillings
2,017 tons milled for £2,149 2s. 10d. by amalgamation	21·3
1,472 tons of tailings cyanided for £2,015 3s. 7d....	27·3
Value per ton extracted ...	48·6
Residue (approximate)	2·0
Total value per ton	50·6

Haulage.—At present the ore is hauled to the surface by means of a bucket or kibble in a small shaft (about 6 feet by 3 feet). It is dumped at the surface, shovelled into drays and carted to the five-head battery on the adjoining Emu Lease No. 1977. This arrangement must be both slow and costly, and a new shaft is certainly required.

There is a pass sunk in the lode 100 feet north of the present main shaft, and Mr. Mathers suggested verbally that this might be stripped and converted into a new main shaft.

I am not altogether in favour of this proposal, as the shaft would be liable to get crushed out of shape unless a good large pillar of ore were left on each side.

I think that it would be better to sink the new shaft off the lode at a point about 30 feet west of this pass.

Plant.—There is a small plant on the Emu South Lease consisting of a five-head battery and some cyanide vats in which sand and slimes are treated together. I understand that Mr. Mathers is endeavouring to get his company to put up a new plant.

Our returns show that 600 tons is the largest tonnage treated in one month.

General Remarks and Recommendation.—On the information supplied, this is a very promising mine, and should be a regular producer making substantial profits.

A properly equipped shaft and new plant alongside the shaft are badly needed.

I consider that the shaft should be sunk in country about 30 feet west of the lode.

3.—NEW FIND AT SYLVANIA.
(19/5/1926.)

Acting on official instructions, I visited this find and have to report as follows:—

LOCATION.

Its approximate position is 27 miles north of Mundi Windi, 13 miles north-east of Sylvania Homestead and nine miles west of No. 23 Well, on the main road from Meekatharra to Marble Bar.

GEOLOGY.

By reference to the Geological Plan of this District, published in Geological Bulletin No. 83 by H. W. B. Talbot (a portion of which is here reproduced), it will be seen that this find is situated near the Eastern boundary of a belt of greenstone, known as the Coobina Belt, which runs east and west for a distance of at least 90 miles and has an average width of about 10 miles.

This greenstone belt is bounded on the east and part of the south by granite and in the remaining sides by the Nullagine Beds, which apparently are of no great thickness in this vicinity, as in a number of places small patches of the underlying granites and greenstones are showing.

The rocks comprising this belt have been described by Mr. R. A. Farquharson as follows:—

(a) Serpentine: Probably either a pyroxenite or a highly pyroxenic facies of a peridotite.

(b) Sheared ferruginous extremely clayey rocks which, though too much altered for accurate determination, may have been sheared greenstone schists.

(c) Dark green, fine-grained altered amphibolised and zoisitised dolerite.

Note: Mr. Farquharson describes one of the specimens as a medium-grained, greyish-green rock, rather similar in appearance to some of the saussuritised epidiorites from Kalgoorlie and Meekatharra.

(d) In addition to the type of rock just mentioned, indubitable dykes of altered ophitic dolerite also occur in the belt. Of these (13955) and (13967) are typical specimens, the former an extremely chloritised and zoisitised ophitic dolerite, and the latter a partially chloritised uralitised and zoisitised micro-pegmatitic quartz dolerite. As these two rocks are considered to belong to the latter series of rocks they will be described as members of that series.

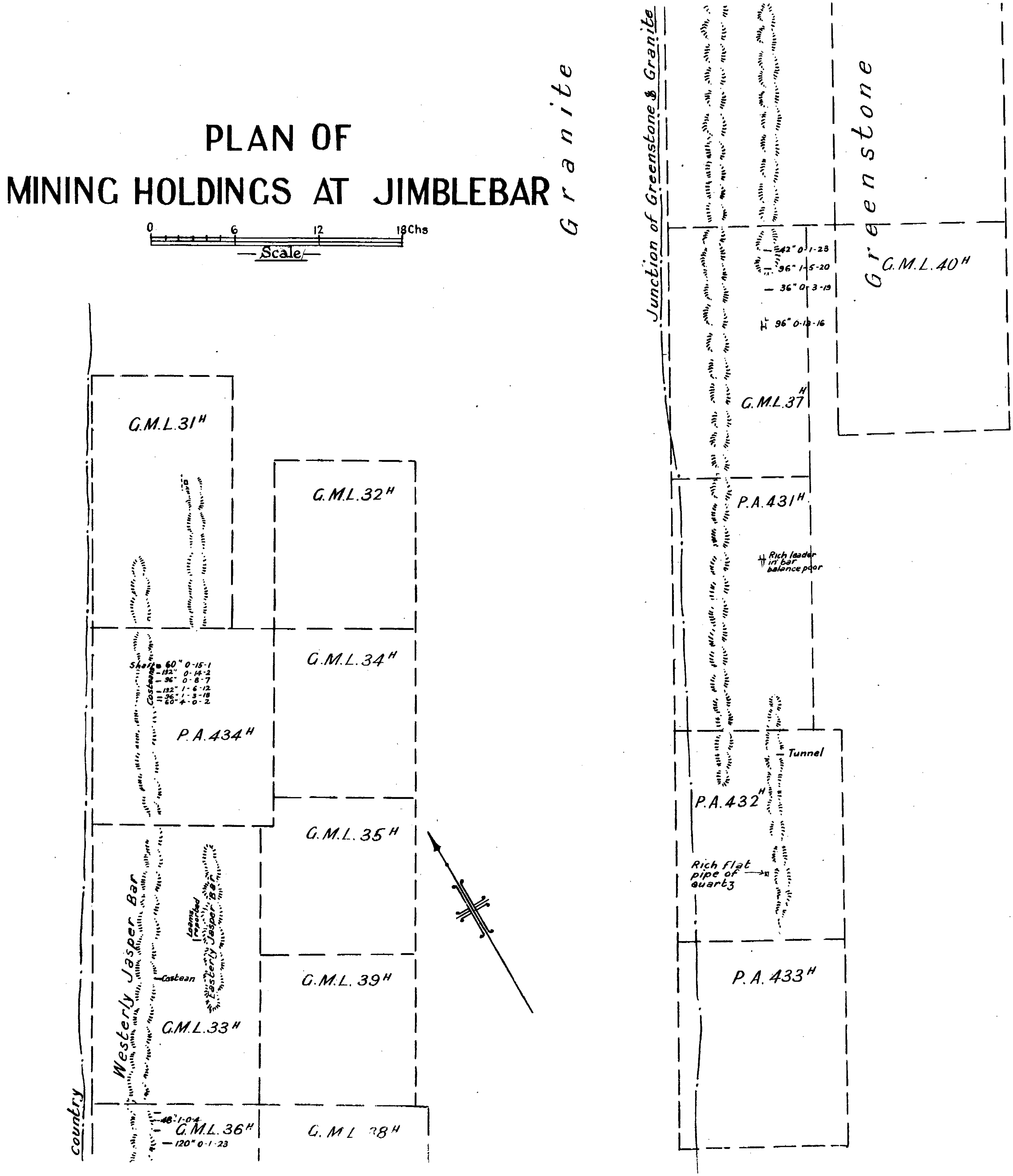
Mr. Talbot's description of the Coobina Belt is as follows:—

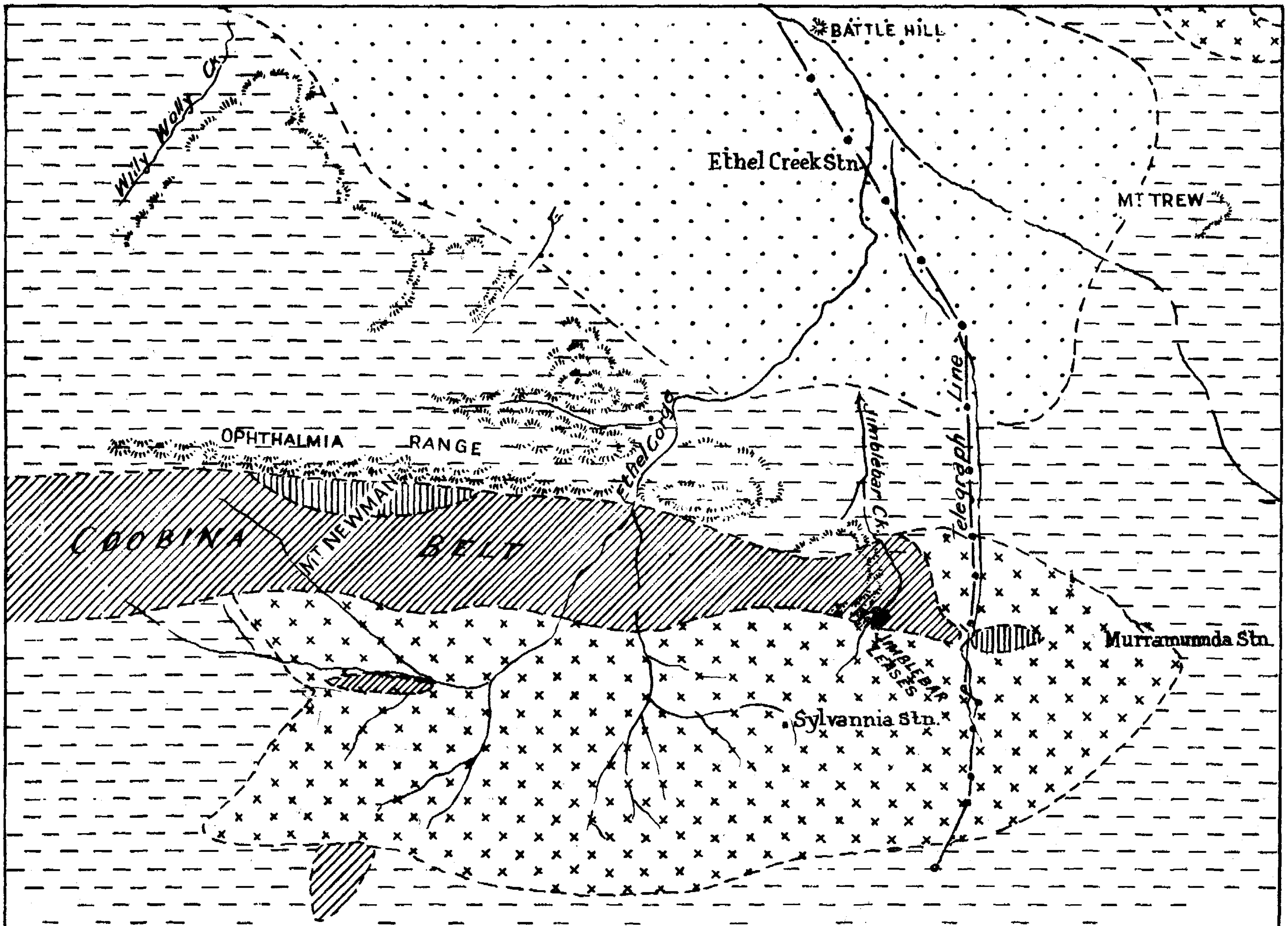
"*Coobina Belt.*—Extending westwards from near Skeleton Creek, beyond the limits of the area mapped, a belt of greenstone, with an average width of about ten miles, lies between the southern escarpment of the Hamersley-Ophthalmia Plateau and the granite area just described.

"Near the eastern end of the belt there are some old workings, known as Coobina, and as this is apparently the only place where gold has been found, the name has been adopted for the belt.

"The rocks of this belt consist of highly altered dolerites, which have been invaded in many places by dykes and bosses of dolerite, similar to those occurring in the granite and the sedimentary rocks of the Nullagine Series. There are numerous hills and ridges, especially at the eastern end of the belt, of jasperoid rocks identical with those occurring in the plateau to the north. The jasperoid rocks are nearly always on the high ground, and are obviously outliers of the Nullagine Beds of the Hamersley-Ophthalmia Plateau.

"Near the contact of the dolerite intrusions the older greenstones, wherever seen, are invariably schistose, but as they are much softer, the dykes and bosses by which they are invaded rise abruptly above them, and the older rocks are, as a rule, covered with soil or rock debris. Away from the dykes the older rocks are in most places massive, although in the vicinity of the Coobina workings, where there is an absence of dykes, sheared zones are common, and it is in these that the quartz reefs occur. Quartz reefs are rare in the western part of the belt, and those that are seen are short lenses. (13953) and (13372) are typical of the older greenstones.

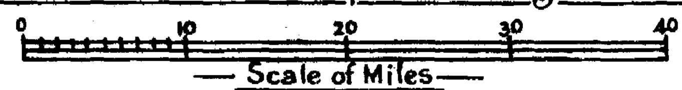

PLAN OF
MINING HOLDINGS AT JIMBLEBAR
0 6 12 18Chs
Scale
Granite
Junction of Greenstone & Granite
Greenstone
G.M.L. 40H
42" 0-1-23
96" 1-5-20
36" 0-3-19
96" 0-13-16
G.M.L. 37H
P.A. 431H
Rich leader in bar balance poor
Tunnel
P.A. 432H
Rich flat pipe of quartz
P.A. 433H
G.M.L. 31H
G.M.L. 32H
G.M.L. 34H
Shaft 60" 0-15-1
132" 0-14-2
96" 0-8-7
132" 1-6-12
96" 1-3-18
60" 4-0-2
Costeans
P.A. 434H
G.M.L. 35H
Westerly Jasper Bar
Loams reported
Easterly Jasper Bar
Costean
G.M.L. 39H
G.M.L. 33H
country
48" 1-0-4
G.M.L. 36H
120" 0-1-23
G.M.L. 38H

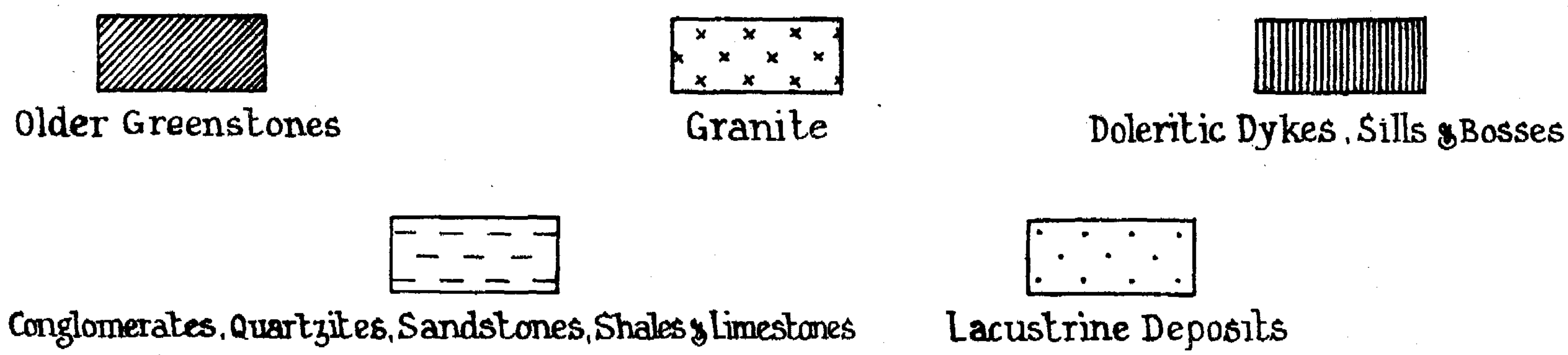


GEOLOGICAL SKETCH MAP OF

COUNTRY IN THE VICINITY OF NEW FIND AT JIMBLEBAR

—Taken from H.W.B. Talbot's Map in Geological Bulletin No. 83—





"Near a station camp, about six miles south-west from the entrance to Ethel 'Gorge,' there is a low hill surrounded by soil flats, formed of an extremely decomposed, highly sheared red ferruginous rock with quartz veins visible on the cross fracture (13952). The rock is too decomposed for accurate determination, but Mr. Farquharson thinks that it is an extremely altered and decomposed greenstone schist. This rock strikes N.N.E. and dips W.S.W. at an angle of 30deg.

"On the flat, about 100 yards from the hill, there is a station well, the dump of which consists of a soft, fine, dark gray chloritic shale, indistinctly laminated (13951). Owing to the timber in the well it was not possible to gain any information regarding the structure of the rock, and the absence of outcrops, except the isolated hill of schist just referred to, makes it impossible to state definitely its relationship to the greenstones.

"Near Coobina Soak, at the eastern extremity of the Coobina Belt, there is a ridge trending east and west, composed of serpentine (13379), derived from either pyroxenite or a pyroxenic variety of peridotite."

NATURE OF ORE DEPOSIT.

Near the south-eastern corner of the Coobina Belt, and just on the east side of Jimble Bar Creek, two parallel jasper bars a few chains apart, and having a north-easterly strike, form conspicuous ridges about a mile in length, which rise in places to perhaps 150 feet above the adjoining country. The country rock on the eastern side of these bars is a greenstone and on the western side a granite, presumably an offshoot from the main granite mass further south.

The gold deposits are intimately associated with these bars, the most important found so far, that on Shearer's P.A., occurring in ironstone lode material on the eastern side of the most westerly bar.

It will be noted that the leases and prospecting areas have been pegged so as to include these bars and in addition the deeps on the eastern side. The ore bodies are quite undeveloped.

Up to the present, the work done consists of two shallow shafts and a number of costeens. The following is a brief description of the gold-mining leases and prospecting areas, beginning from the most Northerly:—

Jimble Bar North, G.M.L. 31H.—An old prospector named Nicol has sunk a shaft 12 feet deep in soft talcose schist material. The gold occurs in this material apparently in the form of a small, rich pipe, showing rough gold when panned off. The gold occurs in the ironstone, the quartz leaders being poor.

Jimble Bar P.A. 434H.—This prospecting area adjoins G.M.L. 31H on the south. A lode formation on the eastern slope of the western bar has been exposed in six costeens. An underlay shaft has also been sunk to a depth of 25 feet.

Assay results were as follows:—

UNDERLAY SHAFT.

Sample No.	Location.	Width.	Value.		
			oz.	dwt.	grs.
1	F. W. Bench at surface	60in.	0	15	1
2	10ft. down S. end ...	42in.	0	7	3
3	16ft. " N. end ...	42in.	0	6	23
4	25ft. " S. end ...	42in.	0	2	9

Five costeens across the lode, all to the South of this shaft, were also sampled with the following result:—

Sample No.	Location.	Width.	Value.		
			oz.	dwt.	grs.
5	Costeen 20ft. South of shaft	W.W., 60in. ...	0	11	11
6	... ...	E.W. 72in. ...	0	17	5
11	Costeen 63ft. South ...	96in.	0	8	7
7	Costeen 111ft. South ...	E.W. 66in. ...	1	9	7
8	... ...	W.W. 66in. ...	1	3	18
9	Costeen 141ft. South ...	96in.	1	3	18
10	Costeen 156ft. South ...	60in.	4	0	2

It will be seen from the above results that values in the shaft are comparatively low. The prospectors now consider that this shaft has been sunk too far in the hanging wall. This is borne out by the fact that the footwall bench at the surface assays 15 dwts 1gr. per ton for a width of 60 inches. The lode in the costeen at 20 feet south averages 14 dwts. 12 grains per ton over a width of 132 inches. Between this point and the costeen 111 feet south (where the lode averages 1 oz. 6 dwts. 12 grs. per ton in value for a width) there is only one costeen, namely, at 63 feet south, which assays 8 dwts. 7 grs. per ton over a width of 96 inches. The three costeens at 111 feet south, at 141 feet south, and at 156 feet south, all give values of over an ounce to the ton for widths of 132 inches, 96 inches and 60 inches, respectively.

These results are very encouraging and fully justify the further exploitation of the lode. Underlay shafts should be sunk, following the values down.

Jimble Bar South, G.M.L. 33H.—Very little work has been done on this lease. Some values are said to have been obtained in a costeen, on the eastern fall of the western bar, and some costeening was in progress where some loams were obtained on the west side of the eastern bar.

G.M.L. 36H.—Some costeening has been done on this lease across the lode material on the east side of the western bar. In all there were four costeens, the distance between the first and last being 48 yards. Two of these were sampled. The second costeen, beginning from the north end, gave an assay value of 1 oz. 0 dwts. 4 grs. per ton over a width of 48 inches, and the fourth (the most southerly), assayed 1 dwt. 23 grs. per ton over a width of 120 inches. Either values here are erratic or the last mentioned costeen is off the lode.

G.M.L. 37H (Jones and Hahnel).—On this lease prospecting operations have been confined to the eastern bar, and in its vicinity good isolated values appeared to have been found. In one costeen an assay result of 1 oz. 5 dwt. 20 grs. was obtained. In a costeen two or three chains further north the assay value was 1 dwt. 20 grs.; in a costeen 35 yards south of the first mentioned assay result was 3 dwts. 19 grs. for a width of 36 inches. In a costeen 47 yards further south again an assay result of 13 dwts. 16 grs. was obtained over a width of 96 inches.

Prospecting Area 431H (Carroll & O'Brien).—On this prospecting area the prospectors are following a very small cross leader, an inch or two in width, in the eastern bar, carrying good values.

Prospecting Area 432H (H. Vistorini).—On this P.A. some value was said to have been obtained in a tunnel on the east side of the eastern bar. A sample taken over a width of 36 inches assayed 12 dwts. 15 grs. per ton in value. Values were also reported in small cuts put into the hill at intervals for a distance of 35 yards south of this tunnel. Near the southern boundary and on the western fall of the hill Vistorini is following a small flat make of quartz showing free gold; unfortunately, it does not appear to be of any great extent.

Prospecting Area 433H (Hall and Shephard).—This P.A. adjoins P.A. 432 on the south side, and has evidently been taken up as a position block. As far as I could see no work had been done on it.

GENERAL CONCLUSION.

The position may be summed up as follows:—

Two parallel jasper bars a few chains apart and running N.E. and S.W. can be traced for a distance of, approximately, a mile. At intervals ironstone lode material alongside these bars carried payable values. The best run of values yet found are those on Prospecting Area 434H, taken up by Shearer.

My samples, taken from costeans, gave an average value of 17½ dwts. per ton for a width of nine feet and a length of, roughly, 156 feet, neglecting one high assay of 4 ozs. per ton. Inspector Deeble's samples, presumably from the same cuts, gave a lower average, viz., 13 dwts. per ton, and he advises us that he has also seen the result of a private sampling showing an average result of 13 dwts. 15 grs. per ton for a width of ten feet and a length of 240 feet.

The values so far, however, are only showing at the surface, and it is important to sink a shaft or two on the values and ascertain if they live down.

The other shoots of ore which have been located have not yet been proved to be of any great length. Gold deposits associated with jasper bars are very common in this State; *e.g.*, at Boogardie, Tuckabianna, St. Ives, and Hancocks, and many other mining centres. The bars themselves are generally devoid of value except where they are sufficiently shattered to allow percolation of auriferous solutions to take place. In consequence, values are usually irregularly distributed, but some very rich patches have been found associated with such bars.

4.—SPRINGVALE LEAD MINE.
(5/5/1926.)

I visited this mine on the 10th instant, and have to report as follows:—

Location.—The mine is situated about two miles north-west of Ajana Siding.

Lode.—The lode, which is almost vertical, has a north-easterly trend, and has been driven on at the 35 feet level for a length of approximately 300 feet. The manager's figures show that in the north drive, which has been driven 120 feet, the lode contains 17 per cent. of recoverable concentrates, over a width of 42 inches, and that in the south drive, which has been driven 180 feet, it is worth 17 per cent. for a width of 36 inches between the main shaft and the No. 3 shaft. Between No. 3 and No. 4 shafts it averages 22 per cent. of recoverable concentrates over a width of 25 inches and in the face is worth 15 per cent. over a width of 36 inches.

At the 100 feet level the north drive has been driven 100 feet. The lode averages 10 per cent. of recoverable concentrates over a width of 48 inches, and has a similar value over a width of 60 inches in the present face. The south drive has been driven 110 feet and averages 14.5 per cent. of recoverable concentrates over a width of 48 inches, while the present face contains 16 per cent. over a similar width. I undertsand that the manager tests by actual panning of a measured amount of ore broken from each face. He assures me that the concentrates obtained would average 74 per cent. metallic lead. His results should be conservative, as a plant should lose less lead than he would in panning.

Treatment.—Up to the present the manager informs me that he has treated 1,750 tons of ore for a recovery of 12.4 per cent. metallic lead. Assuming a lead loss of 5 per cent., the actual contents of the ore treated would be 17.4 per cent. metallic lead. His treatment is in a cradle and sluice and the estimated losses are as follows:—

—	Percentage of total. 1.	Lead Contents. 2.	Product. 1. & 2.
		per cent.	
Loss in roughs	60	3	180
Loss in cradling fines	35	5	175
Loss in cradling seconds ...	5	27	135
	100	5	490

showing an average loss of 5 per cent. metallic lead.

Ore in sight.—The ore in sight above the 100 feet level on Mr. Grant's figures works out approximately as follows:—

Block No.	Tons.	Recoverable concentrates.	Total.
		%	
1	1,925	13·5	259·875
2	688	17·0	116·960
3	1,238	15·75	194·98[illegible]
4	1,522	16·00	243·520
5	706	15·00	105·900
6	100	15·00	15·000
	6,179	15·15	936·240

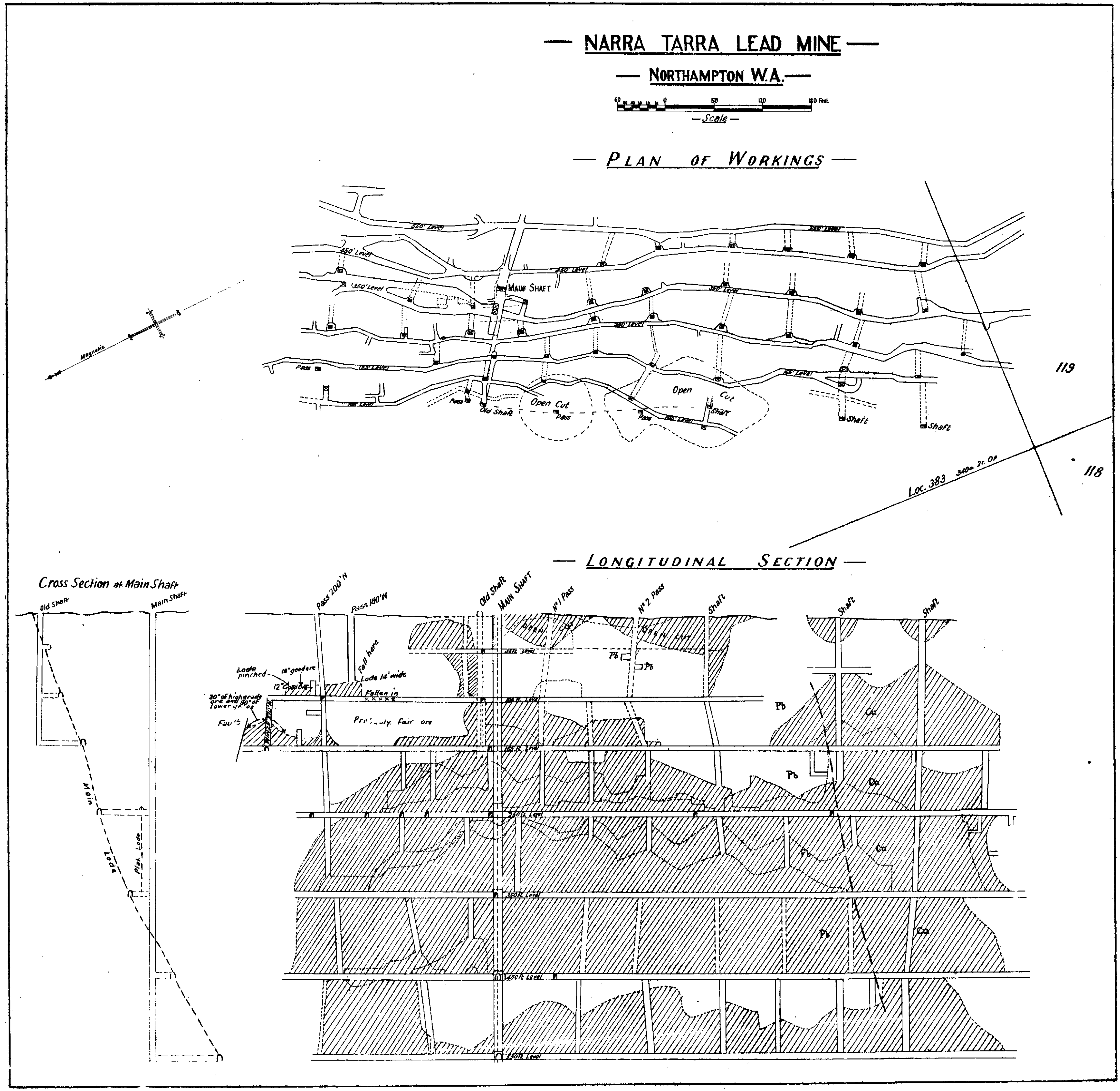
Assuming concentrates to contain 75 per cent. lead and the lead lost in pan 5 per cent., we get—

	metallic lead
Lead recoverable in pan 75% of 15·15 =	11·36
Lost in pan	5·00
Total lead contents in ore ...	16·36%

It would appear, therefore, that there is in sight a little over 6,000 tons of ore averaging 16.36 per cent. of metallic lead, of which 14 per cent. might be recoverable in a mill.

The full width of the lode has not, however, at all times been exposed in driving. It will be noticed, for instance, that in the main crosscut at the 100 feet level, in addition to 3 feet of ore averaging 15 per cent., there is 9 feet of lower grade ore, estimated to contain 6.5 per cent. of recoverable concentrates. I anticipate, therefore, that when the ore comes to be mined a larger tonnage will be obtained, and the grade will be somewhat lower. Short crosscuts to prove the full width of the lode might with advantage be put out at intervals of, say, 50 feet along the drives. In the absence of such crosscutting the value of the additional lower grade ore likely to be won cannot be estimated, but, as a rough guess, I should say that perhaps 10,000 tons in all will be obtained from the present workings of a recoverable value of 10 per cent. to 11 per cent. of metallic lead. As in addition the limits of payable ore have not been reached, either in length or in depth, I am of opinion that the erection of a plant is now justified.

Plant.—A suitable plant would be one to crush, say, 4 tons of crude ore per hour. It should be of



NARRA TARRA LEAD MINE
NORTHAMPTON W.A.
Scale
PLAN OF WORKINGS
Magnetic
350' Level
450' Level
Main Shaft
250' Level
185' Level
100' Level
Pass
Old Shaft
Open Cut
Shaft
119
118
Loc. 383
LONGITUDINAL SECTION
Cross Section at Main Shaft
Old Shaft
Main Shaft
Main Lode
Flat Lode
Pass 200'N
Pass 180'N
N°1 Pass
N°2 Pass
Open Cut
Lode pinched
18" good ore
12" Gossan
Fall here
Lode 14' wide
Fallen in
30" of high grade ore and 30" of lower grade
Fault
Probably fair ore
Pb
Ca
350ft Level
450ft Level
550ft Level

the type common in the district in which the ore is first broken in a rockbreaker, then put through rolls and concentrated in a May jig, followed by Wilfley tables.

Hoisting.—The present shaft is small and has only two compartments, one of which is taken up with ladders and pump rods.

If the mine is to operate for any length of time a new shaft will certainly be necessary.

I think, therefore, that it would be advisable to put this work in hand simultaneously with the erection of the plant to facilitate mining operations when the plant is running.

5.—NARRA TARRA LEAD MINE. (14/5/1926.)

As instructed, I visited this mine on the 4th, 5th, and 6th May, 1926, and have to report as follows:—

I found on my arrival that all mining operations had been suspended. The following is a brief description of the workings:—

Location 119.

100ft. Level Main North Drive: This drive has been driven for a distance of 320 feet in lode material, which appears to be on the low grade side. In the present face irregular stringers of galena and carbonate ore are showing. The full face might average about 6 per cent. of Pb. A little stoping has been done over this drive just north of shaft 250ft. north. Fair ore is showing in the face of the stope. At the bottom of No. 2 pass north, there is a seam of black copper ore about 12 inches wide, making into the hanging wall.

100ft. Level Main South Drive: This drive has been driven a distance of 208 feet on lode material. For the first 120 feet values appear to be on the low grade side. From this point onwards values seem to have improved. At shaft 150ft. south rill stopes on either side of the shaft have been started. These stopes have been broken for a width of about five feet. There is fair value for a width of three feet on the footwall side. Some big lumps have been picked out from the hanging wall side and stacked for mullock.

Mr. Sutherland expressed the opinion that the whole of the ore above the north and south drives would pay to treat but he had no precise figures to give me as to its lead contents.

Shaft 250ft. North: This shaft is accessible only for a depth of 30 feet. Below this depth it is filled with ore. Some high grade ore is showing in the top portion of this shaft. I understand that it was the intention of the company to have cleaned out this shaft and made a connection through to the stope below.

100ft. Level No. 1 Winze North: The winze was started under No. 1 pass north and sunk on a hanging wall seam to a depth of 41 feet. There is about 12 inches of good milling ore showing, the balance being on the low-grade side.

Sheppard's Workings: These workings are situated on the same line of lode as those just described on Block 119 but are approximately 35 chains north-east. The lode in both cases is associated with the same pegmatite bar which forms a ridge extending from one series of working to the other. A shaft has been sunk perhaps 70 feet in the northern fall of a hill. At a depth of 20 feet a south drive was driven into the hill a distance of 200 feet. The last 30 feet has been driven recently. Patches of galena in kidneys were met with. The present face shows a little galena which is rather encouraging. At this point it would be 50 or 60 feet below the surface. Stoping has been carried out above this drive from 36 feet to 136 feet.

At a depth of 57 feet another level has been driven south for a distance of about 120 feet. A little galena is showing in the face. A quantity of bagging ore is said to have been obtained from these workings, but apparently there is not much left to be taken out above the 57ft. level. The lode should now be developed below this level.

Main Workings: A new make of ore further north than any previously worked in the mine has recently been developed. At the 160ft. level this is approximately 100ft. in length from approximately 200ft. north to 300ft. north. The last 20 feet of driving on this level are said to be in low grade ore. There is evidently a fault right at the face, the lode having apparently been faulted to the west. Above the 160 ft. level the rill stopes north and south of winze 270 ft. north are in good order and some good grade can be obtained from them. The width of these stopes is about 5 feet of which 30 inches is high grade ore, the balance being of lower grade.

Stoping has also been carried out above the 105ft. level and good grade ore is said to have been obtained in the vicinity of the pass at 180ft. north, where the lode has been worked for a width of 14 feet. Further south a narrower width only has been taken out, the lode apparently pinching in this direction. On the 3rd February a fall occurred just where the lode was widest, which filled up the stope with mullock and blocked the ore chute. In consequence, no ore could be won from this point. The stope is now in fair order again, and it was the management's intention to begin a stope from the point A, near pass 200ft. north (see sketch attached), and carry it south towards the fall, keeping the stope well filled.

Grade of Ore Mined.

I am indebted to the Fremantle Trading Company for the following information:—

Percentage of Lead recovered:

1925—March	.. ..	11.2	per cent.
April	.. ..	13.0	„
May	.. ..	8.3	„
June	.. ..	8.1	„
July	.. ..	7.1	„
August	.. ..	6.9	„
September	..	6.2	„
October	.. ..	5.7	„
November	..	5.4	„
December	..	6.4	„
1926—January	.. ..	6.7	„
February	.. ..	4.3	„
March	.. ..	5.7	„
April	.. ..	5.4	„

Further details of the last few months are as follows:—

In January 1926, the bulk of the ore was obtained from the main workings, a small tonnage only being obtained from development work in Block 119:—

Ore mined.			Concentrates
trucks.	tons.		tons
3,462	1,384·8	...	129·6

My attention was drawn to the fact that just prior to the fall of ground on February 3rd, a much better grade was obtained. The figures show that from January 27th to 30th, 643 trucks or 257.2 tons of ore were mined and treated yielding 30 tons 12 cwt. of concentrates.

The ore treated from the various workings and the total concentrates won is indicated by the following figures:—

FEBRUARY OUTPUT.

	trucks.	tons.
Block 119	375	150
Main Workings ...	3,050	1,220
	3,425	1,370

Concentrates won 84·12 tons, value £1,118. (Assuming lead £30 per ton.)

MARCH OUTPUT.

	trucks.	tons.
Block 119.		
Stoping	290	116
Dev. North Drive ...	309	123·6
Dev. South Drive ...	130	52
Dev., Winze	13	5·2
Main Workings.		
Stoping	2,064	825·6
Development	152	60·8
Sheppard's Workings.		
Driving	290	116
	3,248	1,299·2

Concentrates won 97·4 tons, value £1,294. (Assuming Lead £30 per ton.)

APRIL OUTPUT.

	trucks	tons.		£
Block 119.				
Stoping	612	244·8	Wages ...	1,414
Development ...	573	229·2	Stores ...	400 (Est.)
	1,185	474		£1,814
Main Workings.				
Stoping	1,677	670·8		
Development ...	393	157·2		
	2,070	828·0		
Sheppard's Workings.				
Development ...	54	21·6		
Total ...	3,309	1323·6		

Concentrates. 100 tons 16 cwt. Value £1,339. (Assuming Lead £30 per ton.)

The following figures indicate the number of men employed on development work and on stoping:—

SHIFTS WORKED IN MARCH.

	Shifts worked.		
Block 119.	Stoping.	Development.	Total.
Stoping	85	...	
Driving	...	73	
Winzing	...	39	
150ft. Pass	...	54	
Winze chamber ...	...	8	
	85	174	259
Main Workings.			
Stoping	331	...	
Picking up level ...	...	70	
Rising	...	6	
Middle lode shaft ...	...	18	
	331	94	425
Sheppard's Workings.			
Stoping	97	...	
Driving	...	81	
Shaft	...	21	
	97	102	199
Total	513	370	883

SHIFTS WORKED IN APRIL.

	Shifts Worked.	
Block 119.	Stoping.	Development.
Stoping	?	...
Driving	...	120
150ft. Pass	...	24
Winzing	...	30
250ft. Shaft	...	30
Rising	...	24
	...	228
Main Workings.		
Stoping	367	...
Picking up	...	106
	367	106
Sheppard's Workings.		
Stoping	3	...
Driving	...	12
	3	12
Total Development	...	346

SALE OF CONCENTRATES.

Concentrates are carted to the siding by the mine. The remaining costs were given to me by Mr. Sutherland as follows:—

	per ton. s.	d.
Bags and bagging	15	0
Railage to Perth	17	0
Handling and unloading at Works ...	2	0
Railage to Fremantle	2	6
Wharf handling	2	0
Wharfage	2	0
Wharf haulage	0	9
	41	3
Returning charge	92	6
	133	9

	£	s.	d.
Value of 70 per cent. concentrates when lead is £30 per ton—			
1 ton of concentrates contains 0·7 Lead value, 0·7 of £30... ... ... =	21	0	0
95 per cent. of £21 paid for ... =	19	19	0
Less expenses as set out above =	6	13	9
Value of concentrates at Nabawa Siding =	13	5	3

The total number of men employed has varied slightly but a fair indication can be obtained from the following list which represents the number of men employed during one particular week. In this instance it was the week ending 27th April, 1926:—

Main Workings—

Underground shift bosses	3
Engine-drivers	2
Fireman	1
Blacksmith	1
Striker	1
Timber men	2
Brace and platmen	2
Truckers and shovellers	3
Stoping	17
Picking up	6
Mullocking	2
	40

Block 119—

Underground shift bosses	1
Engine-drivers	2
Bracemen	2
Stoping	6
Driving	6
Shovellers	4
	21

Plant—

Gas driver	1
Driver (motor, etc.)	1
Cracker	1
Rolls	1
Jigs	1
Taps	1
Tables	1
Dams	1
Labourer	1
Foreman	1
Horse-drivers	2
	12
Total	73

General Remarks and Conclusions.

A glance at the table showing the lead recovered in recent months is sufficient to show that a very low grade ore has been treated. It will also be noted that the concentrates won in February, March, and April with lead at £30 per ton would not cover the amount expended on wages and stores on the mine. As in addition, there are Fremantle expenses amounting, I understand, to £250 a month, it is clear that considerable losses have been made.

In view of the fact that lead is now standing at something between £27 and £28 per ton, a considerably better grade of ore will have to be mined if the mine is to be profitably operated.

Mr. Sutherland takes the rather optimistic view that if the mine is re-started:—

(1) a better grade of ore will be obtained;
(2) expenses will be reduced, as less development work will be necessary; and
(3) the price of lead will rise to £35 per ton as soon as the British coal strike is settled.

With regard to the grade of ore likely to be obtained, it is to be regretted that this mine has not better records of the grade of ore already opened up. Mr. Sutherland states that he considered the ore above the 100ft. level, Block 119, could all be profitably taken out, but his statement was not supported by any assay results. In the absence of such assay results, I am not prepared to assume all this ore payable.

Mr. Sutherland has no plans showing the width and value of the lodes at the various points and I did not do any sampling, as it seemed too formidable a task to attempt to systematically sample the mine, and I did not consider that any useful purpose would be served by taking samples haphazardly here and there. In consequence, I am not prepared to estimate the grade of ore which it might be possible to mine, but if total monthly expenses are put down at £2,000, with lead at £30 per ton, it would take 151.3 tons of 70 per cent. concentrates to bring in this revenue. On the April tonnage of 1,323.6 tons, this would mean that a grade of 8 per cent. recoverable lead was necessary to cover expenses.

This grade, it will be noted, has not been obtained since June last.

With regard to development expenditure, it might be possible to take out a small tonnage without further development, but if the mine is to be operative for any length of time it will be necessary to carry out the following work:—

Main Shaft Workings.

In order to work the new shoot of ore at the north end below the 165ft. level, it will be necessary to—

(1) pick up the north drive at the 250ft. level and continue the drive say 100 feet;
(2) make a connection by winzing from the 165ft. level to the 225ft. level.

Block 119.

It will be necessary to open up the ore below the 100ft. level by sinking a further lift and driving the 200ft. level. It is the intention, I understand, to sink the No. 2 pass north to the 200 level and to drive both ways from the bottom of it rather than sink the main shaft. This will certainly prove the ore body more quickly, but in the end the main shaft will probably have to be sunk also.

Sheppard's Workings.

No ore is developed here and it will be necessary to develop the ore below the both levels by sinking and driving.

In consequence, I could not recommend much reduction in the development expenditure.

With regard to the price of lead, I can only say that I hope that Mr. Sutherland is right and that it will go up to £35. If it does the position will, of course, be vastly improved.

It might be well to point out that it would be rather too much to expect me to be able to decide definitely whether the mine can be profitably operated or not, when Mr. Sutherland, who should know it from end to end, has made serious losses for some months past. My conclusions, however, may be summarised as follows:—

(1) The grade of ore mined for many months has been unpayable and at the present price of lead will have to be improved very considerably before the mine can be worked profitably.
(2) In order to improve the grade much of the ore at present being sent to the mill will have to be discarded and the ore more carefully selected.
(3) The grade of the ore in the various parts of the mine will require to be ascertained more closely. This can be done partly by sampling and assaying and partly by putting through separate crushings, *e.g.*, a crushing from the drives at Block 119 would have been most instructive.
(4) There is some good grade ore in the mine, but it remains to be shown whether this can be won rapidly enough to keep the mill going on it.
(5) The position would be much improved if some fresh blocks of payable ore were opened up or if the price of lead were to rise again to, say, £35 per ton.

6.—REPORTED OIL AT KENDENUP.

(8/7/1926.)

Acting on official instructions, I left Perth on the 19th May last, and proceeded to Kendenup to investigate an oil discovery in this district, reported by Mr. De Garis. I arrived on the morning of the 20th May and spent the day with Mr. Black (the chemist advising Mr. De Garis), and four local residents.

From Kendenup we motored to Martagallup Lake. where Mr. Black drew my attention to the occurrence of small sheets of rubber-like material, which I recognised as coorongite, on the edge of the lake. The largest pieces would be about the size of dinner plates. It occurred as usual on the surface of the ground which had been under water and had since dried up. A few small pieces were also found attached to sticks and stumps about a foot above the present water level.

Mr. Black informed me that he had previously gathered a quantity of this material and, with the aid of a roughly constructed still, had distilled off several oils, samples of which had been left at the Mines Department by Mr. De Garis.

I took a sample of the coorongite and subsequently left it with Dr. Simpson for examination. This material resembles rubber very closely. It is flexible and elastic and is known to occur in many parts of this State. It is always found on the edges of lakes and swamps and, as mentioned by Dr. Simpson in his report, is considered to represent the accumulated debris of dead water plants of minute size known as Eleophyton.

Mr. Black told me that a considerable quantity of inflammable gas is given off from the water in this district, and that he had collected a quantity of this and stripped oil from it. He intimated that they would shortly be collecting this gas in larger quantities when another visit might be made.

In his report Dr. Simpson states that as Mr. Black does not appear to have been provided with suitable apparatus for making this test with a certainty of excluding all error, he is strongly of opinion that Mr. Black was mistaken in his deductions.

Conclusion.—Dr. Simpson has reported upon my samples and those handed in by Mr. C. De Garis, and is very emphatic in pronouncing the material submitted as being coorongite and that the samples contain no trace of petroleum.

I can only add that during my visit to Kendenup I saw nothing to lead me to suppose that mineral oil was likely to occur there. The few exposures of rock seen appeared to be either crystalline rocks or rocks of a sedimentary series, too ancient to contain mineral oil.

7.—ELSIE MAY AND GOLD ROCK LEASES.

(28/7/1926.)

As instructed, I visited the Elsie May and Gold Rock groups of leases in the Mt. Ida district and have to report as follows:—

Elsie May Group.

As will be noted from the Geological Plan attached,* this group consists of the Elsie May South, G.M.L. 5501, the Elsie May Central, G.M.L. 5500, and the Elsie May North G.M.L. 5502.

These leases are situated 21 miles south of Mt. Ida townsite near the western edge of a belt of auriferous greenstone country.

A quartz reef can be traced right through the Elsie May South Lease. It is found again in the Northern portion of the Elsie May Central and continues into the Elsie May North.

Elsie May South Workings—Main Shaft.—This is situated about 330 feet from the southern boundary of the lease. The reef, which dips to the east, has been sunk on to a depth of 61 feet. The reef in the shaft was sampled at intervals of 8 feet, with the following results:—

Sampling of Main Underlay Shaft.

Position of Sample.	Width.	Value.	Remarks.
	inches.	oz. dwt. grs.	
4ft. down shaft ...	48	0 0 5	South End
12ft. ,, ,, ...	48	0 2 4	do.
20ft. ,, ,, ...	48	*Nil*	North End
28ft. ,, ,, ...	30	0 0 17	South End
36ft. ,, ,, ...	12	*Nil*	North End
44ft. ,, ,, ...	24	*Nil*	South End
52ft. ,, ,, ...	30	*Nil*	North End
60ft. ,, ,, ...	36	0 1 10	South End

Thus, out of eight samples taken, four contained no gold at all, and the highest assayed 2 dwts. 4 grs. per ton in value.

Elsewhere on the lease, the reef is exposed at intervals in costeans and potholes. Most of these exposures were sampled with the following results:—

Sampling of Potholes and Outcrops in Elsie May South Lease.

Position of Sample.	Width.	Value.	Remarks.
	ins.	oz. dwt. grs.	
Costean, 30ft. South of Main Shaft	24	0 1 0	Main Reef
Outcrop, 50ft. North ... ,,	60	*Nil*	do.
Pothole, 125ft. North ,,	36	*Nil*	do.
Pothole, 100ft. North ,,	12	*Nil*	East Reef
Pothole, 170ft. North ,,	15	*Nil*	do.
Pothole, 350ft. North ,,	54	*Nil*	Main Reef
Outcrop, 870ft. North ,,	48	*Nil*	do.
Pothole, 975ft. North ,,	8	0 9 1	do.

From the above it will be noted that unpayable values were met with everywhere except in a small pothole 975ft. north, which is about 20 feet from the northern boundary of the lease, and here the reef was only 8 inches in width.

Elsie May Central Workings.—The main reef, a cross reef and an eastern reef are exposed by costeans or potholes on this lease.

The main reef in a pothole 120 feet from the north boundary is 5 feet in width, but two assays both gave the gold contents as nil.

From a costean 45 feet from the North boundary some large loose ironstained quartz boulders 24 inches across had been taken out. These were sampled and assayed 12 dwts. 3 grains per ton in value.

A sample was taken of the cross reef, giving an assay value of 17 grains per ton from a width of 18 inches. A sample was also taken of the eastern reef, which gave an assay result 1 dwt. 2 grains per ton.

* Not published.

Elsie May North Workings.—Very little work has been done on this lease. A pothole 420ft. north of the southern boundary was sampled, the reef being 12 inches in width and its value nil.

A shaft 8 feet deep on an East reef had 6 inches of quartz showing which gave an assay result of 1 dwt. 23 grains per ton in value.

General Conclusions.

The leases are situated on the western edge of an auriferous belt of greenstone and a persistent quartz reef can be traced from the southern end of the south lease right into the north lease. My samples indicate, however, that the reef exposed in the main shaft and in most other places is poor and unpayable.

Out of 23 samples taken only two gave an assay value above 3 dwts. per ton. One of these assayed 9 dwts. 1 grain per ton at a point where the reef was only 8 inches in width. The other was a sample of some large loose boulders which assayed 12 dwts. 3 grains per ton. The solid reef had not been reached at his point. Thirteen of the samples contained no gold at all.

Mr. Fleming, who was in charge of operations, showed me some honeycombed quartz and informed me that the best values were obtained in it. This suggests that a little secondary deposition of gold had taken place which would not be found in the solid quartz.

I regret to have to report that I do not consider that there are any reasonable prospects of this property developing into a profitable mine. Small patches of ore may be obtained at intervals.

The Gold Rock Leases.

These leases are situated about 4 miles south of Mt. Ida townsite.

The principal workings are on a strong body of quartz which runs north and south.

An underlay shaft has been sunk on this quartz reef for a distance of 47 feet. Its width at this depth is 72 inches.

At a depth of 25 feet a spur reef has been driven on for a distance of 25 feet.

My samples from these workings contained no gold. Three separate samples from the quartz at the dump all gave an assay return of nil.

The reef in the south shaft (c) workings was somewhat broken, and as Mr. Fleming did not regard this portion of the mine as being very encouraging it was not sampled.

Some gold was obtained in the pan from the outcrop of a small leader at a shaft (b) about 70 feet north of shaft (a). My sample from the bottom of this shaft (*i.e.*, at a depth of about 6 feet) gave an assay result of 17 grains per ton only, the width of the leader being a few inches.

As far as my observations went this appeared to be a hopeless proposition.

8.—VIVIEN GEM G.M.

(13/9/1926.)

As instructed, I visited this mine on the 7th August, and have to report as follows:—

This mine was reported upon by Inspector Winzar on 18th May, 1925, and again on 28th June, 1926.

The general position on the mine, as I found it, was that the payable ore above the bottom level (130 ft.) had been taken out, and that although a plant had been erected, there was no ore developed for it to crush.

The official figures with regard to ore treated and gold won are as follows:—

Date.	Dollied.	Ore Treated.	Gold therefrom.	Total Gold.
	Fine ozs.	Tons.	Fine ozs.	Fine ozs.
1905–1912	86·36	3,677·25	3,116·72	3,203·08
1926, April	...	422·00	28·84	28·84
1926, June	...	65·00	15·00	15·00
1926, July	...	30·00	7·54	7·54
	86·36	4,194·25	3,168·10	3,254·46

From these figures it will be noted that prior to 1926, 3,677.25 tons of ore had been treated, averaging 17.4 dwts. per ton over the plates, and that during 1926, 517 tons of ore were treated averaging only 2 dwts. per ton in value.

I gathered from the manager, Mr. Ardagh, that the ore crushed recently had been obtained from the extensions of the north and south drives at the 130ft. level and from some stoping above the north drive.

He expressed the opinion that if any good values were going underfoot they would be found under the main south drive.

The bottom of the level was very sloppy and wet, but by damming back the water and digging under the rails some reasonably reliable samples were obtained. Results were as follows:—

Sample No.	Location.	Width.	Value.	Remarks.
		inches.	oz. dwt. gr.	
	130ft. level Main North Drive.			
2	190ft. along drive	42	0 0 5	Sample across back
1	200ft. ,,	42	0 1 2	(Face of drive).
	130ft. level Main South Drive.			
13	24ft. along drive	54	0 13 2	Sample across back
12	30ft. ,,	54	0 5 16	do.
11	40ft. ,,	52	0 0 17	Sample underfoot
10	51ft. ,,	51	0 3 1	do.
9	63ft. ,,	48	0 6 13	do.
8	73ft. ,,	36	0 2 7	do.
7	84ft. ,,	30	1 0 16	do.
6	96ft. ,,	24	0 1 18	Samples, W. wall not exposed
5	106ft. ,,	30	0 6 6	do.
4	119ft. ,,	42	0 1 21	do.

If the samples of the main south drive represent the main ore shoot going underfoot, as Mr. Ardagh gives me to understand, there would seem to be very small justification in sinking the shaft. The owners might, before abandoning their property, drive south under the No. 2 shaft, as suggested by the Inspector of Mines.

9.—MINERAL LEASE 324H FOR MINERAL OIL.

(9/9/1926.)

Acting upon official instructions, I visited this Mineral Lease on 13th August, and have to report as follows:—

The mineral lease is situated a few miles to the south-east of Rockingham, between White Lake and Salt Lake.

The supposed occurrence of mineral oil was reported in a swamp about 100 yards east of Mr. Youngman's residence.

Samples from swamps in this vicinity have previously been collected and were examined by Dr. Simpson in 1923. On extraction and evaporation, the samples yielded minute quantities of an oily-looking substance which was only partly saponified, and some solid wax. It was thought at first that this might be a mineral oil, but after further investigation Dr. Simpson decided that the extractable material had no connection with any supply of mineral oil, but consisted of a mixture of substances of recent vegetable origin. A copy of Mr. Hood's experimental work will be found on pages 69 to 72 of Mines File 1836/22.

Messrs. Green and party have recently done some shallow boring into these swamps and again reported that they had obtained oil in them.

In consequence, I again visited the site and collected six samples. In order to save expense in assaying, I arranged with Dr. Simpson to take a sample consisting of a portion from each of the six and test it for oil in the first place. This was done, and the result of his analysis was as follows:—

"A mixture of six samples, on treatment with suitable solvents, yielded a faint trace (two parts in one million) of white wax-like extract, unlike petroleum or its residuums, and undoubtedly of vegetable origin."

In view of this definitely negative result, the analyses of the individual samples now seem to be unnecessary.

10.—WATER SUPPLY FOR ORA BANDA. (19/10/1926.)

Acting upon official instructions, I proceeded to Ora Banda on the 27th September to look into the prospects of the district, so as to be in a position to submit a report upon the proposal put forward by Mr. G. M. Roberts that the Government should construct a dam near Paddy's Knob having a capacity of 5,000,000 gals.

The general position of affairs is that no satisfactory water supply has been obtained either from wells or from mine workings. Some years ago a pipe line was laid from the Black Flag line, a distance of some 16 miles, but the water was so corrosive that it attacked the pipes, and furthermore it was not particularly suitable for treatment purposes. The manager of the Gimlet mine informed me that the residue loss using Black Flag water was 10s. per ton, whereas the loss using fresh water was only 5s. per ton.

Requirements of District.

At present the only plants which require water for treatment purposes are those at the State Battery and at the Gimlet mine. The State Battery obtains its water from the 42-mile dam, situated about 8 miles south-east of Ora Banda. Ordinarily this dam supplies sufficient water for its requirements, but owing to the fact that this year two million gallons were sold to the Associated Northern Blocks it is now dry, and there are from 200 to 300 tons of prospectors' ore at grass which cannot be crushed.

It should be pointed out, therefore, that if constructed the only apparent use for the dam will be to supply water for the Gimlet mine. I pointed out this aspect of the question to Mr. Roberts, and suggested that he should guarantee the use of a definite amount of water. He promised to write and advise us officially what he was prepared to do in this connection. In his letter of the 13th inst. he states that he is prepared to guarantee not less than 200,000 gallons per month when the mill is crushing. He estimates that the ore reserves in the Gimlet mine amount to 30,000 tons of ore averaging 50s. per ton in value, and that they will treat roughly 2,000 tons per month and use 350,000 gals. of water.

No other mines in the district seem to be likely to purchase water in the immediate future. The Wentworth is now under option, and may possibly develop into a mine which will require a plant of its own later on.

No treatment plants seem to be contemplated on any of the other mines in the district.

In 1924 Mr. W. H. Vale made application for a loan to put up a plant at the La Fortuna mine at Balgarrie. I examined the mine, and came to the conclusion that the general average value of the lode, as indicated by my sampling, was probably a little too low to admit of its being profitably worked. Assistance to do further development work was, however, recommended and approved by the Hon. the Minister (see Mines File 1000/25, p. 37).

There is considerable correspondence on our file in regard to this mine, and a cutting from the "Kalgoorlie Miner," dated 8th May, 1926, states that a meeting was to be held to form a company with the object of erecting a plant on it. This company has now put up an alternate proposal that the Goldfields Water Supply extend from Kurrawang to Ora Banda a pipe line to supply that town and district with an assured water supply.

Sources of Supply.

Proposal No. 1.—Mr. G. M. Roberts favours the construction of a dam situated about a quarter of a mile east of Paddy's Knob. The compass bearing from the site selected to the Ora Banda tanks is 156°, and the distance 8,000 yards. He claims that there are nine separate sheds which would fill this dam. Eleven bores were put down by him. From a depth of 3ft. to 18ft. these were stated to have been in impervious clay. His estimate of the cost of excavating a 5,000,000-gal. dam is approximately £6,000.

He does not consider the prospects of the district justify the expense of extending the goldfields water supply to Ora Banda, and says he will not associate himself with any agitation to secure it. This project he thought might cost £30,000.

Proposal No. 2.—Mr. Allison desires the extension of the goldfields water supply. He claims that the pipes, if taken from Kurrawang to Ora Banda, a distance of 35 miles measured by the map, they would pass Balgarrie, where his company propose to treat a huge low-grade body of ore.

Proposal No. 3.—The possibility of obtaining water from the Orinda mine has been advanced, and is referred to in a letter to the "Kalgoorlie Miner" dated 29th May, 1926 (see Mines File 963/24, p. 67).

The owners of this mine informed me that their water contained 2.8 per cent. solids, and that when struck it rose 3 feet in a shaft 5ft. x 3ft. in three minutes. This works out at 134,880 gals. per 24 hours.

The Gimlet G.M.

Under the heading of requirements for the district I pointed out that the Gimlet was the only mine likely to require any quantity of water from the proposed dam. For this reason it is the prospects of this mine more than any other that appear to me to have a bearing on the question of the construction of the dam. Keeping this fact in mind, I went into the underground position rather carefully. The management placed their assay plans at my disposal, and they will be found accompanying this report.* The only samples taken were at the No. 6 level (700ft.), with the following results:—

Sample No.	Location.	Width.	Value.	Remarks.
		inches.	oz. dwt. grs.	
	No. 6 Level Main E. drive.			
4	At E. side of main shaft crosscut	80	0 7 2	South Lode
3	7ft. along drive	60	0 7 15	do.
2	13ft. along drive... ...	60	0 5 8	do.
1	20ft. along drive (face) ...	...	...	do.
	No. 6 Level Main West drive.			
5	At W. side of M.S. crosscut	54	1 6 8	do.
6	6ft. along drive	60	0 6 20	do.

These samples gave an average value of the lode at this level of 8 dwts. 19 grs., or 37s. 5d. per ton for a width of 65 inches.

At this level the mine results were as follows:—

At crosscut 55s. over 7 feet.

East drive 0ft.-31ft., av. value 32s. over 60in.

West drive 0ft.-5ft., av. value 45s. over 60in.

The following figures give an indication of the length, width, and value of the shoots of ore in the mine. They were obtained by averaging the assay results shown on the assay plans.

No. 5 Level.

On the south lode two shoots of ore have been opened up, viz.:—

(1) A shoot of ore 95ft. long averaging 56s. per ton for a width of 60in.

(2) A shoot of ore 100ft. long averaging 49s. per ton for a width of 60in.

On the middle lode one shoot of ore has been proved, viz.:—

A shoot of ore 130ft. long averaging 31s. per ton for a width of 64in.

No. 4 Level.

At this level three shoots of ore have been opened up on the south lode, viz.:—

(1) An eastern shoot 90ft. long† averaging 54s. for a width of 60in.

(2) A middle shoot 120ft. long averaging 46s for a width of 46in.

(3) A western shoot 145ft. long averaging 51s. for a width of 50in.

One shoot of ore has been found in the middle lode, viz., a shoot of ore 94ft. in length, averaging 45s. per ton for a width of 60in.

Mr. Brierley estimated the ore in sight as follows:—

	tons
Above No. 5 level, west end block of ore, 130ft. x 100ft. x 5ft.	5,400
Above No. 5 level, east end block of ore, 180ft. x 100ft. x 5ft.	7,500
Between Nos. 5 and 6 levels, east end block of ore, 180ft. x 100ft. x 5ft. ..	7,500
Between Nos. 5 and 6 levels, over main crosscut of ore, 150ft. x 60ft. x 5ft. ..	4,000
Above No. 4 level	1,600
Broken ore	2,000
	28,000
In addition there will be a block of ore below west end of No. 5, say 2,000 tons	2,000
	30,000

* Not published.

†The face of the east drive is still in payable ore.

The estimate makes a number of assumptions which have not yet been proved. For instance, it assumes that the east shoot at the No. 4 level will extend east until it is as long as that at the No. 3 level. It also assumes that this shoot will extend down to the No. 6 level without diminishing in length, whereas it has only been proved to do so at one point, viz., at the winze, and so on. Still, the estimate only assumes an average width of 5 feet, whereas in places at least a considerably greater width will probably be stoped. On the whole, it seems reasonably probable that the mine estimate will be realised.

A more reliable estimate will be possible when the No. 6 level has been driven, and when, in addition, the main south crosscut at the No. 5 level has been extended.

The south drive off this crosscut was previously thought to have been driven on the south lode. The information afforded by the No. 4 level winzes, however, now suggests that such is not the case, and that the crosscut will require to be extended to cut this lode.

Brief details of some of the other mines inspected are as follows:—

The Wentworth G.M.—This mine was inspected, but unfortunately the only man present on the lease at the time had never been below before. A large 50ft. ore body had been stoped above the No. 1 level in a manner that suggested a rather flat shoot of ore pitching to the south. I understand it is the intention of the option holders to put down winzes at either end of this level. This mine has crushed 467.50 tons of ore for a return of 233.78 fine ozs., and at the time of my visit had another parcel ready to crush.

The Mopoke G.M.—This mine was also inspected. The lode is large, but apparently mostly very low grade. The owners spoke of applying for permission to hold the mine as a prospecting area instead of a lease, in order to effect a small saving in rent. This mine has produced 586.00 tons of ore for 79.73 ozs. of fine gold.

The Orinda G.M.—This mine was also inspected. The ore body consists of a large sugary quartz. The payable values, however, are confined to comparatively short shoots of ore. The owners admitted that their method of working was a hand to mouth one, and consisted of following a rich shoot until it gave out. No estimate of what ore was likely to be obtained was possible. The production from this mine was 1,835.00 tons of ore for 1,585.82 ozs. of fine gold

The Dark Horse.—This mine was visited, but as the men had knocked off work, an inspection was not made. There were about 10 tons of rich ore at grass to be crushed. The party work an ironstone leader alongside a big quartz reef. Small tonnages only are to be expected from here.

SUMMARY AND GENERAL REMARKS.

The Gimlet mine badly requires a water supply. It seems reasonably probable that the mine estimate of 30,000 tons of payable ore will be obtained, and if the mine continues to develop satisfactorily the mine may continue to be profitably operated for a number of years.

It is proposed to crush 2,000 tons, and use 350,000 gals. of water per month. Mr. Roberts is prepared to guarantee to take 200,000 gals. per month. He estimates that 75 men will be employed at the mine, and 8 on charcoal burning and wood cutting.

I do not consider it safe to assume that the La Fortuna mine will become a producer on anything like a large scale, and I consider the Government will take the risk of very serious loss if it decides to extend the Goldfields Water Supply from Kurrawang to Ora Banda.

With regard to the dam, it must be realised that a certain amount of loss is also quite possible; but on the other hand a freshwater dam in a dry goldfields district is a valuable and, more or less, permanent asset.

With regard to the Orinda mine, I have submitted a sample of the water to the Government Analyst and Mineralogist, whose report is appended.

Until it is tried out by pumping, the amount of water making in this mine is only guess-work.

It might be worth while to spend, say, £100 or £200 to try out this supply, provided satisfactory arrangements can be made with the owners. In view of the experience in other mines in this district, however, I do not feel very optimistic about it.

CERTIFICATE OF ANALYSIS.

One Bottle of Water from Orinda Mine, Ora Banda.

——	Parts per million.	Grains per gallon.
Calcium Carbonate	395	27·65
Calcium Sulphate	506	35·42
Magnesium Sulphate	2,316	162·12
Sodium Nitrate	11	·77
Magnesium Chloride	1,735	121·45
Potassium Chloride	4	·28
Sodium Chloride	10,023	701·61
Silica	*Nil*	*Nil*
3A (Iron and Al Oxides) ...	6	·42
	14,996	1,049·72

Reaction: PH. 7.9; faintly alkaline.

Waters containing appreciable quantities of magnesium salts and nitrates are liable to cause a high consumption of cyanide, unless used in conjunction with lime. Magnesium salts act by destroying the protective alkalinity of the solution and nitrates by oxidising the cyanide. This particular water gave a heavy gelatinous precipitate of basic salts when mixed with cyanide solution.

(Sgd.) EDWARD S. SIMPSON,
Government Mineralogist and Analyst.

11.—GASCOYNE MICA FIELD.

(10/2/1927.)

Acting upon official instructions, I visited this mica field on the 9th, 10th, and 11th December, and have to report as follows.—

Location.

Its location is on the northern side of the Gascoyne River, in the vicinity of Yinnietharra Station, which is approximately 150 miles east of Carnarvon.

Geology and General Description.

The mica-bearing country is a belt of micaceous gneiss, which is known to extend from Pyramid Hill on the south-west, past Lockier Range and Morrissey Hill on the north, on to within a few miles of Mt. James on the south-east. This somewhat crescent-shaped area is roughly 50 miles in length by 15 miles in width (see litho. attached). The gneiss is traversed by pegmatites, many of which are of huge dimensions, and show a remarkable segregation of their constituent minerals. It is common for a pegmatite to consist almost entirely of quartz for a long length and width. Elsewhere it will be almost entirely composed of felspar (albite and microcline). The mica occurs in the form of veins, and also as bunches usually encased in felspar, but occurring near one of the walls of the pegmatites.

Other associated minerals are magnetite, tourmaline, and beryl; crystals of the last named were observed measuring nearly 12 inches across the hexagonal cross section. On the Mica Queen lease, during my first visit to this field Mr. Breen picked up a piece of tapiolite, a tetragonal variety of tantalite.

Operations of the Australian Prospecting and Development Syndicate, Limited.

This syndicate holds mineral claims 39H to 49H and 51H to 61H, and since it commenced operations in May last, I understand, has produced approximately 3¼ tons of mica.

The workings are scattered over a very considerable area. In some instances the rough mica was brought in a distance of over 30 miles to the mica-dressing plant.

The operations of this company are interesting, inasmuch as they represent the only serious attempt that has been made to establish the mica industry in Western Australia.

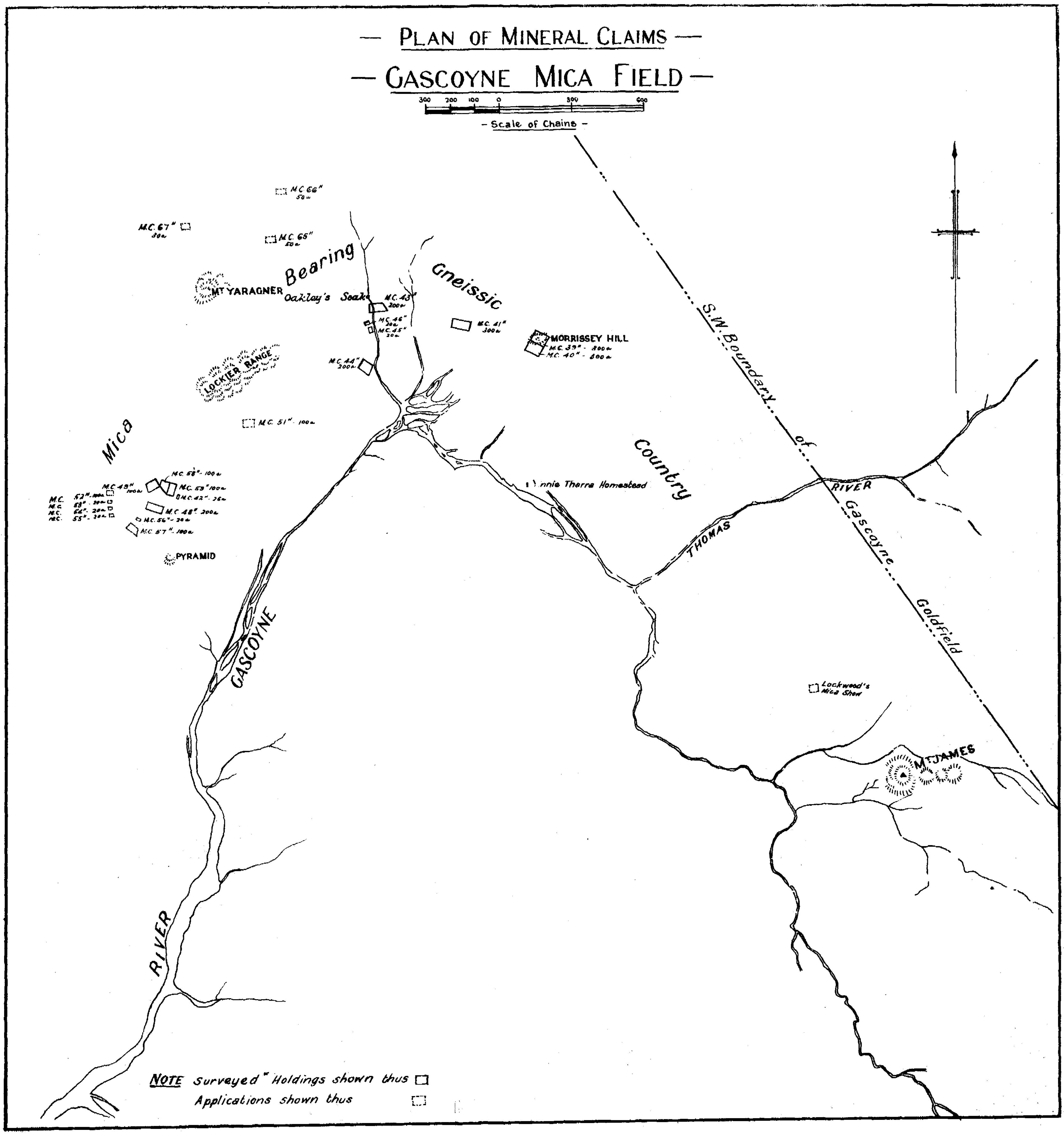
It is to be regretted that after so short a run the company has gone into liquidation, owing over £2,000 in wages, as well as other amounts for stores.

Mr. Coggan evidently began to establish himself for a protracted stay on the field. He put up a bungalow for himself, and a number of camps for his men, as well as a store and a dressing shed for the preparation of dressed mica. He bought a motor car and a motor truck, and generally spent a good deal of money on what he considered to be necessary preparatory expenses. These apparently far exceeded the expectations of the directors, and as after about six months' running the venture was not self-supporting the directors refused to cable the manager any more money.

I could, unfortunately, obtain no reliable information relative to the amounts of ore mined for the various mineral claims and the amounts and quality of the mica won.

I was further handicapped, as Mr. Coggan was not well enough to accompany me to the workings from which he had obtained his mica, with the exception of the open-cut on the Mica King. A Mr. Stephens, who took me to see the other claims, knew where they were and nothing further. The following is a brief description of those visited:—

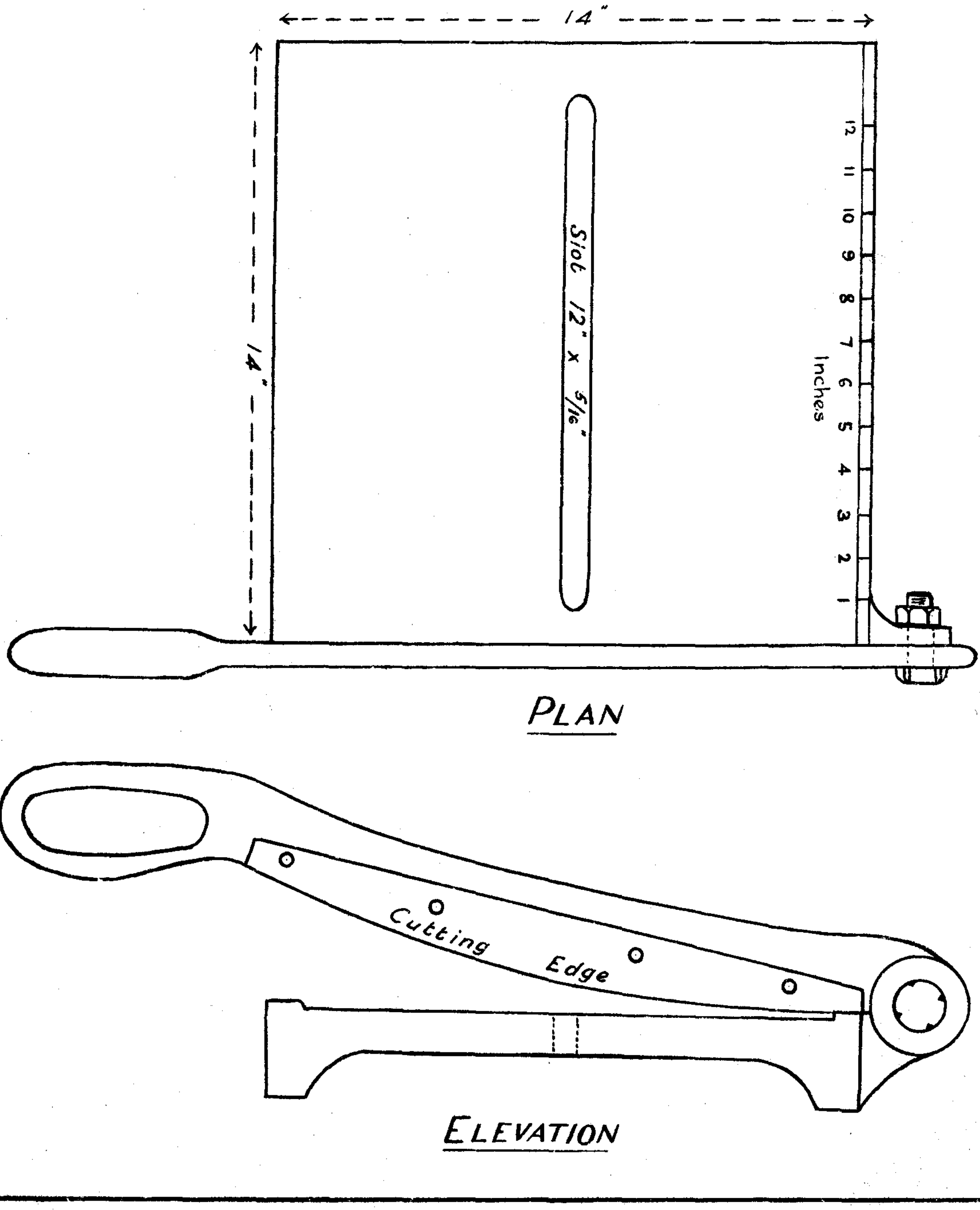
Mica King M.C. 39H.—This mineral claim has an area of 300 acres, and takes in most of the same ground as old M.C. 19H, which is described in my earlier report of 4th May, 1922. At that time a mica vein had been worked by Messrs. Whitlock and Spaven in the form of an open-cut for a length of



PLAN OF MINERAL CLAIMS
GASCOYNE MICA FIELD
300 200 100 0 300 600
Scale of Chains
M.C. 66" 50a
M.C. 67" 30a
M.C. 65" 50a
Mica Bearing Gneissic Country
Mt YARAGNER
Oakley's Soak
M.C. 43" 200a
M.C. 46" 20a
M.C. 45" 20a
M.C. 41" 300a
MORRISSEY HILL
M.C. 39" - 300a
M.C. 40" - 300a
LOCKIER RANGE
M.C. 44" 200a
M.C. 51" - 100a
M.C. 58" - 100a
M.C. 49" 100a
M.C. 59" 100a
M.C. 42" - 26a
M.C. 52" - 100a
M.C. 53" - 20a
M.C. 54" - 20a
M.C. 55" - 20a
M.C. 48" - 200a
M.C. 56" - 20a
M.C. 57" - 100a
PYRAMID
Homestead
S.W. Boundary of Gascoyne Goldfield
THOMAS RIVER
GASCOYNE RIVER
Lockwood's Mica Show
Mt JAMES
NOTE Surveyed" Holdings shown thus
Applications shown thus

MICA CUTTING MACHINE - FLAT TABLE TYPE

Scale:- ¼ Full size



105 feet and a depth of 6 to 8 feet, the average width being about 30 inches. Mr. Coggan has since deepened the open-cut to a depth of about 25 feet in the deepest part, and has taken out the pegmatite for a width of about 7 feet, there being a vein of mica on the footwall in addition to the abovementioned vein, which occurs on the hanging wall. This cut appears to have produced a large proportion of Mr. Coggan's output. The mica is all stained, but occurs in fairly large sheets, the largest cut sheet free from flaws seen by me being about 10 inches x 8 inches. The discoloration is caused by inclusions of magnetite and occasionally tourmaline.

Mineral Claim 40H.—This mineral claim adjoins 39H on the south side, and also contains 300 acres. Some development work has been carried out on a pegmatite bar approximately parallel to that worked on M.C. 39H and about 24 chains south. Two shafts have been sunk on the lode to a depth of about 35 feet, and another to a depth of 12 feet. The lode material consists of felspar and quartz with a little sporadic mica. No workable seams were met with. A vertical shaft (11ft. x 4ft.) was started in country rock 56 feet south of the lode and sunk to a depth of 25 feet. Another vertical shaft of the same dimensions was started on the north side of the lode. On the general prospects of this lease the expense of sinking large vertical shafts did not seem to be justifiable.

This mineral claim contains also the dressing plant, the manager's residence, a store, and a number of camps.

Five Mile M.C. 41H.

Formerly known as the Mica Queen, M.C. 20H. This lease is described in my earlier report; since then some open-cutting has been done on the Mica Queen workings. Some fair mica is now showing alongside the road in an open-cut 14ft. long x 14ft. deep x 4ft. wide. The lode has a strike of 22°. A quantity of apparently fair mica can be seen outcropping a little to the south-west of the cut.

Ten Mile M.C. 43H.

This Mineral Claim is situated about 5 miles west of the Five Mile, and has an acreage of 200 acres. A lode has been worked by means of an open-cut for a length of 42 feet to a depth of 20 to 25 feet in the deepest part, and for a width of 4 to 5 feet. Some good clean ruby mica is showing, and I understand that a few large books were obtained. Apparently, however, a large percentage of the mica is on the small side.

Eleven Mile M.C. 46H.

This Mineral Claim is situated about a mile south of the last-mentioned. The lode, which has a strike a little east of north, has been exposed in two shallow open-cuts. The most northerly is 30ft. long x 7ft. wide x 10ft. deep. Some large mica is showing in this cut, but apparently mostly more or less distorted. A few nice, clean, but smaller pieces are exposed.

The south cut is about 50 feet long and 6 feet deep at the north end, sloping towards the surface going south. Very little marketable mica is showing in this cut.

Thirty Mile M.C. 42.

On this Mineral Claim there is a large pegmatite bar composed mainly of microcline felspar with quartz, and having a strike of roughly 290°. On this bar a certain amount of open-cutting has been done, as per sketch attached. Bunches of mica are showing in the most northern cut, and a mica seam is showing in the southern cut.

Thirty-two Mile M.C. 48H.

On this lease a mica seam having a strike of 105° and dipping to the south-west at an angle of about 40° has been stoped for a length of 70 feet and a depth of 20 feet. The method of working is the company's usual one of open-cutting a certain distance, then putting in a row of stulls and continuing to a greater depth. Haulage is by means of a windlass. The width of the stope is from 3 to 5 feet, but a seam 18 inches in width takes in the best mica, some of which is very clear and of excellent quality: but there does not appear to be much large mica.

Mica-dressing Plant.

The mica-dressing plant is of unusual interest, as it is the only one in this State, if not in Australia. Mr. R. Bray, who was in charge of the dressing plant, explained everything connected with it to me, and I am indebted to him for most of the following information. The treatment of the mica is briefly as follows:—

(1) Rough mica is brought in from the mines.
(2) It is roughly graded into three sizes:
 (a) large,
 (b) medium, and
 (c) small.
(3) It is roughly split ready for final splitting.
(4) This is weighed and taken into the shed.
(5) The final splitting is now done.
(6) The mica is graded into large, medium, and small for the cutting machines.
(7) The mica is cut and graded.

Splitting.

Splitting is done with double-edged knives; a large knife is used for rough splitting, and smaller ones for the final splitting. In splitting, as in cutting, a considerable amount of judgment is necessary. Sometimes there is a flaw on one side of a piece of mica, so that the splitter can get a thick small piece or a larger thin piece. Mica can be split down to one twentieth of an inch or less, depending on its firmness. Clear mica can be split thinner than stained. The splitter passes on to the cutter anything that will yield 1 sq. inch of mica without flaws.

It is customary for two men to rough-split a basketful of mica and bring it in. They each have their own baskets to split into, but in addition they have between them two boxes, one for films and the other for rubbish.

Cutting.

Cutting has been effected by cutting machines, of which there are four types.

Type 1.—There is one power-driven machine, the power being supplied by small kerosene engines: (eccentrics cause one cutting edge to move up and down upon the other after the manner of a guillotine). The sheet mica rests upon a horizontal steel plate, and is slid under the cutter, which on descending cuts the sheet as desired.

Type 2.—There is one so-called big hand machine. This takes two men to operate it, one on the handle of the cutting blade and the other puts the mica into position.

Type 3.—There are two hand flat table leverage machines, similar in principle to type 2 but sufficiently small to be operated by one man. (See sketch attached.)

Type 4.—There are four leverage machines similar to type 3, but with no tables attached.

Of these, I am informed that the flat table machines gave the best results, and that with them one man had cut as much as 25lbs. of mica in a day.

The most cut on the power machine in one day was 28lbs., and on the big hand machine 43½lbs., consisting of medium and large mica.

The average figures are stated to be as follows:—

Big hand machine ..	25lbs. per day.
Power machine	20lbs. per day.
Flat table machine ..	18lbs. per day.

The first 2¼ tons of cut mica were obtained from 19½ tons of rough mica obtained principally from the Mica King workings, and consequently stained. This shows an average recovery of 11.5 per cent. The ruby mica was obtained practically at surface and was more cross-grained, and consequently gave a lower percentage recovery.

It was pointed out to me that there is liable to be more waste in the case of clear mica than in the case of stained, for the reason that, if there is a split piece in the centre of clear mica it has to come out, whereas in the case of stained mica it could not be detected. There appeared to be some 30 to 40 tons of waste mica in heaps around the plant.

Classification and Grading.

(1) Ruby mica is obtained from the Thirty Mile, and classified as follows:—

(a) Slightly stained (S.S.).
(b) Very slightly stained (V.S.S.).
(c) Clear.

(2) Green mica is obtained from the Eighteen Mile, and classified as follows:—

(a) Slightly stained.
(b) Very slightly stained.
(c) Clear.

(3) Stained mica is obtained from the Mica King M.C.

Each of the above-mentioned classes is then graded on the Indian system, according to size, by means of rectangular templates, as follows:—

	Size in sq. inches.
Extra special	60 to 71⅞
Special	48 „ 59⅞
A1	36 „ 47
1	24 „ 33
2	14 „ 23
3	10 „ 13
4	6 „ 9
5	3 „ 5
6	1 „ 3

Each sheet of extra special, special, or A1 mica is packed separately in tissue paper.

Grades 1 to 4 are packed one by one, while
Grades 5 and 6 are spread about in a box.
The boxes hold approximately 1cwt. of mica.

Lockwood's Show.

On Saturday, 11th December, I visited Lockwood's show, situated about 5 miles north-west of Mt. James. I understand that the new company has acquired this mineral claim. With the exception of one pot hole, no work at all had been done, but the large sheets of mica outcropping indicated very favourable prospects.

Mica can be traced at surface for a length of 54 yards along a pegmatite having a strike of 280°. This mica is stained, but not so deeply as that found at the Mica King, and in the rough state sheets 12in. x 12in. are comparatively common.

General Remarks.

The mica-bearing country is a gneiss, and is known to have a length of 50 miles, measured round in a semi-circle, by a width of about 15 miles. The mica occurs in pegmatites, and one cannot fail to be impressed with their size and number.

The amount of mica won per ton of ore mined was unfortunately not ascertainable, but I formed the impression that it would be considerably higher than has been profitably mined elsewhere. According to the "Mineral Industry," during 1925 each ton of saleable mica won from South Africa involved the mining and handling of 1,400 to 1,600 tons of rock.

Mr. Coggan claims that he spent much time and money training men in the art of mica dressing. He says that he now has a party of trained men who are to receive a share of profits, and that the operations of his new company will be a fair guide as to what can be done on the field.

The mining methods so far have been somewhat crude, and resembled those of prospectors following rich shoots of ore in a large lode.

The A.P. & D. Company is in an unfortunate position financially. According to the liquidator, Mr. Broderick, their liabilities amount to approximately £7,000, and of this amount approximately £2,000 is owing to employees for wages. I thought that more money had been spent on preliminary work than was justified. The workings were also so scattered that mining was necessarily expensive. Very little fault could be found with the dressing plant, and in training men to dress mica Mr. Coggan has rendered the State a distinct service. The operations of the new company will be watched with interest, and I am sure that in offering the men a share of the profits Mr. Coggan is on the right lines.

In conclusion, I would like to say that the prospects of successful mining on this field appear to me to be distinctly good. It is a large field, and the small amount of prospecting done up to the present has proved the existence of mica of excellent quality over a wide area.

We are not in possession of particulars of prices obtained on the London market for the early shipments, but we should shortly be advised of those obtained for the 1,986 lbs. of mica shipped on the "Hobson's Bay" on the 11th November.

12.—PROSPECTS OF MINERAL OIL AT CHEYNE BEACH.

(23/5/27.)

The State Mining Engineer.

Acting upon official instructions, I paid a visit to Cheyne Beach, arriving there on the 17th February and leaving on the 21st, and beg to report as follows:—

INTRODUCTORY.

Mr. C. J. R. LeMesurier has held O.P.A. 129H, an area embracing Cheyne Beach, since 11th September, 1924. He was led to believe that mineral oil would be found in the vicinity of this beach by the fact that bitumen—a petroleum residual—had frequently been discovered there, and also by the fact that the rocks exposed at surface over practically the whole of the area consist of sedimentary beds of tertiary age, which in other countries have produced a large proportion of the world's production of mineral oil.

As against this evidence, it has been pointed out that the bitumen has been found at many other places along the southern coast of Australia, but that it has never been found inland, and consequently appears to be sea borne.

It has also been pointed out that where tested nearer Albany, the tertiary beds were not of sufficient thickness to be likely to contain mineral oil in commercial quantities.

Mr. LeMesurier, however, has never lost confidence in the prospects of his area, and recently reported having found plastic bitumen, which he considered could have travelled but a short distance only. In addition, he found what he thought to be the source of the bitumen in the swamps at the head of the rivers which drain into Cheyne Beach.

In view of the fact that no geologist had ever examined this area at all closely, it was thought desirable that I should accompany Mr. LeMesurier to his oil area, see what evidences of mineral oil there were, and furnish a report.

GEOLOGY.

The rocks found outcropping on Oil Prospecting Area 129H are, for the most part, fine-grained horizontally bedded fossiliferous sandstones. These appear to be a continuation of the Miocene Beds found near Albany, and known as the Plantagenet Beds, which have been described by Mr. A. Gibb Maitland as follows:—

"Geology of W.A.," page 48.—"On the southern portion of the maritime areas of the State there is a large development of marine sediments which have been named the Plantagenet Beds, from the Lands Department district throughout which they are so widely distributed. These beds, which do not appear to have attained any greater thickness than 300 feet, were deposited on an irregular surface of granite which forms "bedrock" in this portion of the State. The beds, which are practically horizontal, consist of silt which is often cemented into a somewhat fine-grained sandstone of a uniformly fine grain.

"Siliceous sponges are especially abundant throughout these beds, many complete skeletons of lithistids being obtainable, whilst isolated spicules of the same and of tetractinellids form an important proportion of the whole rock. In addition, gastropods, cephalopods, lamellibranchs, and echinids are found, but, unfortunately, they are too poorly preserved for specific determination.

"The Plantagenet Beds, as exposed in the brick-pit about three miles north-west of Albany, are intersected by a basic dyke which may possibly be in some way connected with those basalts occurring at Bunbury (Fig. 71), and various other localities to the south: viz., the Blackwood River, at Black Point on the south coast near Silver Mount between the Warren and the Donnelly Rivers, and in those recorded in Nos. 1 and 3 bores of the Westralian Mining and Oil Corporation on the Warren River. These may be of middle or late Tertiary Age and belong to the same period as those occurring in South Australia and Victoria."

In the area under review granite can be seen out-cropping along a range of hills running in an east and west direction from Mt. Many Peak to Channel Pt. Granite is also found near the northern boundary of the area at Warriup Homestead, and I understand that it also outcrops along Green Range. In between these granite ranges, which are about 10 miles apart, sedimentary beds only were met with. Some of the fine sandstones were highly fossiliferous, and some specimens were left with the Government Geologist for examination.

Near the coast there were the usual sandhills behind which the country has been described by the District Surveyor as Marlock and Mallee Plains with shallow sandy and gravelly soils overlying either yellow clay or limestone occasional ironstone outcrops—soil 6in. to 2ft. in thickness.

The photographs accompanying this report, for which I am indebted to Mr. LeMesurier, serve to illustrate the general appearance of the sedimentary beds and of the country near the coast.

I noted undoubted evidence at the coast of a raised beach of recent geological age. Quantities of shells partially silicified strongly resembling present day types can be seen ten or twelve feet and perhaps more above present high water mark. These are cemented together and occur at the surface and in crevices in the sandstones which were evidently there at the time the shells were washed on shore. A mass of such shells were examined by Mr. Glauert of the Perth Museum, who described them as a mass of lamellibranch shells composed mainly of Glycymeras Radians, a bivalve species still living off the south and west coasts of Western Australia.

A large gastropod shell much worn seemed to him to be identical with Ceratoptilus lævis Q. & G., a species still living off the south-west and south coasts of this State. He considers the age of the Raised Beach to be about the same as that of those on the coast near Perth, *i.e.*, Pleistocene, or even later.

CONDITIONS NECESSARY FOR THE FORMATION AND RETENTION OF PETROLEUM.

The origin of petroleum cannot yet be said to have been definitely established. Cunningham Craig, who is a strong supporter of the vegetable origin theory, has expressed himself as follows:—

"Petroleum is formed from the remains of terrestrial vegetation accumulated in clays, sands, and actual beds which, under other conditions, would develop into carbonaceous shales, sandstones, and seams of coal or lignite by natural processes which can be not only reproduced in the laboratory, but can also be proven to have taken place in the past, and are taking place at the present day."

The essential conditions, he goes on to say, are: great pressure, comparatively low temperature, and a limited amount of water.

Whether this is strictly correct or not the following two essential conditions for its formation and retention may be regarded as being well established, viz.:—

(1) A very considerable thickness of sedimentary beds.

(2) An impervious covering over the oil-bearing strata to prevent its escape.

The nature and thickness of the beds of the area under review can only be determined by boring. Where exposed the beds consist of fine sandstones which would not prevent the escape of oil. The nearest bores that the writer has any record of are near the Albany-Perth railway line, details of which are set out hereunder.

Under the heading of "Boring for coal near Albany," the Government Geologist, Mr. A. Gibb Maitland, in 1900, expressed himself as follows:—

"It having been held by the residents of Albany that coal might possibly be discovered in the neighbourhood, the Government was approached with the view of obtaining advice from the Department as to the most likely spots upon which to conduct boring operations. To this end the then Assistant Geologist, Mr. Blatchford, was instructed to proceed to the district to locate at least two likely areas in which to bore for coal. An examination having previously been made of the country to the eastward of Albany as far as Cape Riche, * with the object of reporting upon the possibilities of the occurrence of coal deposits, Mr. Blatchford's operations were of necessity somewhat circumscribed.

"A careful examination of the central and southern portions of the country between the Stirling Range and the Pallinup River was made. Two well-defined depressions, separated by a granite ridge, trending approximately east and west, were known to occur within the area under examination. The more southerly of these lies to the north of the Stirling Range (Fig. 1), and embraces a series of lakes. The other depression extends from Lake Toolbrunup to the westward, and crosses the railway line at a distance of about 84 miles from Albany. A minor depression is traversed by the railway at the 79-mile post. A bore previously put down in this depression showed that the valley was filled with beds of clay, sand, and mud, 76 feet in thickness, and that the deposits rested upon a surface of decomposed granite, which latter was penetrated for 35 feet.

"The contour of the country examined by Mr. Blatchford showed that the most likely spots, near Pootenup, in which sedimentary rocks—possibly associated with coal seams—might have accumulated, were the two main depressions to which allusion has previously been made.

"Having this in view, the Assistant Geologist selected three sites for experimental boring, viz.: (a) A spot one mile to the east of Lake Munrilup; (b) a locality three miles to the south-east of Lake Munrilup, in the vicinity of the Salt Lakes; and (c) a spot in the vicinity of the 84-mile post, on the Great Southern railway line."

The following are the particulars of the strata pierced in two of these bores:—

A.—ONE MILE EAST OF LAKE MUNRILUP.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Sandy clay	16 0	0 0
Light blue clay (very tough) ...	49 0	16 0
Dark mud, impregnated with decomposed vegetable matter ...	45 0	65 0
Decomposed granite	10 0	110 0
Total	120 0	120 0

B.—THREE AND A-HALF MILES SOUTH-EAST OF LAKE MUNRILUP.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Blue and white clay, with coarse grit	39 0	0 0
Yellow clay with bands of lime deposit	23 0	39 0
Coarse sandstone	3 0	62 0
Decomposed granite	6 2	65 0
Total	71 2	71 2

In all 16 bores appear to have been put down in the vicinity of Albany in search of coal. For convenience of comparison the particulars furnished by the Department of Public Works in connection with this question are attached. The approximate location of these bores is shown in Fig. 1. The deepest bore was carried down to a depth of 234 feet; and in all cases the floor of older crystalline rocks upon which the beds were laid down was unequivocally reached.

NO. 1 BORE, 15½ MILES FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Sand and mud	38 0	0 0
Light brown shale	59 0	38 0
White pipe-clay	16 0	97 0
Quartz	0 3	113 0
Decomposed Diorite (?)	37 9	113 3
Total	151 0	151 0

* The country between Cape Riche and Albany. A Gibb Maitland. Annual Progress Report of the Geological Survey for the Year 1898: Perth, By Authority, 1899. P. 29.

No. 2 BORE, 17¾ MILES FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Soil	1 0	0 0
Soft white sand	42 0	1 0
Brown Shale	11 0	43 0
Compressed sand	13 0	54 0
Decomposed diorite (?)	13 0	67 0
Total	80 0	80 0

No. 3 BORE, TORBAY JUNCTION.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Drift sand	92 0	0 0
Hard blue clay	4 0	92 0
Drift sand	38 0	96 0
Decomposed Diorite (?)	17 0	134 0
Total	151 0	151 0

No. 4 BORE, CHORKERUP.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Soil and sand	3 0	0 0
Green sandy clay	60 0	3 0
White sand	51 0	63 0
Decomposed diorite (soft)	25 0	114 0
Total	139 0	139 0

No. 5 BORE, 79-MILE PEG FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Surface clay	10 0	0 0
Sandy clay	38 0	10 0
Black mud	15 0	48 0
Coarse drift sand	13 0	63 0
Coarse sand with clay bands ...	59 0	76 0
Decomposed granite	60 0	135 0
Very hard granite	1 0	195 0
Total	196 0	196 0

No. 6 BORE, *vide* (A) above.

No. 7 BORE, *vide* (B) above.

No. 8 BORE, 9 MILES EAST-SOUTH-EAST OF POOTENUP.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Yellow clay	14 0	0 0
White sand	6 0	14 0
Pink clay with grit	4 0	20 0
Blue and yellow clay	16 0	24 0
Decomposed granite	8 0	40 0
Total	48 0	48 0

No. 9 BORE, ONE MILE WEST OF 15½-MILE RAILWAY PEG FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Ironstone conglomerate	2 0	0 0
Clay	20 0	2 0
Red sand	21 0	22 0
Red and white sand	94 0	43 0
Soft black mud	7 0	137 0
Hard brown shale	81 0	144 0
Coarse black sand	7 0	225 0
Decomposed granite	2 0	232 0
Total	234 0	234 0

No. 10 BORE, TWO MILES WEST OF 15½-MILE RAILWAY PEG FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Ironstone conglomerate	2 0	0 0
Clay	12 0	2 0
Red sand	6 0	14 0
Red and white sand	92 0	20 0
Soft grey sand	12 0	112 0
Brown Shale with hard bands ...	77 0	124 0
Decomposed granite	14 0	201 0
Total	215 0	215 0

No. 11 BORE, 3½ MILES WEST OF 15½-MILE RAILWAY PEG FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Ironstone conglomerate	3 0	0 0
White sandy clay	25 0	3 0
Fine red and white sand ...	45 0	28 0
Brown shale	77 0	73 0
Decomposed granite	12 0	150 0
Total	162 0	162 0

No. 12 BORE, 6 MILES WEST OF 15½-MILE RAILWAY PEG FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Yellow sand	55 0	0 0
Ferruginous sandstone	0 6	55 0
Yellow sand	12 6	55 6
Brown shale	14 0	68 0
Coarse dark sand	12 0	82 0
Brown shale	19 0	94 0
Coarse dark sand	3 0	113 0
Decomposed granite	5 0	116 0
Total	121 0	121 0

No. 13 BORE, 24-MILE RAILWAY PEG FROM ALBANY.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Surface sand	2 0	0 0
Ironstone conglomerate	4 0	2 0
Sandstone	47 0	6 0
Fine sand (?) Incoherent sandstone	61 0	53 0
Decomposed granite	26 0	114 0
Total	140 0	140 0

No. 14 BORE, 4 MILES EAST OF MOUNT BARKER.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Soil and gravel	2 0	0 0
Soft sandstone	3 0	2 0
Decomposed granite	35 0	5 0
Total	40 0	40 0

No. 15 BORE, ONE MILE SOUTH OF EASTWOOD.

Nature of Strata.	Thickness.	Depth.
	ft. in.	ft. in.
Dark sand	61 0	0 0
Dark sandy mud	48 0	61 0
Decomposed granite	21 0	109 0
Total	130 0	130 0

It is significant that the deepest bore was carried down to a depth of 234 feet, and in all cases the floor of the old crystalline rocks upon which the beds were laid down was unequivocally reached.

It does not follow that the same conditions must necessarily prevail in the area under review, but the bores afford the best guide that we have of what may be expected. There is a certain amount of presumptive evidence that Mr. LeMesurier is correct in assuming that the beds are thicker in his area. They are certainly found from two to three hundred feet above sea level a few miles from the coast, and Mr. LeMesurier reports having bored into them to a depth of 50 feet at the coast.

THE EVIDENCES OF OIL ON THE AREA.

I will now review the evidences of oil pointed out to me, explain where samples were taken, and give the results of analysis by Dr. Simpson, Government Mineralogist and Analyst.

A Mud Volcano near Warriup.—About a mile from Warriup a quantity of mud had been brought to the surface in such a way as to form a crater. This occurred in granite country, and had no doubt been formed by the action of water. It obviously had no connection with the presence of mineral oil.

Supposed Bitumen from Lake south of Warriup Homestead.—The material collected in my presence was found by Dr. Simpson to be of two kinds, viz.:

(a) Lustrous and dense, of brownish black colour. This consisted of—

Silica	21.16	per cent.
Iron oxide	24.28	„
Sulphur	1.82	„
Organic matter and water ..	52.74	„
	100.00	„
Density	1.87	„

The organic matter appeared to be derived from peat or diatomaceous earth. It was insoluble in all the organic solvents tried. It is a siliceous concretion from a peaty or infusorial swamp.

(b) Dull black material showing the typical interlacing fibres of banksia wood, and is probably banksia charcoal.

Black Beach Sand west of Bluff River.—This was tested to see if it might be bituminous. All tests showed the black constituent to be charcoal.

Swamp Material from Bluff River.—This sample was taken at Mr. LeMesurier's request and consisted for the most part of a green and white fibrous growth and had a jelly-like appearance. He said that his tests had yielded mineral oil.

Extraction with petroleum ether gave .191 per cent. of a yellow wax of strong seaweed odour. The unsaponifiable matter amounted to .066 per cent. of a greenish wax, soluble in warm acetic anhydride, of vegetable origin. There was no indication of mineral oil in the sample.

Carbonaceous Sandstone near Coast west of Bluff River.—This sample yielded .012 per cent. of a pale yellow waxy material to petroleum ether. On saponification .009 per cent. of unsaponifiable matter was obtained. This was soluble in warm acetic anhydride and was of vegetable origin. No indication of mineral oil was obtained.

Pieces of Board with Bitumen attached.—These were two of a number of boards which had recently been washed ashore near Bluff River, and which had pieces of more or less plastic bitumen attached to them. I was also shown one flat piece of quite flexible bitumen, about half an inch thick and perhaps a foot square. Mr. LeMesurier attached considerable importance to this occurrence. His surmise was that bitumen had oozed out of a crack or fissure in the sea-floor a short distance from the shore, and that it had become attached to any pieces of wood which were washed in over it. He said that the bitumen can at low tide be seen as a dark patch under the water, and that he intended to get divers to secure some of it.

Dr. Simpson's analysis of bitumen was as follows:—

Sample No. 7—Portion of a deal board with a little adhering.

Sample No. 8—A piece of jarrah (apparently water-worn) with a good deal of bitumen caked on it.

In both cases the bitumen was carefully detached and analysed with the following results:—

	No. 7. Piece of deal.		No. 8. Jarrah piece.	
	%		%	
Soluble in petroleum ether	61·70	Bitumen 88·59	66·95	Bitumen 97·56
Residue soluble in carbon bisulphide	26·89		30·61	
Insoluble organic matter	11·41	Chiefly inorganic	0·38	
Earthy matter (sand, etc.)			2·06	
	100·00		100·00	
Specific gravity	1·195		1·104	
Phenols	absent		absent.	

The small amount of insoluble organic matter (free carbon) and the absence of phenols indicate that both samples are not the result of any manufacturing distillation process, either from petroleum oils or coal tar, but are soft asphaltums of natural origin similar to those which have previously been found along the south coast and presumed to have been transported there from external sources.

The bitumens on samples No. 7 and 8 are undoubtedly derived from petroleum."

Origin of Bitumen.—I may explain in the first place that bitumen is formed by the inspissation or drying out of petroleum. It may be regarded as the residual product of natural distillation after the more volatile fluids have been given off.

In 1915 a contribution on asphaltum (bitumen) from the southern coast of Australia by E. S. Simpson was published in Geological Bulletin No. 65. The following tables have been taken from this publication:—

TABLE I.—COMPOSITION OF FOREIGN ASPHALTUM AND RELATED SUBSTANCES.

—	Asphalt, Pitch Lake Trinidad.	Asphalt, Pitch Lake Trinidad.	Maltha, Mexico.	Asphaltum Bermudez, Venezuela.	Gibsonite Uinta Co., Utah.	Tabbyite Tabby Cam., Utah.
Moisture	·07	·07	...	·18	·35	·91
Soluble in Petroleum Spirit*	41·00	33·7	87·12	34·40	61·70	58·50
Bitumen insoluble in Petroleum Spirit†	19·36	18·63	10·19	56·54	37·94	36·13
Non-bituminous Organic matter ...	3·94	10·85	2·40	3·74	none	·72
Earthy matter	35·70	36·72	·29	5·32	·36	4·65
	100·07	100·00	100·00	100·18	100·35	100·91
Sulphur	4·22	6·16	1·48	4·70	·52‡	1·24
Specific Gravity	1·372	...	...	1·05	1·018	1·006

—	Asphaltum Hasbaya, ? Syria.	Maltha Alcatraz, California.	Manjak Barbadoes	Artificial Petroleum Pitch, California.	Coal-tar Pitch Source. ?	Coal-tar Pitch Source ?	Wood-Pitch Stock.
Moisture	...	...	...	...	...	...	...
Soluble in Petroleum Spirit * ...	48·16	89·1	97·00	64·5	15·86	22·44	91·46
Bitumen insoluble in Petroleum Spirit †	51·16	10·4		21·2	83·66	75·36	7·70
Non-bituminous Organic matter ...	traces	trace	·68	13·7			
Earthy matter	·68	·5	2·32	·6	·48	·20	·84
	100·00	100·00	100·0	100·00	100·00	100·00	100·00
Sulphur	6·13	1·32	...	·74	·59	·69	·01
Specific Gravity	...	...	1·123	...	...	...	...

* "Malthene" of C. Richardson. † "Carbene" of C. Richardson. ‡ Often much higher.

TABLE II.—COMPOSITION OF ASPHALTUMS FROM THE SOUTH COAST OF AUSTRALIA.

—	Mouth of Warren River.	Near Warren River.	Doubtful Island Bay.	Albany Harbour.	South Coast of W.A.	Ocean Beach, near Esperance.	Kangaroo Island, S.A.
G.S. Museum No.	3429	...	4448	6677	6648	5308	...
Moisture	·56	·58	·6	·73	·50	·06	·40
Soluble in Petroleum Spirit	49·47	49·44	47·00	56·48	45·56	43·94	47·57
Bitumen insoluble in Petroleum Spirit	49·37	49·33	51·88	42·22	53·74	55·38	51·62
Non-bituminous Organic matter ...	none	none	none	trace	trace	·52	·20
Earthy matter	·60	·65	·50	·57	·20	·10	·21
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Sulphur	...	...	...	...	3·32	3·70	...
Specific Gravity	1·05	1·04	...	1·039 to 1·44*	...	1·0492 to 1·0506	1·0269 to 1·0507
Analyst	Simpson.	Simpson.	Simpson.	Simpson.	Simpson.	Bowley.	Bowley.
Description	Hard exterior, softer centre, solid throughout	Like 3429	Like 3429	Soft semi-fluid interior, somewhat harder exterior.	Fairly hard and brittle.	Like 3429	Like 3429. Analysis made of harder portion. 9,1·0507.

* After exposure to the air in small fragments. Fresh fragments from the centre of the masses floated for some time in brine, ranging between 1·025 and 1·032. This was in part, but not wholly, due to enclosed and attached air bubbles.

It will be noted by comparison that the bitumen found on the south coast of Australia is remarkably free from non-bituminous organic matter, while that from Trinidad, for instance, contains 10.85 per cent. (consisting of rotten vegetable matter, etc.). Most natural asphalts have considerable quantities of sand, clay, or other earthy substances entangled in the mass, and only those which have collected in open fissures in firm rocks are as free from earthy matter as the asphaltum of the southern Australian coasts.

The similarity of the bitumen from the various points along the coast and its dissimilarity to most well known deposits is an argument in favour of its local origin.

The following paragraph, however, taken from the same contribution by Dr. Simpson shows the possibility of the bitumen having been transported from considerable distances, viz.:—

"L. K. Ward has recently stated that* 'the specific gravity of sea water is, in the Southern Ocean off the coast of South Australia, about 1.0285.' The temperature at which this specific gravity was taken is not stated, but we may assume that the maximum density attained by the water of this ocean in the winter is 1.0290. From the nature of the specimens of asphaltum from the South Coast, which have been examined, it appears highly probable that, prior to its exposure to the air, it was all of the semi-fluid type, having a specific gravity (when free from sand grains) not greater than 1.027, as indicated by experiments made with the Albany and Kangaroo Island material. The original specific gravity may well have been still less, the freshest fragments experimented with having had abundant opportunity of losing part of their lighter and more volatile constituents. The Government Analyst of South Australia† has noted specific gravities as low as 1.017 and 1.018. There is no doubt, therefore, of the capacity of the ocean to float and distribute this material, and the probability of its having done so is emphasised by the constant association with it of such sure ocean drift as angular fragments of pine resin, New South Wales kerosene shale, beeswax, etc. Ward gives a map‡ of the ocean currents round the coasts of Australia, from which it appears that a westerly current passes along the south coast of Australia from near the western end of Bass Straits to Cape Leeuwin. It seems reasonable to believe that the widespread occurrence of small quantities of asphaltum of one fixed type along just this stretch of coast is due, not to innumerable local sources of supply, but to the distributing effect of this current on material derived from a limited number of sources."

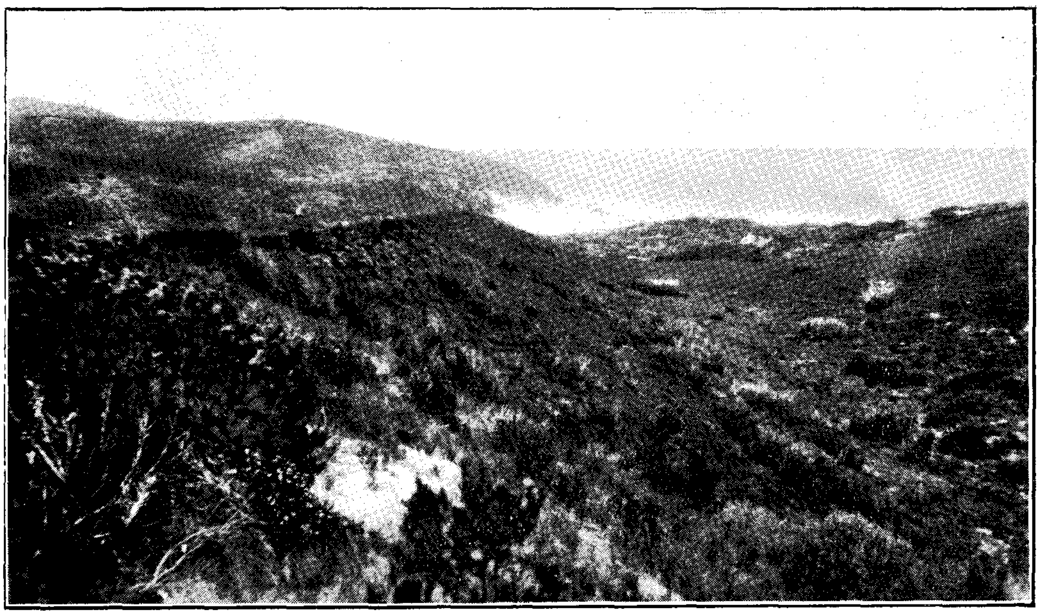
SUMMARY AND CONCLUSIONS.

The area under review is covered almost entirely by sandstones, probably portion of the Plantagenet Beds of Miocene Age. These beds where they have been tested by boring near the Perth-Albany line are comparatively shallow—under 250 feet—and rest on a granite floor. They appear to be somewhat thicker in the area under review.

There is no official record of any bitumen or petroleum derivative having been found on the area or anywhere inland in the southern portion of the State. A local resident assured me that she knew where there was some; she may, however, be mistaken, as many others have been.

A considerable quantity has been found, in the form of lumps, on the beach; one piece weighing about a pound was picked up during my visit at the mouth of the Cordinup River, besides a number of smaller pieces.

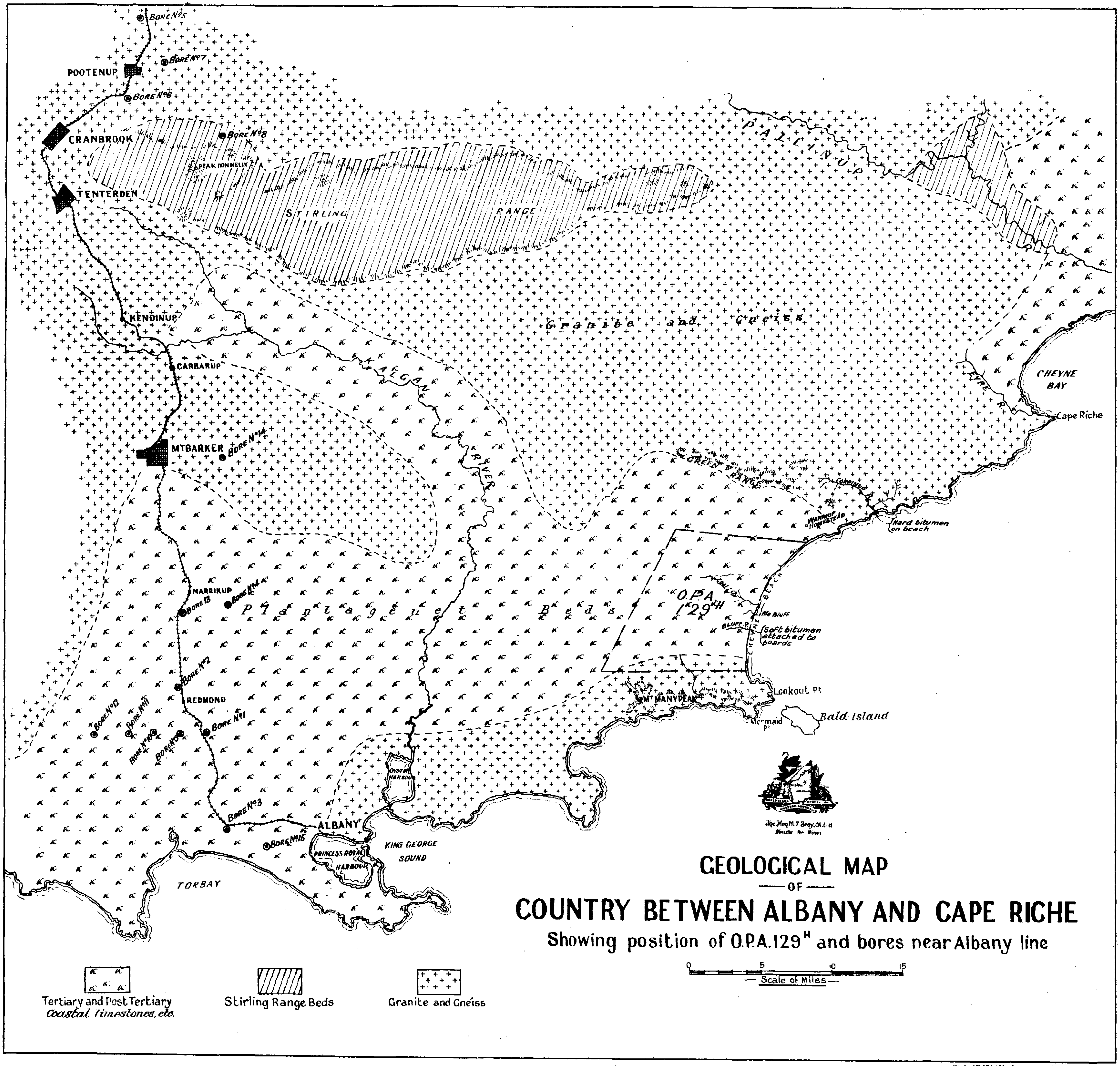
* Loc. cit. p. 14. † Quoted by Ward, ibid. ‡ Ibid, p. 25.



Mouth of Bluff River.

Miocene Beds near Warriup.

Mouth of Cordinup River where bitumen has been found.



FRED. WM. SIMPSON, Government Printer, Perth.

Mr. Montgomery's comments on this asphaltum are as follows:—

"The asphaltum found at times on the beach, and of which Mr. LeMesurier has a number of samples of unusual size and interest, is, however, on quite a different footing, being an indubitable petroleum product. Similar pieces of asphaltum, however, have been found in considerable quantity all along the south coast of Australia from the Leeuwin to Kangaroo Island, south of Adelaide, and some pieces even as far east as the west coast of Tasmania. Wherever found it has always been on the beaches, and evidently a drifted substance, and no occurrence of it inland is known and none in veins *in situ* in any coastal rock. Its source is quite unknown and entirely problematical, and the principal grounds for any belief that it comes out from fissures in the sea bed somewhere near our south coast are that its occurrence is common on our south coast beaches, and nothing exactly of the same composition has been found elsewhere. So far as I am aware there is no known source of natural asphaltum from which identical natural pitch can be obtained."

Just prior to my visit a number of boards with more or less plastic bitumen attached were washed up on the shore. I should say that it is more probable that these boards came off a boat where bitumen was used for caulking purposes than that they picked up the bitumen as they were being washed ashore, as suggested by Mr. LeMesurier.

Although a number of supposed indications of mineral oil were pointed out to me in swamps, the only real evidence of petroleum was the bitumen on the beach, and as this occurred either attached to sawn pieces of wood, or in lumps in the sand, it had in all instances evidently been transported there. Where it originally came from is a matter for conjecture.

Similar bitumen is stated to have been found along the south coast of Australia for a distance of at least 1,500 miles. Its similarity wherever found, and its dissimilarity to most other well known deposits, is an argument in favour of its local origin from some submarine fissure. Mr. L. K. Ward, Government Geologist of South Australia, has, however, pointed out the capacity of the ocean to float and distribute this material in a plastic state. My own observations have shown that some at least of the bitumen has been brought ashore attached to pieces of sawn timber, but have not assisted in determining where it came from.

In conclusion, I must state that when one considers firstly, that bitumen, the only evidence of oil, occurs along the southern coast of Australia for a length of 1,500 miles; secondly, that there is no authentic evidence of any bitumen or other petroleum derivative having been found inland in the southern portion of the State; and thirdly, that the Plantagenet beds in which mineral oil must be looked for are elsewhere of no great thickness, I cannot take an optimistic view of the likelihood of mineral oil being found on the area under review.

APPENDIX No. 4.

REPORT OF THE COMMITTEE ON SUPPLY OF ELECTRIC POWER TO THE KALGOORLIE MINES

By Messrs. W. H. Taylor (General Manager, Government Tramways and Electricity Supply), A. M. Howe (Superintendent of State Batteries), A. Montgomery, M.A., F.G.S. (State Mining Engineer),

and

MEMORANDUM TO THE COMMITTEE

by A. Montgomery, M.A., F.G.S.

Department of Mines,
Perth, 26th July, 1926.

The Hon. the Minister for Mines, Perth.

Sir,—

In pursuance of your instructions of 14th May, constituting a Committee consisting of Messrs. W. H. Taylor (General Manager of the Government Tramways and Electricity Supply), A. M. Howe (Superintendent of State Batteries), and A. Montgomery (State Mining Engineer), to make investigations relative to the Government's proposals to assist the mines on the Golden Mile towards a reduction of costs by provision of Electric Power at low prices, the Committee have the honour to submit the following report:—

The Committee have investigated the question of supplying electric power to the Mines on the Boulder Belt, and the best means whereby it can be made available at the lowest cost.

The principal mines were visited and much data collected, together with particulars and operating statistics from the Manager of the Kalgoorlie Electric Power and Lighting Corporation, Limited, and much valuable information from other sources.

Three possible methods of providing better supplies of electric power may be given some consideration, viz.:—

(a) by isolated Power Plants at each mine or for groups of adjacent mines, and belonging to such mines,

(b) by enlargement and improvement of the existing Power Station of the Kalgoorlie Electric Power and Lighting Corporation, Limited,

(c) by installation by the Government of a new Central Power Station.

As it is the desire of the Government that power should be available to the mines at a lower cost than that at which they can at present generate it themselves or obtain it from the Power Corporation, we have regarded a material reduction of cost as an indispensable requirement of the proposition.

(a) Separate power plants at each mine, however modern and efficient, cannot provide power as cheaply as it can be supplied from a central power station of modern design. It may be claimed that generating sets driven by internal combustion engines may do so, but consideration of all phases of the question, including capital cost and more especially the important factor of continuity of supply over a period of years under varying local conditions, leads us to believe otherwise.

(b) The plant owned by the Kalgoorlie Electric Power and Lighting Corporation, Limited, at present supplying power to the mines, is operated with wood fuel without mechanical means of firing the boilers, and it cannot be seen where a material improvement can be expected in this direction while log wood is used. For the cheapest power production the most efficient plant must be employed. If it be asked why the corporation could not sell current to the mines as cheaply as it could be generated by the Government, we should answer that in order to have any possibility of doing so they would first have to provide a complete new boiler installation and additional generating sets, and secondly to modify their whole system of transmission to obtain more economical operation. The supply to the mines substations should be at 10,000 volts, 3-phase, instead of, as at present, 550 volts and 3,000 volts. The amount of copper in use between the corporation's power station and the mines is represented in the accompanying photograph, any three of which lines at 10,000 volts would supply the whole mining area, instead of which there is a maze of wire. But if the corporation installed new plant with or without Government assistance it is obvious that the shareholders could not be expected to operate the scheme without any return, and their profits would increase the price of power to the consumers.

(c) After very careful consideration of the ways and means of supplying cheaper power to the mines, the Committee are convinced that centralisation is, without doubt, the correct method of doing so. It is essential for the business success of the undertaking that the Central Power Station should generate all power required for all purposes throughout the whole district, so as to have the greatest opportunity of producing it at a much lower cost than is possible when several power houses of varying types are operated.

We have considered the use of oil-driven generating plant in a central power station, but we are of opinion that the capital cost of such plant would be considerably in excess of that of a steam-driven turbo-generator plant, and the cost of maintenance and operation would not show sufficient saving to justify the adoption of this form of prime movers.

We have also come to the conclusion that the only practicable means of establishing a satisfactory central power station is for the Government to instal and operate it.

Such a power station should be designed for—

(1) The use of pulverised fuel;
(2) the use of steam-driven turbo-generators;
(3) an initial load of 4,000 kilowatts;
(4) and with a suitable transmission system to the mines, etc.

ESTIMATED COST OF POWER STATION.

The estimated cost of a power station and transmission system is as follows:—

	£
Power Station complete with buildings ...	200,000
Transmission system	6,000
Transformers and switchgear	21,000
Total Cost	£227,000

This estimate covers a power station having a plant suitable for a continuous output of 20,000,000 kilowatt hours per annum with the necessary reserve, and the transmission lines to the mines, including a substation at each principal mine with transformers capable of dealing with the various users' requirements. The plainest buildings consistent with safety should be erected, and for their construction steel and galvanised iron are proposed. With the load factor obtainable, such a power station using pulverised Collie coal could produce power for 0.933 pence per kilowatt hour, based on the cost of coal at 37s. 6d. per ton (purchase price, 15s.; railway freight, 22s. 6d.).

OPERATING COSTS WITH COAL AT 37s. 6d. PER TON.

Item.	Per Annum.	Cost per K.W. Hour generated.
	£	pence.
Management	1,500	0·018
Fuel	17,250	0·207
Freight	25,875	0·310
Wages, water, etc.	15,000	0·180
Maintenance	1,200	0·014
	£60,825	0·729

CAPITAL CHARGES.

Interest, 6% =	£13,620	0·204 pence per K.W.H. generated.
Sinking Fund, 1½ % =	£3,405	
	£17,025	

Total cost per K.W. Hour generated = 0·933 pence.

The cost of railway freight on coal from Collie to Kalgoorlie at 22s. 6d. per ton represents a cost of 0.310 pence per kilowatt hour generated in a total cost of 0.729 pence per kilowatt hour.

EFFECT OF REDUCED PRICE OF CURRENT.

The attached schedule shows the kilowatt hours purchased from the Kalgoorlie Electric Power and Lighting Corporation, Limited, during the year ended the 30th June, 1926, by the seven principal mines, the amounts paid, the cost per ton (2,240lbs.) of ore treated, also the cost of the current used, based on a price of 0.933 pence per kilowatt hour, and the saving that would be made.

If the power had been supplied to the mines at 0.933 pence per kilowatt hour, the total saving would have been approximately £40,000.

The South Kalgurli was the only mine that used purchased power for all operations, except winding. Other mines used it for treatment, some wholly and some partly, but they used steam power for air compression and other purposes.

If all the mines used electric power at a cost of 0.933 pence per kilowatt hour for all purposes, except winding, and adopted direct drives wherever possible, thus eliminating unnecessary shaft losses, a very considerable saving in power costs would be eeffcted, amounting to not less than £60,000 per annum.

Electrically-driven air compressors of varying size to suit requirements, cost from £5,000 to £8,000 erected on mines. Information submitted for our consideration indicates that some electrically-driven air compresors using current at 0.933 pence per kilowatt hour show a saving up to 47½ per cent. on existing steam-driven compresors.

RECOMMENDATION.

Provided the Government decides to make cheap electric power available to the district, we recommend that a central power station and transmission system, as outlined in this report, be erected and operated by the Government at Kalgoorlie.

GENERAL REMARKS.

In making this recommendation we wish it to be understood that we are assuming that the prospects of continued existence of the Kalgoorlie field as a gold-producing centre can be regarded as assured for a good many years to come with production of gold not materially less than at present. For this to be counted upon it is evident that reduction in the cost of power is not the only economy which will have to be effected, and there are a great many other considerations also to be taken into account. The State Mining Engineer has prepared the appended memorandum on this aspect of the matter, having special reference to the mining and metallurgical prospects of the field, and we are taking it from this, in recommending the power station, that there is at least a reasonable prospect that somewhere about the present gold production can be maintained.

The Government, by owning and operating a power plant, can supply current at a rate which will be of substantial benefit to the mining industry, and thereby give assistance in the most useful form. The Government would be in a position to render additional asistance is considered desirable, by supplying current at a figure governed by the freight rates on fuel paid to its Railway Department.

A fine example of what can be done with electric driving under good conditions of layout was made evident by an inspection of the treatment plant of the Lake View and Star Company at Chaffer's Mine. This plant is in a position to take the fullest advantage of a reduction in the cost of purchased power. Other plants are not so well laid out, and in some of them many instances of inefficient drives were outstanding. The extended use of individual drives might with advantage be adopted with a consequential saving in shaft losses. These points may perhaps be outside the scope of this report, but are mentioned with a view to emphasising that while power may be obtainable by the mines cheaply, it should not be used inefficiently.

If, in the future electric winders should be required, the power station could provide for such load by installing an additional generating unit. With complete electrification of all the power-absorbing equipment on the mines and the elimination of steam boilers a considerable saving in cost must inevitably result. The numerous wood-fired steam boilers now in use show a huge waste of fuel.

We think most of the mining companies would be prepared to electrify all their power-absorbing machinery in the near future, with perhaps the exception of their winders. The municipalities of Kalgoorlie and Boulder, and all other consumers would, of course, be constrained to avail themselves of the cheaper power.

We desire to thank the Chamber of Mines, the Managers of Mining Companies and the Power Corporation, and others who have rendered assistance to the Committee by supplying information and statistics.

We have the honour to be,

Sir,

Yours faithfully,

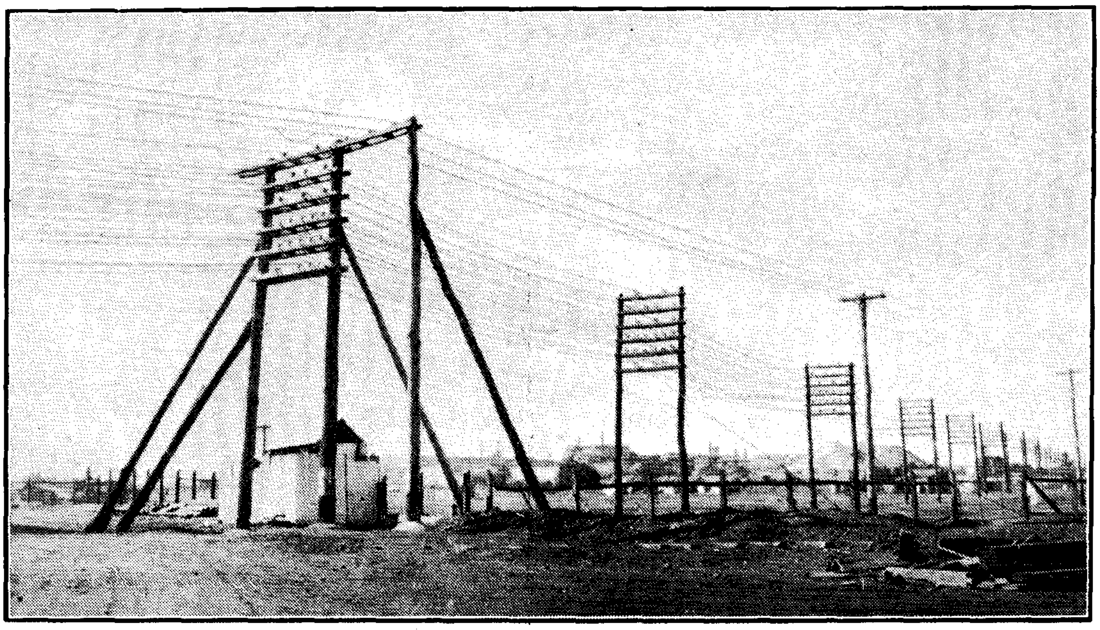
(Sgd.) A. MONTGOMERY.

A. M. HOWE.

WILLIAM H. TAYLOR.

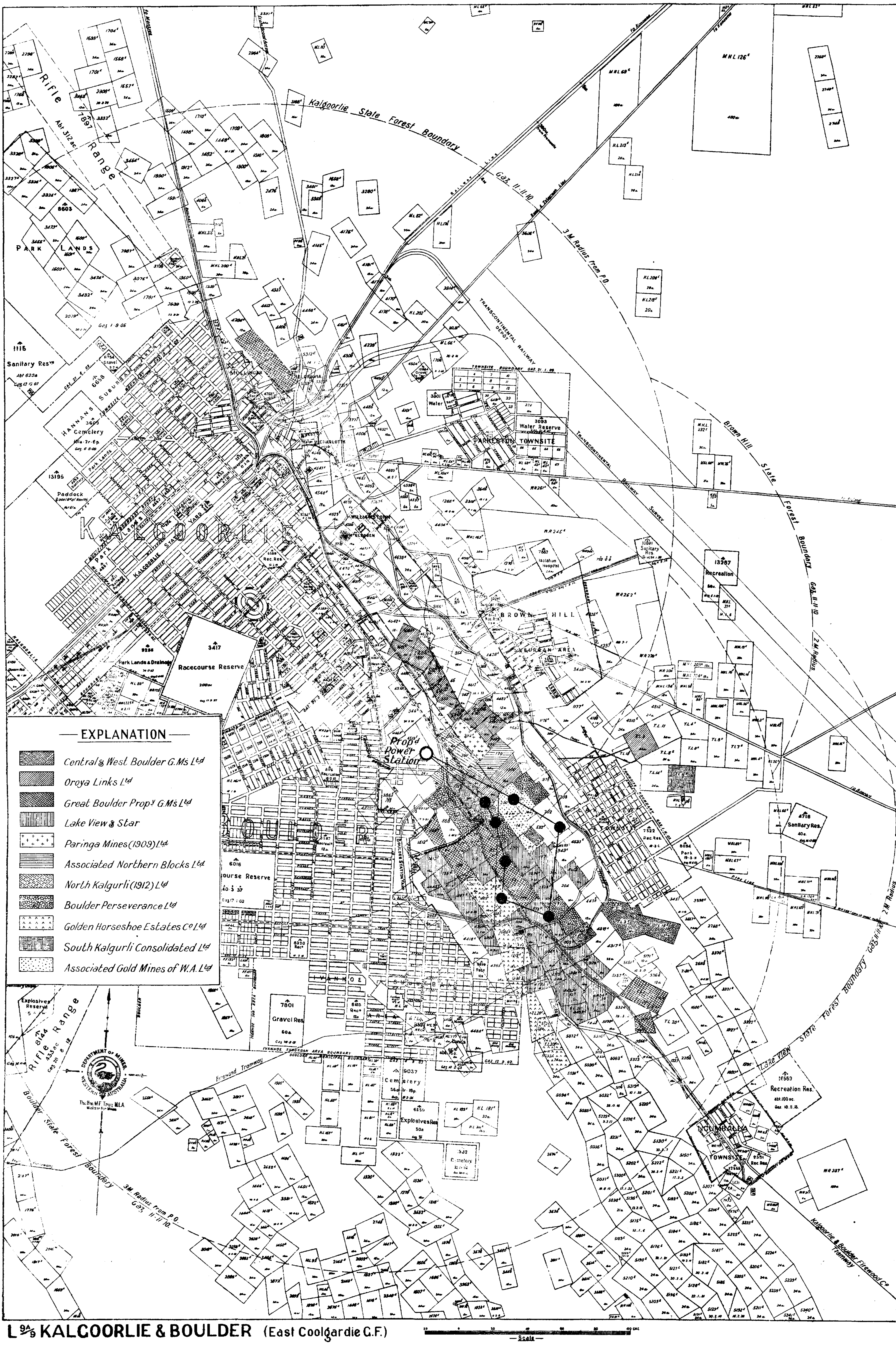
SCHEDULE.

	Year ended 30th June, 1926.					Comparison, assuming current to cost 0·933 pence per K.W. Hour.		
	K.W. Hours purchased.	Price paid per K.W.H.	Cost.	Ore treated.	Cost per ton of ore treated.	Cost.	Saving.	Cost per ton of ore treated.
		pence.	£ s. d.	Tons (2,240lbs.)	s. d.	£ s. d.	£ s. d.	s. d.
Associated ...	1,042,190	1·72	7,469 0 7	55,566	2 8·2	4,051 10 3	3,417 10 4	1 5·4
Boulder Perseverance	2,478,901	1·555	16,072 3 11	60,910	5 3·3	9,636 14 6	6,435 9 5	3 1·96
Great Boulder ...	603,573	1·87	4,702 16 9	112,281	0 10·0	2,346 7 9	2,356 9 0	0 5·0
Golden Horseshoe	71,998	2·49	746 11 3	88,902	0 2·0	279 17 10	466 13 5	0 0·7
Lake View and Star	6,182,971	1·46	37,733 19 3	132,892	5 8·1	24,036 5 11	13,697 13 4	3 7·3
Oroya Links ...	1,558,619	1·615	10,499 12 8	38,171	5 6·0	6,059 2 7	4,440 10 1	3 2·0
South Kalgurli ...	3,979,412	1·453	24,098 16 2	95,631	5 0·4	15,469 19 3	8,628 16 11	3 2·8
Totals ...	15,917,664	...	£101,323 0 7	584,353	...	£61,879 18 1	39,443 2 6	...



KALGOORLIE.

Present Transmission Line to Mines.



L 9A/9 KALGOORLIE & BOULDER (East Coolgardie G.F.)

Scale

MEMORANDUM TO THE COMMITTEE ON SUPPLY OF ELECTRIC POWER TO THE KALGOORLIE MINES, BY THE STATE MINING ENGINEER, ON THE PROSPECTS OF MAINTENANCE OF GOLD PRODUCTION IN THE KALGOORLIE DISTRICT.

Office of the State Mining Engineer,
Department of Mines,
Perth, 3rd August, 1926.

In considering better and cheaper Power Supply to the mines of the Kalgoorlie Goldfield by establishing a good modern Central Electric Power Station there, one of the most essential factors of the problem from a business point of view is obviously the probable duration of the life of the station, and as there are other industries in prospect in the district which might serve to use electric power extensively in the event of mining failing to require it, it is manifest that the expectation of life of the Station must depend on the duration of that of the principal productive mines. The following table exemplifies the serious rate at which gold production has been falling off in the East Coolgardie Goldfield during the last twenty years, the figures being given for every fifth year:—

Annual production of ore and gold, therefrom, in the East Coolgardie district shown at five year intervals for the last 20 years.

Year.	Ore treated.	Gold therefrom.	Value.
	Tons (2,240lbs.).	Fine ozs.	£
1905	1,288,953·59	993,790·58	4,221,354
1910	1,635,511·72	776,266·88	3,297,372
1915	1,596,697·51	666,537·96	2,831,273
1920	724,521·83	400,953·88	1,703,144
1925	562,912·87	304,482·38	1,293,359

It cannot be said that a turn for the better in our gold production is yet in sight, and it is in order that the serious decline may be stayed as far as possible and induced to change to an upward movement that the Government are considering the advisability of providing for power to be made available to the mines of the Boulder Belt at prices which would be a substantial reduction on the best now obtainable. It is held by them that a material cheapening of power prices should be a key to the reduction of many other expenses of gold production besides those of the engine-rooms only, and that by a scheme of this sort they could give more valuable and practical assistance in stabilising the industry than by any other method open to them. The position demands that all possible economies must be made in working costs of every kind, and an almost universal use of electrical power in every branch of mining operations in place of the engines now in use is clearly indicated as one of the most potent factors by which we may hope to bring about really substantial reductions of cost, not only on the surface of the mines, but also underground as well,

As is shown in the foregoing table, the production of ore and gold in the East Coolgardie Goldfield has fallen off heavily year after year for over twenty years past, the decline beginning long before the Great War ,and a good many years before the general rise in costs of labour and prices of commodities, which set in about 1911, as shown in the Commonwealth Statistics. It is clear, therefore, that there has been some general cause in more or less continuous operation all the time which has had the effect of decreasing the production of gold, and this cause has without doubt been the continuously increasing difficulty of obtaining supplies of profitable ore and keeping down working costs. As the mines have got deeper, the general experience has been that the gold values have become more and more segregated into "shoots" and "lenses," becoming much more discontinuous than in the shallower levels, and therefore giving a less yield along the length of each level, while at the same time the average value of the ore below a depth of, say, 1,000ft., has been undoubtedly distinctly less than of that above that level, though there have been many occurrences of very good ore even in the lowest depths at which the lodes have been opened up to any material extent. This feature is, in my opinion, probably due to a certain amount of secondary enrichment of the ore bodies in the shallower parts of the lodes—those affected by the so-called "vadose" circulation of water through the rocks—from gold dissolved in course of the removal by erosion of the upper parts of the lodes, which doubtless extended at one time far above the present surface of the ground, and carried down and reprecipitated in the lower portions. On this theory, it would be expectable that the first 800 to 1,000 feet in depth of a gold lode would be likely to average better and more continuously in gold value than the deeper parts, as is the actual experience. In the deeper workings on the Great Boulder Lode, which is open to the 3,400 feet level in the Golden Horseshoe ground, examination of the assay plans gives the idea that once the zone of such vadose enrichment is passed through, the value of the ore is more uniform at successively deper levels, and is apparently not greatly influenced by depth from the surface. This is said to be the experience also of the deep mines, now approaching 6,000ft. in depth of the Kolar Goldfield in India, which are very similar in essential features to those of Kalgoorlie, and there is, therefore, reason to think that our lodes will most probably carry values down beyond the reach of practical working.

—The downward development of the Great Boulder and Ivanhoe East lodes has, however, been greatly restricted by a geological feature of the field, which has introduced some very serious mining difficulties. This is the great dyke of Felsite or Keratophyre, often loosely called "porphyry," which comes in from the footwall (eastern) side and strikes the Ivanhoe East lode opposite Patterson's shaft, a few feet below the 2,300 feet level. There are several similar dykes in the field, and it appears to be generally accepted that they existed and formed part of the country rock before the gold-bearing lodes were formed, though I am not clear that this has been certainly proved.

The Ivanhoe Main Shaft (Patterson's) has been carried down to a depth of 3,635 feet in the hanging-wall of the lode, to which crosscuts have been driven at 2,420, 2,570, and 2,720ft. levels. In these crosscuts a lode was found in the Keratophyre dyke, in about the proper position for the Ivanhoe lode, but small, weak, and of poor value. Diamond drill bores from plats at the shaft also cut the lode channel in the dyke in about its expected position at depths of 3,064 feet, 3,332 feet, and 3,457 feet, and another, from the 3,470 feet plat, cut three small veins of lode material close to the shaft in the greenstone country, one of them assaying 98s. 9d. a ton over a foot in width, and five larger veins in the dyke rock, one of which, 2½ feet wide, assayed 42s 6d. per ton. A crosscut was then driven out east to the Great Boulder boundary, at the 3,620 feet level, which cut two feet wide of vein matter assaying 17s. close to the shaft in the greenstone, and three bodies of lodestuff 20 feet, 17 feet, and 16 feet wide in the dyke, but all of low grade. Two depressed bores at 39 degrees 14 min. and 60 degrees 15 min. depression from the plat-cut lodestuff, the first 10 feet and 20 feet wide, and two smaller veins, with 10 inches, assaying 63s. 9d. and 9 inches assaying 106s. 3d. per ton, and the second mineralised dyke stuff and lode material 22 feet wide, but very poor. A vertical bore, 462 feet deep, from the 3,620 feet plat tested the ground to a vertical depth of 4,082 feet, and passed through 11ft., 1ft., 8ft., 24ft., and 112ft., of more or less lode material carrying small values in gold. The dyke was struck in the vertical bore at a vertical depth of 3,907ft., and probably had been about half penetrated when boring ceased at 4,082ft. The position and size of the dyke have been well ascertained by the above-mentioned bores, four of which passed completely through it, determining both its western and eastern margins. It is about 280 feet thick, and appears to be much the same thickness deep down as in the upper parts of the mine. Below 3,500 feet its westerly dip appears to flatten a little, bringing it under the shaft a little earlier than if the average dip from surface had been maintained, but it is too early yet to assume that it is now approaching the form of a synclinal fold; the flattening may be only local and temporary. If it should be the beginning of a synclinal bend, the shaft would probably pass through the dyke somewhere under rather than over 4,500 feet, and get into the belt of favourable quartz dolerite country which lies east of the dyke.

The lode matter within the dyke, which is found approximately in the position where the Ivanhoe lode may be expected, has naturally been taken to be that lode, and if this be the case the lode would be small and pinched in the felsite from the 2,400ft. level downwards to the 3,500ft. level, below which it appears to open out into a wide mineralised zone, containing several fairly well-defined larger veins of low-grade lodestuff, and a number of smaller ones, in some of which there is a certain amount of recrudescence of payable values. There are also several veins which seem to be connected with the lode in the greenstone country on the western margin of the dyke. It appears to me that the lode has improved in strength and prospects very considerably below the 3,500 feet level, and that it might be coming out of the dyke on to its western margin, and taking the form of a contact ore body between it and the greenstone. This would be probably a more favourable position for ore than if it remained within the dyke. Opposite the shaft there seems little hope of any great improvement from this cause at less than 5,000 feet. Further south, however, any change for the better should be at a more practical depth. Taking it that these ore-bodies are truly the Ivanhoe East lode, its fissure would seem to have been deflected by the hard, strong dyke, which it does not seem to have been able to penetrate.

The felsitic dyke is traceable for a long distance through the Boulder field and runs a general northwesterly course, while the Ivanhoe East and Great Boulder lodes run about N.N.W. The dyke dips westward a little less steeply than these lodes, and their intersection with it therefore rises going northward, and gets rapidly deeper and deeper going south. It would seem that the lode-shearing movements were able to crack the dyke more or less, but not to cut right through it, the section in the bottom of Patterson's shaft suggesting strongly that the fissure became deflected back to the margin of the dyke, downwards along which would be a likely place to expect its continuation. It would therefore seem that the lode cannot be expected to break through the dyke at all, unless perhaps in the possible event of the latter taking a synclinal bend westwards, when it might be found that the fracture would be able to traverse it and reach the favourable quartz dolerite country known to lie on its eastern side. Any such change for the better, however, must lie so deep that it would be practically impossible to work the lode profitably. The chance of ore making along the western margin of the dyke on its contact with the favourable quartz dolerite seems to be a better one, particularly by coming south along the contact, as the lodes appear to be more or less completely terminated by the dyke going northwards, and to become stronger going south.

The net result of these considerations is that there is little to be hoped from the Great Boulder and Ivanhoe East lodes in their northern portions where they run against the dyke, and that we have to look to the southern continuation of the Great Boulder lode in the south of the Golden Horseshoe and onwards into the Chaffers lease for further supplies of ore from this lode. The prospects of deep ore in the south end seem to be quite good, but the lode will have to be opened up at an early date to, say, 4,000 feet depth to secure good tonnage reserves.

The Ivanhoe Middle lode and Golden Horseshoe No. 3 lode are well away from the dyke, and contain very large reserves below the 2,000 feet level of ore which has not yet been at all well proved, and which so far as we know is of rather low grade. Figures of the values are on page 125 of the Royal Commission report. Recent developments in the Golden Horseshoe, however, have shown that some parts of No. 3 lode contain quite good ore at 2,600ft. depth, and we must look to it for a large proportion of the ore to be worked in the future. The southern end of the Golden Horseshoe lode and the Chaffers and Star leases give good promise of large supplies of good ore below the 2,000ft. level.

The Great Boulder leases east of the dyke have been very thoroughly tested by a large number of diamond drill borings, and seem to contain no lodes until at the eastern boundary some of the Lake View and Boulder Perseverance lodes dip in depth into the Boulder ground.

The long group of lodes extending through the Lake View, Boulder Perseverance, and South Kalgurli leases, the Associated group to the east of them, and the Oroya-Links leases (Kalgurli, Eclipse, Croesus, etc.) to the north, have all fallen off very greatly from their old productiveness as their workings approach 2,000 feet in depth, and it is undoubtedly much harder than formerly to find continuous ore bodies which can be relied upon to provide stone for the mills. There are, however, wonderfully many ore-bodies of greater or less size which are found as work progresses, and which maintain an output year after year from ground in which it cannot be said that there are any proved ore-reserves. In many instances the managers are quite unable to say at any moment that they have any considerable quantity of ore on which they can rely, but at the same time can be very confident that supplies will come to hand at about their usual rate by carrying on their usual operations.

In this eastern portion of the field, however, there is another geological question which has to be taken very seriously into consideration, namely, the influence of the calc-schist country. A wide belt of this rock lies to the east of the lode system and appears to be dipping westerly more rapidly than the lodes, coming therefore into the mines at progressively greater depths as we come westward. It has been, with two principal exceptions, a most unfavourable "country," the lodes becoming small, breaking up, and apparently often dying out when they get into it, and consequently very little hope is entertained by the managers on the "eastern belt" of getting much good ore once their lodes pass well into the calc schist. The two notable exceptions are the Oroya Brownhill shoot, one of the most marvellously rich ore bodies ever found in any country, and the "Croesus" lode, which at 1,000 feet level in the "Eclipse" shaft of the Oroya Links recently sunk shows a fine body of ore about 12 feet thick, and assaying about 30s. per ton. Usually, however, when the calc-schist country is struck, an almost immediate end to the ore is taken to be imminent, and deep sinking on the Lake View and Perseverance group is commonly regarded as practically limited to the depth at which the calc-schist will be struck. For the more westerly portions of the group this depth is not yet ascertained, but in the eastern portions several shafts have already encountered it. It seems inevitable that it must be met with all along the Lake View line within another 1,000 feet of sinking, unless its dip should become much steeper again. The experience of the loss of values and breaking up of the lodes in the calc-schist country has been on the whole so consistent that its generally unfavourable character must be conceded to be established, but it ought to be borne in mind nevertheless that there have been exceptions, and that occurrence of good ore is not at all impossible in it. If the gold-bearing solutions by which the lodes were charged with their valuable contents have arisen, as modern theories suppose, from magmas deep seated down in the earth's crust, they must have found an outlet through the overlying rocks, and along the course of their passage one would naturally expect ore to be deposited. Possibly the Oroya shoot may have been such a passage-way, and others like it may exist. It seems well, therefore, not to accept the apparently unfavourable influence of the calc-schist as necessarily involving that it is useless to persevere with any prospecting development in that class of rock.

ORE RESERVES.

It will be seen from the foregoing that the ore reserves in the principal mines have been very adversely affected by the felsite dyke and the calc-schist country, which rendered valueless large portions of the lodes, which otherwise would have been expected to supply great quantities of ore. In the parts of the quartz-dolerite country which are clear of these unfavourable influences, however, there are still many lodes on which not much work has been done, and which should be more vigorously opened up, and the expectation of new ore being found in the field is far from exhausted. The estimate of ore reserves made by Mr. Kingsley Thomas in his report of his Royal Commission on the Mining Industry, 1925, page xii., to end of 1924, as prospectively somewhat over 5,000,000 tons, is probably still as nearly correct as such estimates can be. He says that this figure "can only be estimated as a fraction of the payable gold contents of the Boulder Belt," an opinion with which there will be very general concurrence among mining men who know the field. Mr. D. F. McAuley, Manager of the Associated Gold Mines, has advised us, for example, that in March, 1910, the reserves in his mine were estimated at 553,000 tons of 7dwt. ore, and that since then 1,448,214 tons have been actually raised, yielding £1,946,138 without any deeper sinking. He cannot now put any very definite figure on the ore in the mine, but continues to maintain a yearly output of 50,000 to 60,000 tons, with every expectation of being able to continue at that rate for an indefinite time to come. Mr. Ernest Williams, General Manager of the Boulder Perseverance, Limited, in his evidence before Mr. Thomas' Royal Commission gave a similar experience. In reply to Question 849, he said: "In 1917, we had 207,900 tons of positive ore in place, 209,848 tons of broken ore in reserve, and 320,980 tons of probable ore. . . . The tributers up to December, 1924, produced 236,504 tons, having an average value of 25dwt. per ton. A large proportion of that ore came from blocks of ore not included in the reserves. The average of the ore reserves worked out at 21s. 11d. in 1917. Yet tributers took out, up to December, 1924, 236,504 tons of ore, averaging 25 dwt. That shows the difficulty of valuing ore in a mine like this. The tributers did very little exploratory work and practically no development work. . . . To-day we are developing and finding ore of good grade where none was expected."

The ore crushed in the East Coolgardie district altogether during 1925 was 562,912.87 tons (2,240lbs.), and for the 12 months from 1st July, 1925, to 30th June, 1926, the seven principal mines crushed 584,353 tons, from which we may say that the present monthly production of ore from all the mines large and small, in the district is, roundly, from 47,000 to 50,000 tons per month. At the latter rate, the Commissioner's estimate of 5,000,000 tons would provide ore for the mills for 100 months, or $8\frac{1}{3}$ years, but further development during that time will doubtless greatly extend the life of the mines. This is a fairly long time ahead to see ore supplies in gold mines, and taken in conjunction with projected economies, which will bring back into the ore reserves a large quantity of stone which has been deleted from them as being just a little too poor to be handled, there are good grounds for forming a strong opinion that the life of the field is sufficiently assured to justify the heavy expenditure involved in the scheme for provision of cheap electric power.

It is highly necessary, however, that the most strenuous efforts should be made by all concerned to bring about all possible improvements in mining and treatment practice which will lessen costs and permit of increased tonnages of ore being handled at grades lower than those which, under existing conditions, are now the lowest profitable. The Royal Commissioner indicated some of the lines on which improvements can be made, and it may be useful to repeat these and discuss some others which seem possible.

Mr. Kingsley Thomas's recommendations were under the following headings:—

(1) *Amalgamation of Properties.*—A certain amount of this has already been done, but the process can be carried much further advantageously, for the reasons put forward by the Commissioner. Other amalgamations are already probable, and if the Electric Power Scheme be adopted, the alterations in equipment consequential thereon would be greatly facilitated and systematised by combination of the owning interests. If, as seems likely, there is a great change imminent in ore-treatment methods, due to general adoption of the froth-flotation process, the case for centralisation of the new plant is a very strong one, and the changes in mill equipment would be best made by a combination of effort among the various owners, rather than by each one putting up his separate mill.

(2) *Development.*—The Royal Commissioner's remarks on this head still hold good, and it is very clear that the time has come for the hoisting capacity of main shafts to be increased, and the mine roadways improved to give quicker and cheaper transport of ore to the shafts. When considering main shafts, it will be well to give attention to the system now often adopted in deep shafts in India and South Africa, of two and three-stage hoisting rather than going to, say, 4,000 feet depth in one lift. The multiple-stage method has numerous advantages which quite outweigh the cost of the supplementary underground hoisting stations. The establishment of main haulage levels at every third or fourth successive ordinary level, equipped with electric transport would also be advantageous in view of the long distances which have to be worked from one shaft when these get to be over 2,000 feet in depth.

(3) *Underground Re-organisation.*—The Commissioner's recommendations under this heading are excellent, so far as they go. The Electric Power Scheme would permit of improvements being carried much further, particularly in regard to more plentiful use of ventilating fans, and of mechanical means of handling ore and filling. For all power purposes underground, electrically driven machines will no doubt largely displace the winding and pumping appliances now driven by compressed air, and at some points may permit of workings distant from the air-mains being carried on by rock-drills supplied with air from small electrically-driven portable compressors brought close to the working faces.

(4) *Power.*—The Commissioner's ideas on Power have developed into the power scheme now under consideration. He highly commends the establishment of a Central Power Plant for the whole requirements of the Golden Mile.

(5) *Surface Transport.*—The Lake View and Star Company are now carrying ore from their mines to their central mill on Chaffers lease with a small locomotive and railway, and a similar method would be very suitable for bringing ore from the various shafts into centrally situated mills. It might be worth consideration whether this might not be done more cheaply and effectively by doing the first stage of crushing at the various shafts, at any rate to a degree of fineness sufficient to enable the ore to be accurately assayed before leaving its parent mine, as accurate assaying will be an essential to any scheme of joint milling treatment, such as is involved in treatment of the output of several mines at one central mill. This would permit also of the use of amalgamation, in cases where this would be advantageous, at the first crushing plants. The transport of the crushed ore to the central mills by pumping with water through pipes, just as tailing is removed to the distant tailing areas, would then probably be cheaper than by the tramways. Under any system of centralised treatment fine crushing of the ore from each mine separately must be the first stage of treatment, in order that the exact value of the stone supplied by each may be ascertained before its treatment is combined with that from other mines. Entirely separate treatment cannot be carried very far in such a mill.

(6) *Treatment.*—The Royal Commissioner was in favour of centralised milling treatment, and whether this be by all-roasting or by froth flotation, in either event there can be no question that a very few completely equipped mills could deal with the whole output of the field much more economically than under the present method of separate treatment plants for each mine. It is highly important that the relative merits of the two systems of treatment should be compared by extended working trials on an equal scale of tonnage, so that one or the other might become the approved standard treatment. The treatment by flotation, if it proved the better, would enable great reductions to be made in the amount of plant required, and would simplify the central mills.

(7) *Administration.*—The need for combination of the numerous separate mine administrations now in operation is stressed by the Royal Commissioner, and is fully borne out by the evidence taken by him. For example, the following figures of one of the large mines are given at page 30 the Commissioner's report:—

OVERHEAD CHARGES.

—	1904.	1914.	1924.
Management and proportion of salaries	£3,983 13s. 4d.	£5,012 16s.	£4,245 0s. 0d.
Total Overhead	£9,221 6s. 0d.	£9,352 9s. 1d.	£9,776 1s. 3d.
Tonnage treated	112,718 tons	190,117 tons	111,514 tons.
Total Overhead per ton	1s. 7·63d.	11·80d.	1s. 9·04d.

The mine development account for 1924 showed 104,933 tons opened up for an expenditure of £9,281 14s. 1d., or 1s. 9·22d. per ton, the overhead charges for the year being almost the same as those on mining development. The total overhead costs were actually greater in 1924, with a tonnage of 111,514 tons, than they were in 1914, when 190,117 tons were treated. Taking the table on page 1 of this memo., it will be seen that there was more than three times as much tonnage treated in the East Coolgardie field in 1905 as in 1925, but the figures of the various mines quoted in the Royal Commissioner's report do not show reductions in the administrative expenses commensurate with the reductions in tonnage. Evidently, a very large saving could be made by amalgamation of administrations. The Commissioner has remarks on page vii. of his report also referring to this item of expenditure.

The Royal Commissioner has given as his opinion that, "I see no reason why costs should not be reduced to below 25s. per ton, and have no doubt that the tonnage of ore treated will be gradually raised to 100,000 tons per month, and the field worked at a profit for another generation."

Filling Stoped Ground.—There is another suggestion not mentioned by the Commissioner which seems to me to be the very first importance in respect of continuing mining to great depths on the Kalgoorlie field, and which I should, therefore, recommend for consideration by those concerned. This relates to the filling of the stopes from which ore has been extracted, which has usually been done by utilising any available waste rock from the mine workings themselves, running down waste rock from old dumps at surface, excavating soft weathered rock from large opencuts on the outcrops of the lodes and passing it down below through mullock passes, and most of all by running down tailing sands from the mills. Where such material can be readily and cheaply put into the stopes the walls become well supported and their pressure is taken by the filling, preventing their movement and collapse. The long stopes to great depths as on the Great Boulder lode would naturally cause serious movements of the wall rock if they were not tightly filled with waste rock of some sort. Where we have a group of nearly parallel lodes like the Great Boulder, Ivanhoe East, and Horseshoe Nos. 3, 2, and 1 within a short distance of each other it is easily seen that as the lodes are more and more worked out the intervening slabs of country rock are left more and more without lateral support, and if the stopes are not well filled the whole sheared zone is likely to move and become greatly shattered, which makes it very difficult to preserve shafts, levels and passes from being crushed and closed up. Great trouble has often been experienced with several of the main shafts from this cause, and ventilation openings and main mullock passes require a great deal of attention to keep them open. It is much easier to send filling from surface down into the first 1,000 feet in depth in the mines than it becomes at lower depths, and it is at the lower levels that serious difficulty is now being experienced in getting filling into the lower stopes. In one instance I heard of it being necessary for filling to be trucked along levels from pass to pass not less than four times, the repeated handling making the work very expensive. As the mines get deeper it takes more and more labour to get the filling directed through the various passes into the stopes to be filled, and the cost may easily become prohibitive For this reason many of the mines are using the method of "shrinkage" stoping whenever it is thought they can do so safely. This system of working did not commend itself to the Royal Commissioner and is strongly opposed by the Miners' Union and the Inspectors of Mines, for reasons set out by a number of witnesses in the evidence taken by the Commissioner. On the other hand, more than one manager has assured me that if he should have to fill his stopes with sand and mullock from the surface, the cost will be too great to be borne and the extraction of ore must stop. They contended that the method was a perfectly good one in suitable situations, and one of the safest during the actual stoping of the ore, as the men working down the ground stand and put up their machines close to the "back" on a footing of broken ore. Only enough of this is drawn off from the level below to keep an open working space over the top of the broken down ore. It has always seemed to me that the method is an excellent one throughout the stage when the ore is being shot down, and that if proper care is taken to break up all big lumps after firing, just as is done in "flat-back" and "rill" stopes in order to make the ore small enough to go down the ore passes, most of the objections to it are removed. It is when the stope is being entirely emptied that danger begins, as then the support is removed from the walls and heavy lumps are apt to fall from them, and others to remain without falling but hanging dangerously so as to make it very risky for men to enter the stope. Where the walls are hard and strong and the ore shoots are short, forming flattened pipe-like bodies, it quite often happens that the broken ore may all be run out without difficulty, and if the cavity left is not too large it may remain open for years without any danger of collapse. But very often the walls collapse early after removal of the ore and fill up the space more or less thoroughly, the rock on each side gradually cracking and settling more and more until the spaces are quite filled. Where there are no other lodes near by, such filling from the walls is often quite harmless, but if other veins are near enough to be affected by the movement of the rock they may be made dangerous to work. The method of working long and large stopes when filling is not available, by leaving numerous pillars of lode matter to support the walls, together with artificial pillars made by filling timber "pig-sties" with waste rock and poor ore, has many features in common with shrinkage stoping of short ore shoots, and is one of the best alternatives to it. Taking out the ground "on timber" without filling, by square-setting or otherwise, is usually too expensive.

There is, however, one modern system of filling which appears to me to offer much the best solution of the difficulty of filling stopes in the Boulder Belt mines. It is that of hydraulic filling, now very extensively used in Europe and America in filling the worked-out ground in collieries. In these the material used for filling is almost any loose waste dirt from the mine and surface sand, clay and gravel, which may be available cheaply, and which is mixed with the minimum of water required to make it fluid enough to run freely through large pipes. Two parts by weight of solids to one part of water are found to serve very well if the angle of downward inclination of the pipes is more than 15 degrees from the horizontal. In the Simmer and Jack mine in the Witwatersrand the system has been very successfully used, as described by the manager, Mr. F. Dunning, at page 45 of the Bulletin lately published by this

Department giving Mr. Inspector Phoenix's report on "Methods of Dust Determination and Elimination in South African Mines." In this instance battery sands are used for the filling, at a cost of 7.45 pence per ton for filling. How far mill tailing sands can be employed at Boulder depends on the extent to which fine grinding of the ore is carried, and it is important to determine in every case to what degree of fineness of grinding the milling treatment should be carried so as to give the best financial result. There seem often to be better returns obtainable by not carrying the grinding to an extreme, and separating out as much as possible of fine sand without reducing the whole to slime, than by complete all-sliming, and where sand for filling is a consideration it will often pay to make more of it than if high gold extraction were the only object. The all-sliming treatment, however, seems so necessary for a great deal of the ore that it seems unlikely that mill sands will provide the amount required for filling the worked out stopes. However, oxidised superficial dirt can be easily obtained from surface for use in hydraulic filling and is very suitable. At the North Mount Lyell mine in Tasmania, weathered schist is quarried at surface and mixed with water to form a sludge like wet concrete, which is run down into the stopes through barrel-lined circular passes and sets very strongly in a short time. The method of wet filling has been in very successful use in this mine for many years now.

It is undoubtedly a somewhat formidable undertaking to introduce wet filling into mines of the depth of those with which we are concerned, but the economy secured thereby would very soon pay for the initial cost over and over again. It may be as well to note that the use of wet filling under proper control does not make the mines particularly wet nor add much to the cost of unwatering them. The ventilation must, however, be kept strong to remove the humidity caused by evaporation. The electric power scheme will be of great assistance in facilitating ventilation.

I have no doubt whatever that if the owners of the mines will seriously take up the question of combining their efforts to bring about a thorough revision and reform of their mining and treatment methods, the Kalgoorlie field can be made to take a long new lease of life and prosperity. The cheap electric power scheme is the key to very many possible improvements, and in my opinion is exceedingly well worth undertaking, even if it may seem for a time to involve a heavy subsidy from the general revenues of the State. The advantages to the State and its general revenue of maintaining a producing centre of the magnitude of Kalgoorlie my well be held to justify an apparent considerable subsidy.

(Sgd.) A. MONTGOMERY,
State Mining Engineer.—

APPENDIX No. 5.

Report by A. Montgomery, M.A., F.G.S., State Mining Engineer.
(22/2/1926.)

1.—MENZIES CONSOLIDATED G.M.

"The Menzies Consolidated Gold Mines, Ltd.," Company was originally formed in September, 1895 (Incorporated 1898), and commenced operations the same year. The leases were surrendered and taken up in a different shape in 1900, and have been renewed at the end of their first term of 21 years. The nominal capital of the company was £225,000 in £1 shares. Work was carried on regularly but without much margin over working expenses, although four dividends of 6d. each, totalling £22,401, were paid in 1914, 1915, 1916 and 1917, until July, 1921, when the company found it necessary, on account of expenses exceeding the value of the gold won, to apply for six months' exemption from full working of the mine.

At the time of application for exemption, in 1921, the men employed on the mine numbered 97, which was about the strength of the usual mine working force.

The lode runs nearly north-west and south-east, and underlays to the south-west about 1 (horizontal) in 1¾ (vertical), *i.e.*, a dip of about 60 degrees from the horizontal. The shaft passes through the lode near the No. 12 level, and at lower levels the underlay rapidly increases the distance between the shaft and the lode. The gold values in the mine, so far as known, are comprised in one main ore-shoot which pitches southerly in the lode at an angle which appears as about 34 degrees from the horizontal on the longitudinal section of the mine, and the shoot therefore also gets further and further away from the shaft with each successive deeper level below No. 12. Consequently at the bottom, or No. 19 level (1,896 feet from surface), the crosscut from the shaft has not been driven out south-west at right angles to the lode, but nearly south, to strike into it about where the ore-shoot might be expected to begin, an anticipation which proved substantially correct. The crosscut, however, had to go 618 feet to reach the shoot. At successively deeper levels this distance would become greater and greater, until excessive for working purposes, and it has become evident that the stage has been reached when either a new main shaft is required, away to the S.S.E. of the present main one, put down to cut the lode at, say, 2,500 to 3,000 feet, or some form of internal shaft to work the mine below the No. 19 level. The cost of a new main deep shaft would be so large that an internal shaft is the best practical alternative.

The mine had been well worked out by 1921 down to the No. 16 level, the company's annual report for that year showing ore reserves of only 12,695 tons down to No. 16, of estimated assay value only 29s. 0½d. per ton. Most of this ore is not now profitably accessible, having been left to support the levels. This portion of the ore estimate was maintained unaltered in the company's annual report for year ended 31st July, 1924, but does not appear in that for year ended 31st July, 1925, which does not take into account any ore above No. 16 level. The late general manager, Mr. Goninon, in 1921 estimated that "from surface to the bottom level the average width of the reef has been about 36 inches." (In parts it has often been 6 to 8 feet wide.)

Below No. 16 level, Nos. 17, 18, and 19 had been opened in 1921, but between 17 and 19 the ore-shoot was much shorter than previously, and presented an appearance which might well lead to a belief that it was running to a point and coming to an early termination.

However, on resuming in February, 1922, after the six months' exemption, winzes were sunk below the No. 19 level (1,896ft. vertical depth) to Nos. 20 (1,976) and 21 (2,051ft.), when the reef was found to increase again in length, width and value, and the company continued to carry on in the hope of improvement. Finding itself at the end of its resources, with little or no prospect of being able to raise more money until more favourable developments could be shown, the company, in January, 1923, applied to the Government for assistance under the Mining Development Act, 1902, by way of a loan of £5,000 to carry out a scheme of winzing, driving, and sinking an internal shaft below the No. 19 level. The application stated, inter alia, that to 31st December, 1922, the company's total expenditure had been £1,047,174 8s. 1d., of which—

	£	s.	d.
Development has cost ..	202,008	1	5
Plant and machinery ..	39,730	17	6
Wages	588,365	10	6

The manager's estimate of the realisable value of the plant, machinery, and buildings was £20,500. The value for insurance was £23,500. After departmental examination of the mine and projected scheme of work and full consideration of resulting reports, the Hon. the Minister agreed to a loan of £5,000 in two equal portions, the second to be made available after reconsideration when the first had been expended. The company gave a mortgage and bill of sale over their whole mining property as security for the loan.

Work with the aid of the loan was carried on during 1923, 1924 and part of 1925, the company sending out from London a sum of about £7,000 towards the work. The Nos. 20 and 21 levels were driven on the lode with very encouraging results. Mr. R. C. Wilson, Acting Assistant State Mining Engineer, reported on 31st January, 1925, that the No. 21 level for 458 feet in length gave an average assay value of 15.7 dwt. of gold per standard ton over an average width of 41 inches, that the No. 2 winze from No. 19 to No. 21 level, a depth of 158 feet, averages 16 dwt. per ton over a width of 60 inches, and that the No. 1 winze averaged 14.4 dwt. over 16 inches of width of quartz. These results confirmed those of the mine daily assays with reasonably practical agreement. In parts the ore-body is 84 inches in width. Present appearances are that below the No. 19 level the ore-shoot is improving again in width, length, and value, and seems to have quite good chances of obtaining stoping lengths and widths quite comparable with those in the higher levels of the mine.

The company made a complete change of management at the mine in November, 1924. The new manager, after examination of the mine and the treatment equipment, while reporting favourably on the new mine developments below the No. 19 level and urging more and deeper opening up of the lode, could not see his way to carrying on work without loss with the equipment in its existing condition, and put forward a scheme of development underground and renovation of the surface plant and equipment, to find adequate money for which would involve the company in either considerable borrowing of money, in one way or another, or reconstruction. The times do not appear to be propitious for either course, unfortunately, and the mine has come almost to a standstill for want of means of carrying on. All underground work was stopped on 27th February, 1925, and tools and machines, etc., removed to the surface. Since then underground mining work has been confined to keeping the levels in repair and pumping out the water, which otherwise would soon fill the mine.

The influx of water constitutes a serious difficulty, for there seems to be great unanimity of opinion among mining men who have examined the mine that if the water be allowed to fill the workings the weak schist walls of the lode will soften and squeeze into the open spaces, filling the levels, winzes, stopes, etc., completely, and rendering them thereafter inaccessible. The walls of the reef in the lower levels of this mine are certainly unusually ready to become crushed. All along the levels and in the winzes the schist country, especially on the footwall, very readily separates into leaves and flakes, which extrude into the workings, requiring recurring removals of the loosened schist to keep the passage-ways clear. From the way the schist rises up round the lower ends of the set timbers, it would appear to yield very readily to the pressure transmitted through these from the superincumbent country, the squeezing upwards and outwards of the schist closely resembling the "creep" of shale floors under the pressure of pillars of coal in coal mines. It seems generally taken as certain that if water were allowed to rise on to this weak schist it would form a sort of slurry and run freely, making the ground practically unworkable ever afterwards. Personally I find some difficulty in accepting that the exfoliation and "creep" of the schist is necessarily due to pressure, as it is not easy to see how heavy pressure could be developed in narrow workings like levels and winzes far below the stoped-out ground. The swelling of the ground might quite well be due to so-called "winding," meaning an effect which some rocks show when, after being covered for time immemorial, they become exposed to the atmosphere, admitted through mining openings. Some sorts of rock then absorb air, soften, and swell very vigorously, often strongly enough to break the heaviest timbers. The effect on such ground of submergence in water may be to exclude the air and prevent the swelling, and it *might* therefore happen that the best way of preserving the mining openings would be to allow them to fill with water. The "creep" is so considerable in the workings that they seem likely to fill up even if no water is allowed to rise in them, and to keep them open would then involve constant attention not only in keeping out the water, but also in removing the extruded schist. In many cases of "swelling" ground due to contact of newly-cut rock with air, the swelling eventually cures itself by the portions exposed to the air becoming fully charged and forming an impervious coating over the rock below.

Undoubtedly, however, there would be the very gravest risk that if this mine were to allow the water to rise there would be such collapses of the soft walls as to make it very uncertain if the mine could be reopened at practicable expense. It is therefore of the greatest urgency that continuous means be provided to keep the workings accessible, but, of course, it would be unnecessary to do this unless use were to be made of the accessibility to work the mine: if there be no hope of working the mine in any case, it would clearly be futile to keep it accessible. The issue is therefore a definite one, either the mine must be worked and made to pay, or it must be definitely abandoned, which would probably mean that it would never be reopened.

We have therefore to consider what are the prospects of bringing the mine into the condition of being workable profitably, or so as to cover at least its working expenses. The new developments below the No. 19 level to Nos. 20 and 21 are undoubtedly very encouraging, and there is very good reason for strong hope that further development below No. 21 level would show still more improvement. At any rate the prospects are so good, from a mining point of view, that the enterprise should not be allowed to be abandoned, but every effort should be made to open up deeper and so prove more certainly if the mine can be profitably worked. Present appearances and evidence fully justify spending a good deal of money on deeper testing of the mine with very reasonable hopes of success. The mining chances are much too good to permit the closing down of the mine to be contemplated with anything but the greatest disappointment.

The returns from the mine up to end of 1925 have been 271,619.74 fine ounces from 515,822.46 tons crushed, equal at mint value to £1,153,767, or a general average of 44s. 8¾d. per ton. For the last six months of crushing, the returns have been (on mine valuation of gold)—

	Tons crushed.	Value returned. £	s.	d.
September, 1924	1,083	1,930	11	1
October, 1924 . ..	972	1,806	7	2
November, 1924 . ..	841	1,335	6	1
December, 1924 . ..	609	766	1	5
January, 1925	1,135	1,163	16	9
February, 1925	1,244	2,300	0	0
	5,884	£9,302	2	6

equal to 31s. 7.4d. per ton. Seeing that a large part of the ore came from development work, and that regular stoping was not in progress, the return is not so much below the average of the mine as to justify any sound conclusion that the average values have declined at the deepest levels as compared with the higher ones, or that ore of equal value to that from the latter cannot be expected below the 2,000ft. level. The face assays are often so good as to warrant us in believing that equally good ore as ever previously obtained may be got in the deep ground still to be opened up. The mine undoubtedly deserves that its deeper development should be persisted with, there being quite a good mining chance that the ore-shoot will open up again into profitably workable ground. The chance at any rate is so good that the owners of the mine can be strongly recommended to test the ore-body further by winzing and driving on it for another 200 feet in depth, which would prove the mine for 355 feet below the No. 19 level (1,896ft. from surface). The late manager, Mr. T. Ellis, estimated the ore tonnage opened below the No. 19 level at 12,252 tons (2,240 lbs.) of assay value 48s. 4d. In the report of my colleague, Mr. R. C. Wilson, of 31st January, 1925, Mr. Giblin, who had reported on the mine for the Directors a short time before, was quoted as estimating the available ore between 19 and 21 (2,051 feet) levels at 12,000 tons and that still obtainable above No. 19 at 7,500 tons, figures which Mr. Wilson regarded as very conservative. In the Annual Report of the Company, dated 28th October, 1925, the ore reserves were taken at 19,000 tons at assay value 48s. 5d. per ton. From the actual crushing results, however, Mr. Wilson came to the conclusion that the developed ore below No. 19 level should not be relied upon to produce more than 42s. a ton.

The great difficulty in the way of making ore of this value payable lies in the unfortunate shape of the ore-body and consequent trouble in exploring it and working it out. It pitches somewhat flatly to the south as it gets deeper in the lode, getting further and further away from the main shaft at each deeper level, and it is no longer practicable to run filling from surface into the stopes through winzes. The late management obtained filling by driving crosscuts into the walls, and the present one has improved on this by taking it from the footwall, parallel to the lode. The footwall is the above-mentioned somewhat soft schist and is fairly cheaply excavated, and the practice has been instituted of excavating the flaky wall rock for a thickness about double that of the ore alongside before the latter is shot down. The excavated wall-rock is used to fill the stope last previously taken out, and then boards are laid on this filling and the bared ore is shot down on to them and shovelled to the passes. The open space so formed is then filled with waste rock from another slice excavated from the footwall of the next higher stope, and the ore again shot down on to this. On this system the reef and its walls have to be taken out for a width about three times that of the ore alone, but while the walls remain weak and flaky the filling can be obtained at a cost not greater than that common in other mines in which filling is sent down from surface. With systematic stoping on this plan the stoping costs per ton of ore won should be fairly favourable. Much care should be taken, however, to keep the ore clear from the valueless wall-rock, in order not to crush more of the latter than is avoidable.

In consequence of the pitch of the ore-body, not only do the workings get further and further away from the main vertical shaft at each lower level, but also the height stopable above any level is restricted to the upper boundary of the ore-body, above which the lode is practically barren. Great care should, however, be taken to watch the upper limit of the shoot very closely to see if anywhere it sends out branches into the upper portions of the lode-channel, as these might lead to other ore-bodies in the supposed barren ground. For the same reason every fifth level or so should be extended long distances into the supposed barren parts of the lode, to prospect for other lenses of ore.

The pitch of the ore-shoot has been so consistent from near surface down to the 2,000 feet level that there is a strong presumption that it will continue to pitch at much the same angle of inclination. If, therefore, an internal shaft be made it would be best not put down directly on the maximum dip of the lode, as this would soon take it through the ore-shoot, and at still lower levels the latter would get farther and farther away from it. In order to keep near and under the ore-shoot the internal shaft should go diagonally down the underlay, keeping a short distance below the lower boundary of the ore-shoot. By following this course, the shaft would have rather a low angle of inclination, and would, of course, be relatively longer between the levels than one straight down the underlay, but it would keep close to the ore-shoot and do away with a great deal of unnecessary driving along barren parts of the lode. Such a shaft is favourable for skip-haulage and rapid and easy loading of the skips from ore-pockets under the levels.

In Mr. C. Kingsley Thomas' report of his examination of our mines during his Royal Commission on the Mining Industry, 1925, on page xx., this mine is referred to, and he remarks "Should further development give sufficiently encouraging results it would be necessary to sink a new shaft in the vicinity of the ore-shoot, to work the mine at depth." This undoubtedly would be the best course from the point of view of economical working of the mine afterwards if the new developments were so good and proved such large reserves of ore as would justify the great expense of sinking a new main shaft to cut the lode near the ore-shoot at 2,500 to 3,000 feet from the surface. Such a shaft would probably cost not less than £30 a foot, and might very likely require a good deal more, so might require £75,000 to £100,000 to construct. Very large supplies of ore would require to be obtainable before there could be any hope of recovering such a large capital cost from profits on the stone. Such a shaft, therefore, could only be contemplated after very successful development of large reserves of ore below the present bottom of the mine. These may exist—let us hope they do—but there are no grounds yet visible for seriously expecting any very important change for the better in the ore-producing capacity of the lode as we know it. It is to be feared, therefore, that the new deep shaft is outside of practical consideration in the near future, and that some alternative cheaper scheme must be resorted to. An internal inclined shaft from the No. 19 level running down under the ore-shoot, but parallel with its main axis would be the best solution, with electric winders at the No. 19 level. Such a shaft would be best laid out so that if later developments should justify cutting out the cost of trucking, or mechanical haulage or transport, from the internal shaft to the main one along the No. 19 level, the internal shaft could be continued upwards to meet the main shaft at the most convenient higher level, when the winding could be converted into a normal two-stage proposition, the lower stage being inclined skip haulage, self-dumping into an ore-pocket at the main vertical shaft, and the upper one vertical haulage by skips through the main shaft to surface. This would minimise the handling of the ore at the change from vertical to inclined winding.

If a new vertical shaft were sunk to cut the ore-shoot at say, 2,500 feet, it would be best to follow the shoot below that level by a separate stage of winding through an inclined shaft, enabling the ore to be followed to any workable depth. It is becoming very generally recognised that when winding depths much exceed 2,000 feet it becomes more economical to wind in two stages than in one, the extra cost of men at the top of the second stage being compensated for by the much less size, weight, and cost of the winding equipment, and the increased output of ore in a given time, as compared with the very expensive and heavy plant required for winding in one lift from distances such as 3,000 to 4,000 feet.

An advantage of utilising the existing main shaft would be that if it were maintained as the permanent main winding point, the renovated mill could be built at once beside it, but if a new deep main shaft were intended to be made the mill should be placed so as to fit in with it, and not with the present main shaft.

The existing mill is far too distant from the main shaft, and is in very bad order, requiring complete renovation, though much of it could still be made use of. The necessary alterations are so great, however, that they would be best made by removing the plant to the main shaft and entirely reconstructing it. The manager's estimate of the cost of this, together with some alteration to the winding plant, is £8,000.

On 2nd April, 1925, the Hon. the Minister cabled to the company that he was willing to increase the existing loan of £5,000 to a total of £8,000 if the company would provide £15,000 for mining development and reconstruction of plant. This was to enable new development to be gone on with to the value of £6,000, half to be provided by the company and half advanced on loan by the Government, and to enable the company to renovate its plant. The company, however, did not see its way to providing the necessary money, and cabled to its local attorney on 8th July, 1925:—"Very difficult to raise any money London for Consolidated. Please continue negotiations to obtain larger proportionate Government subsidy than pound for pound; outlook hopeless without more encouragement from Government." The Hon. the Minister, however, considered the assistance offered to be very liberal, and that it could not be increased. The company were asked if they could provide £3,000 to do six months' development to ascertain if it is worth spending further effort upon the mine, and a scheme was then brought forward by the manager to try to get this money by treatment of a quantity about 5,000 tons, of old partially cyanided concentrates, which were lying near the mill. A hand-rabbled roasting furnace had been erected by the previous manager to roast these concentrates, and had treated about 1,000 tons, and from the results of this treatment the manager reckoned that if a mechanically-rabbled furnace of capacity 25 tons per day were built he could rely on a recoverable value of not less than 36s. a ton, and make a profit of about £23 a day, or say 18s. per ton. This would provide a profit of about £700 per month, which would enable £500 per month to be spent on development, with an equal amount from the Government loan, enabling work to be proceeded with at the rate of £1,000 a month as desired. The cost of the roasting plant was quoted at £2,000, and the company's representatives asked that the Government should lend them this amount.

Up to this point the Government advances and unpaid interest thereon had amounted to £3,357 1s. 10d. out of the £5,000 authorised, and the Hon. the Minister now authorised further advances of £4,000, raising the total of the loan to £7,357 1s. 10d., of which £2,000 were to be advanced for payment of cost of the new furnace, and £2,000 in payment of one-third of the cost of development work in the mine to the total value of £6,000. In the end this would mean that of £8,000 spent on the furnace and mine development, £4,000 had been provided by the company and £4,000 advanced by the Government, bringing the transaction on to a £1 for £1 basis. The company's manager expected to be able to pay their share out of profits of the treatment of the concentrates. The company agreed, and documents were executed accordingly. Erection of the furnace was proceeded with, under a contract, for a furnace capable of roasting 30 tons a day of Kalgoorlie concentrates. When the furnace was put to work, however, the manager found that he could not properly roast more than 16 tons a day of his material. This made a very serious difference in the costs of roasting.

In part of October, 1925, 163 tons were roasted and treated for a return of £244 16s., at a cost of £383 10s. 6d.

In November 450 tons were roasted and treated for a return of £660, at a cost of £716 17s. 10d.

In December 347 tons were roasted and treated for a return of £730, at a cost of £712 5s. 1d.

In January, 1926, 407 tons were roasted and treated for a return of £600, at a cost of £691 7s. 1d.

These figures add up to 1,367 tons roasted and treated for a return of £2,234 16s. (32s. 8.3d. per ton) at a cost of £2,504 0s. 6d. (36s. 7.6d. per ton), showing an actual loss on the treatment instead of providing any surplus for the development work. The costs may no doubt be reduced somewhat in more regular work, but the returns from the concentrates are a good deal lower than was confidently expected.

The Acting Assistant State Mining Engineer, Mr. R. C. Wilson, went to the mine on 31st December, 1925, and 1st January, 1926, and carefully bored and sampled the heaps of concentrates still to be roasted and treated. His report and assay plans show that a great deal of the material is of much lower grade than that actually treated in the hand-rabbled furnace on which the manager's estimates were founded. Mr. Wilson's tests show that a tonnage of 2,000 tons, averaging 34s. per ton, say 29s. extractable, is all that can be relied on, and on past costs this would not pay expenses of treatment. Unless a much better showing can be made for February, it does not seem to be any use to continue the concentrates treatment.

The failure of the roasting plant to make the profits expected of it has nullified the scheme of carrying on extensive underground development from gold recovered, and has brought about a deadlock so far as progress is concerned.

The mine is being kept unwatered and the levels in repair at a cost of about £270 to £280 a month, and the Hon. the Minister has consented to advance necessary expenditure for this purpose up to the end of February, 1926, to give time for deciding what is best to be done.

The local attorney of the company has been informed by cable from London by his directors that there is no possibility of their raising any further funds, and has urged that the Government should provide for a six months' scheme of development at the rate of £1,000 a month.

What is to be done? If operations are terminated and the mine allowed to fill with water, the consensus of opinion is that the soft walls will collapse and the mine be irrecoverably lost. Apparently the company will do no more, although they must know that by throwing up the sponge they are facing the complete loss of their property. The only hope lies in the further testing of the mine by a scheme of deeper development, with the hope that ore will be opened up of quantity and value which would induce the company to reconstruct itself with enough more capital to be able to renovate its milling equipment, put in an inclined working shaft from the 1,900 feet level, and carry on necessary work while these preliminaries were in progress. Proving the mine is only the first step, for when it is done, and supposing it to demonstrate that the mine is still valuable, there can be no profitable working without very considerable further expenditure on the treatment plant and the internal shaft. It seems, therefore, to be quite essential that assurances should be given by the directors of the company that if the Government assist in the development work which has been indicated they will do their utmost to bring about a reconstruction of their company or otherwise to raise further capital, which would be best not less than £30,000. If they will undertake to do this, I would advise that the Government lend them up to £6,000 (inclusive of unexpended portions of existing loans) as a last effort to save this still promising mine, but if they do not see their way to make any promise to back up the Government effort, the prospect of getting any other persons to do so seems so remote that it is hard to see that any good would come of the Government expenditure, and it would be best to close down the mine at once. However, the importance to the Menzies district of maintaining this mine as a producer is so vital that almost desperate remedies have to be given serious consideration.

Annual Report of the Board of Examiners for Colliery Managers' and Under-Managers' Certificates under "The Coal Mines Regulation Act, 1902-1926."

The Under Secretary for Mines. Perth, W.A.

Office of the State Mining Engineer,
Mines Department, Perth,
7th April, 1927.

Sir,

The Annual Report of the Board of Examiners for the year 1926 is submitted for the information of the Hon. the Minister for Mines.

Two meetings were held during the year under review, the first on 28th April and the second on 28th October.

At the October meeting Mr. Maitland, then Government Geologist, informed the Board that it was the last meeting he would attend as he had been retired from the Public Service. Regret was expressed at the loss of his services on the Board.

Examinations.

Examinations for 1st and 2nd Class Certificates of Competency were advertised to be held in April and October: no applications were received to sit for examination in April, and only one candidate for a Second Class Certificate of Competency sat in October, viz., Mr. William Gane, who obtained the requisite number of marks for a pass and a certificate was issued to him. Copy of examination papers herewith.

Both written and oral examinations were supervised by Mr. J. McVee, Inspector of Mines, Collie.

Application for First Class Certificate of Competency without Examination.

Mr. A. K. B. Howell was refused a 1st Class Certificate of Competency on his English corresponding certificate unless and until he satisfied the Inspector of Mines at a personal interview at Collie that his knowledge of coal mining is adequate for local conditions. Up to the end of the year no interview had taken place.

In December the personnel of the Board was gazetted as follows:—The State Mining Engineer (Chairman), the Government Geologist (Member), the Inspector of Mines, Collie (Member), and Miss F. A. Lane (Secretary).

The Coal Mines Regulation Act, 1902.

An Act to amend the Coal Mines Regulation Act, 1902, came into operation on the 16th December, 1926, and amendments to the Regulations were under consideration at the end of the year.

We have the honour, etc.,

A. MONTGOMERY,
State Mining Engineer, Chairman.

T. BLATCHFORD,
Government Geologist, Member.

JAS. McVEE,
Inspector of Mines, Member.

F. A. LANE,
Secretary.

THE COAL MINES REGULATION ACT, 1902.

Examination for Second Class Certificate of Competency as Under Manager or Overman.

SUBJECT: VENTILATION AND DANGEROUS GASES.

Wednesday, 6th October, 1926, 10 a.m. to 11·30 a.m.

Possible Marks.	
50	1. A return airway is 10 feet wide and 5 feet high; the velocity 600 feet per minute. The air is composed by volume as follows:—Nitrogen 79 per cent., Oxygen 20.96 per cent., Carbon Dioxide ·04 per cent. Find the number of cubic feet of each gas passing in the airway per minute.
50	2. Say if you consider there is any advantage in having auxiliary fans underground in addition to the main fan at the surface. Explain fully.
50	3. In order that airways shall be as efficient as possible, what factors would you consider to be of greatest importance?
50	4. What is an anemometer? What is its use? Explain how you would use it.
50	5. Name the principal gases met with in coal mines. What are their dangers to life and their injurious effects on man? Give also their symbols, specific gravities, and properties.
50	6. Ventilate the accompanying plan with due regard to haulage, etc.
300	

THE COAL MINES REGULATION ACT, 1902.

Examination for Second Class Certificate of Competency as Under Manager or Overman.

SUBJECT: MINING OF COAL.

Wednesday, 6th October, 1926, 11.30 a.m. to 1 p.m.

Possible Marks.	
50	1. When a fault is encountered in a mine, what features would you examine for information as to whether it is an upthrow or a downthrow, and an approximation of the displacement.
50	2. What in your opinion is an adequate pillar for supporting 8 yard bords, at a depth of 600 feet in the Collie field, and approximately what percentage of extraction would you expect to obtain?
50	3. Coal is to be won from beyond an upthrow fault. Describe the preliminary work necessary in order to extract the coal.
50	4. In a seam of coal 8 feet thick, overlain by 3 feet of friable shale covered by a strong rock roof, a road is being driven for endless rope haulage. How much coal would you extract, and describe with sketches suitable timber for the roadway.
50	5. When coal cutting machines are operating what points are to be observed in order to obtain the best results?
50	6. How would you proceed to extinguish a fire that has occurred in a bord in the middle of a district? The fire when discovered has reached a serious stage. Water is available from pumping column about eleven chains distant.
300	

THE COAL MINES REGULATION ACT, 1902.

Examination for Second Class Certificate of Competency as Under Manager or Overman.

SUBJECT: ARITHMETIC.

Wednesday, 6th October, 1926, 2 p.m. to 3 p.m.

Possible Marks.	
16	1. The area of a block of coal is 5,760 square yards. Express this is acres, roods, perches and yards.
17	2. In the above question what is the length in yards of an equivalent square, and what weight of coal is there in the block, the coal being 3 feet 3 inches in thickness and weighing 18 cwt. per cubic yard.
17	3. A, B, and C work together in a drive 7 feet by 12 feet, and excavate 25 feet of drive. A works 5 days, B works 4½ days, and C works 6 days. They are paid 4s. 6d. per cubic yard. How much does each earn?
17	4. Find the cost of 2 tons 2 cwt. 2 qrs. 11 lbs. at £21 10s. per ton.
16	5. A heading 9 feet wide and 8 feet high cost 30s. per lineal yard. What is the cost per cubic foot?
17	6. A pipe is 9 feet long and 8 inches internal diameter. How many gallons of water will it contain at 277.274 cubic inches to the gallon.
100	

THE COAL MINES REGULATION ACT, 1902.

Examination for Second Class Certificate of Competency as Under Manager or Overman.

SUBJECT: ROADWAYS.

Wednesday, 6th October, 1926, 3 p.m. to 4 p.m.

Possible Marks.	
50	1. Give your opinion of the advisability or otherwise of stripping a fault which has crossed the main dip heading of a mine, with a slant heading which has to be used as a main haulage road.
50	2. Describe how you would construct a haulage road 12 feet wide and 7 feet high through a portion of old workings partly closed by creep.
50	3. A haulage road is to be relaid with heavy rails. Describe fully how you would carry out this work in order that the normal operations of the colliery are disorganised as little as possible.
50	4. There is a turn on an endless rope haulage. Describe fully how you would prevent the rope from slipping off the sheaves at this point.
50	5. With endless rope haulage up a grade of 1 in 6, what precautions would you take to guard against accidents by clips slipping, breakage of ropes, etc.?
50	6. Write a report on a system of hauling coal from the face to the gantry in any colliery with which you are acquainted. Suggest any alterations which you think would improve the system.
300	

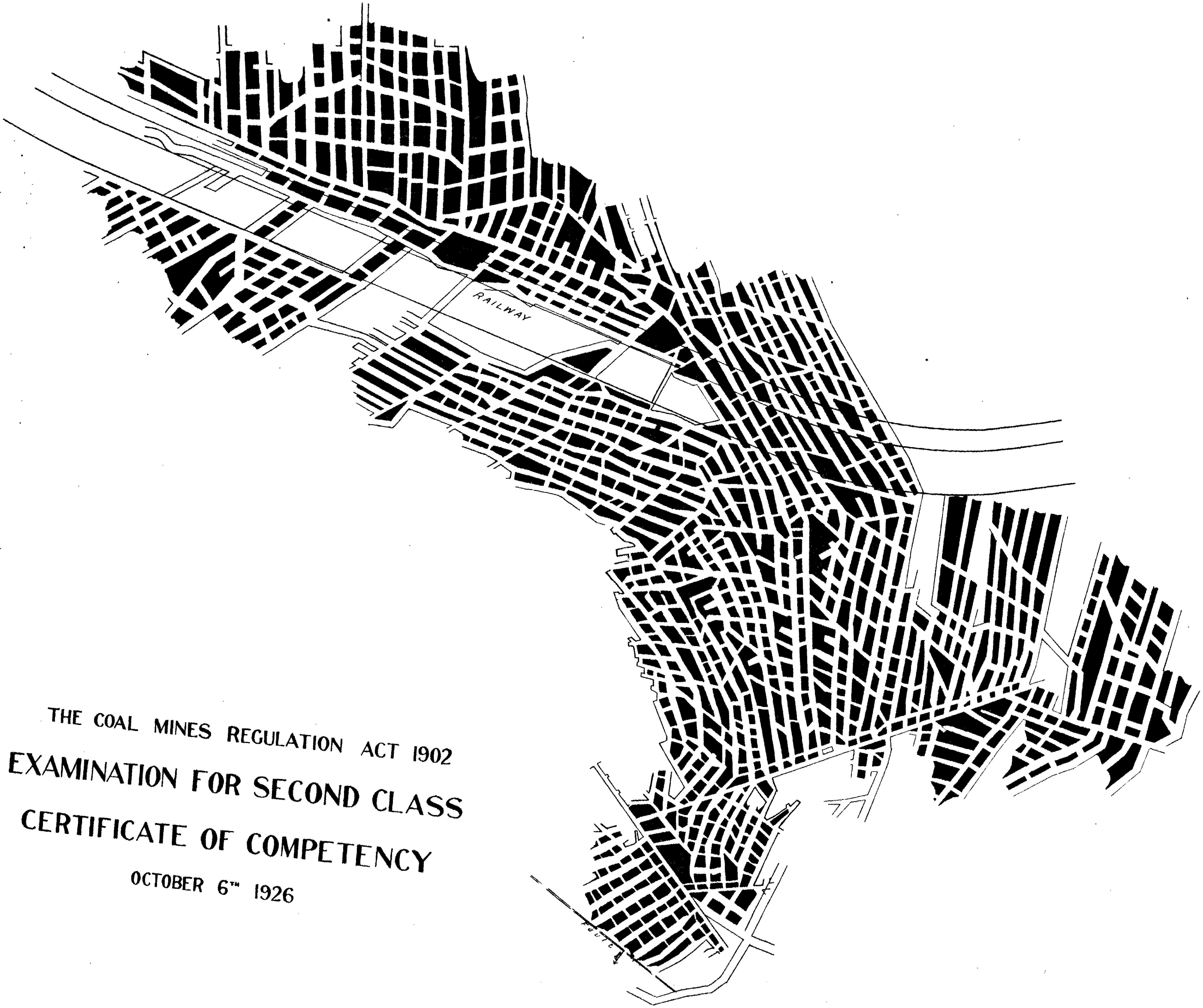
THE COAL MINES REGULATION ACT, 1902.

Examination for Second Class Certificate of Competency as Under Manager or Overman.

SUBJECT: THE COAL MINES REGULATION ACT, 1902.

Wednesday, 6th October, 1926, 4 p.m. to 5 p.m.

Possible Marks.	
17	1. For what purposes were the General and Special Rules established under the Coal Mines Regulation Act?
16	2. What are the provisions of the General Rules regarding manholes and signalling?
17	3. What are the provisions of the Act regarding the ventilation of mines?
17	4. What is meant by the terms "ventilating district" and "main haulage road" as stated in General Rule 12?
17	5. What are the provisions of the Act concerning a place approaching workings likely to contain a dangerous accumulation of water?
16	6. What are the provisions of the Act as to travelling on haulage roads?
100	



THE COAL MINES REGULATION ACT 1902

EXAMINATION FOR SECOND CLASS

CERTIFICATE OF COMPETENCY

OCTOBER 6TH 1926

DIVISION III.

REPORT OF THE SUPERINTENDENT OF STATE BATTERIES.

Department of Mines,
State Batteries Branch,
Perth, 11th May, 1927.

The Under Secretary for Mines,

Sir,—

I have the honour to submit my report on State Battery operations for the year 1926, for the information of the Hon. the Minister for Mines. This is the twenty-ninth Annual Report.

MILLING.

Tonnage.—379 parcels of ore were treated at 17 batteries, the total tonnage being 17,104½ tons. The largest tonnage was crushed at Coolgardie, 2,452½ tons, although 2,302¼ tons were crushed at Cue, a close second, while Peak Hill handled 2,006 tons. Only three batteries crushed between 1,000 and 2,000 tons of ore, *i.e.,* St. Ives 1,481¼ tons, Boogardie 1,082½ tons, and Youanmi 1,080½tons. The remaining 11 batteries crushed less than 1,000 tons each.

During 1925 eighteen batteries crushed 416 parcels of ore, aggregating 18,093¼ tons, thus the 1926 tonnage showed a decrease of 988¾ tons.

Amalgamation.—All ore crushed was treated by amalgamation in the first instance for the recovery of gold contents, and 16,666.11ozs. of bullion, estimated to contain 14,127.11 fine ozs., were recovered. The gross contents of the tailings amounted to 4,727.43 ozs. fine, the value of the ore being 94s. 2d. per ton.

The recovery by amalgamation was, therefore, 74.92 per cent., compared with 75.38 per cent. in 1925, when the value of the ore was 104s. 6d. per ton (Schedule 5.)

Crushing Charges.—The crushing charges at Marble Bar and Bamboo Creek batteries, which had hitherto been 1s. 6d. per ton higher than at the more southern batteries, were reduced to 10s. 6d. per ton or 8s. 6d. per hour for five stamps. The charges are now uniform throughout the system.

Rebates allowed for low grade ores were paid on 4,170¾ tons crushed and amounted to £635 15s. 1d. revenue being recouped from the Mines Development Vote. During 1925 rebates amounting to £499 5s. 6d. on 3,728¼ tons milled, were allowed to prospectors.

Revenue.—The total revenue collected amounted to £8,235 9s. 9d., equal to 9s. 7.56d. per ton. During 1925, the revenue was £9,695 1s. 6d., equal to 10s. 8.59d. per ton, a decrease of 1s. 1.03d. per ton, due to a larger tonnage of soft ore crushed at the rate per hour.

Expenditure.—The total expenditure, which includes administration and maintenance and working expenses, amounted to £20,394 7s. 1d., equal to 23s. 10.08d. per ton. This result is 1s. 2.67d. per ton more than in 1925.

The loss on milling operations was £12,158 17s. 4d. compared with a loss of £10,767 19s. 4d. during 1925 (Schedules 5 and 8).

TAILING TREATMENT.

During the year 16,122 tons of tailing were treated at 16 plants, the details being shown in the attached statement. During 1925 14,289½ tons were treated at 13 plants. As was usual, the tonnage treated was produced from a large number of parcels of ore, varying in nature from clean quartz to lode matter and quartz containing sulphides and other minerals.

The average head value of the tailing was 8.081 dwts. per ton and the average residue value 1.524 dwts. per ton—the assay extraction being 81.14 per cent. The total gold call was £22,199, and the actual recovery, including slag values, was £252 in excess of that figure. Following is a statement showing details of the treatment.

TAILING TREATMENT.

Showing Details of Values and Recovery for the Year 1926.

Battery.	Tons treated.	Head Value.	Contents.	Tail Value.	Contents.	Extract.	Short over call.	Surplus over call.
		dwts.	ozs.	dwts.	ozs.	%		
Bamboo Creek	540	15·105	407·85	2·148	58·00	85·7	...	3
Boogardie	650	11·755	382·05	1·910	62·05	86·3	...	19
Coolgardie	2,029	4·910	498·20	1·080	82·45	77·9	...	50
Cue	1,728	6·528	564·05	1·716	148·30	74·5	...	130
Laverton	500	7·414	185·35	1·540	38·50	79·23	...	32
Leonora	405	6·319	127·98	1·458	29·52	70·00	59	...
Meekatharra	2,826	7·833	1,106·90	1·365	192·85	82·5	...	161
Norseman	1,275	9·198	586·40	2·135	136·15	78·5	51	...
Ora Banda	1,080	7·338	390·30	1·601	86·50	76·5	...	168
Payne's Find	256	2·000	25·55	0·898	11·50	55·5	9	...
Peak Hill	736	8·206	302·00	1·328	48·90	83·7	79	...
Sandstone	715	7·380	263·85	1·166	41·70	84·19	...	39
St. Ives	476	3·458	62·30	1·083	25·80	68·5	5	...
Warriedar	543	5·308	144·15	1·276	34·65	75·9	37	...
Wiluna	1,947	13·286	1,293·45	1·941	188·98	85·3	100	...
Youanmi	224	8·916	100·00	2·583	28·90	71·00	10	...
	* 15,939	8·081	6,440·38	1·524	1,214·75	...	350	602

COMPARATIVE SYNOPSIS.

	1926.	1925.
Tons treated	15,939	14,153·5
Head Value	8·081 dwts.	7·415 dwts.
Tail Value	1·524 „	1·483 „
Value of Call	£22·199	£17,830
Theoretic Extraction	81·14%	80·0%
Actual	82·11%	80·7%

*** In addition 192 tons of highly refractory tailings were treated at Coolgardie for a return of £124.**

Revenue.—The revenue from this department of our operations amounted to £11,033 16s. 10d., equal to 13s. 8.25d. per ton. During 1925, the revenue was £11,557 18s. 10d., or 16s. 2.11d. per ton. It should be stated, however, that in 1925 £1,500 received previously from the Gold Producers' Association was included in our receipts.

Expenditure.—The total expenditure was £9,254 1s. 7d., or 11s. 5.76d. per ton. These figures include maintenance of plants and administration and realisation of bullion as well as working expenses. During 1925 the cost of treatment was 11s. 6.67d. per ton.

The profit from this operation was £1,779 15s. 3d. compared with £3,301 10s. 9d. during 1925, when £1,500 was received for gold premiums. On the actual operations the 1925 profit was £1,801 10s. 9d. (Schedule 9).

TAILING PURCHASE.

During the year 10,432¾ tons of tailing were purchased from prospectors for £10,226 8s. 2d., compared with 9,583¼ tons for £8,776 during 1925. (Schedule 7.)

On 1st January, 1926, the charges for purchase and treatment of tailing were altered in order to give prospectors more liberal terms. Prior to 1926 the charges were as follows:—

Three dwts. fine gold per ton were deducted from the agreed assay value to cover cost of treatment and loss. The balance of the gold contents in the tailings were paid for on a basis of 75 per cent. extraction and the gold paid for at the rate of £4 an ounce. The tonnage of tailing allowed was 85 per cent. of the tons milled. Since 1st January, 1926, the charges have been as follows:—

Seventy-five per cent. of the agreed assay value per ton has been paid for at the rate of £4 per oz., less 7s. per ton for treatment. The tonnage of tailing allowed is 85 per cent. of the tons milled.

This alteration has been an advantage to prospectors of 2s. per ton.

RENEWALS AND REPAIRS.

The total cost under this heading was £4,716 14s. 7d. compared with £3,945 5s. 7d. during 1925. Extensive repairs and renewals were effected during 1926, including new water mains at Coolgardie and Sandstone, a new Commonwealth Producer at Warriedar, a general overhaul of the St. Ives Mill, a new pump at Youanmi, and renovations to well pump and ore bins at Yarri; Cyanide vats and tanks at Bamboo Creek. St. Ives and Coolgardie were reinforced with wire netting and cement. (Schedules 8 and 9).

TOTAL OPERATIONS.

The total cost of milling and treatment operations was £29,648 8s. 8d. for 33,226½ tons handled, equal to 17s. 10.15d. per ton.

The total revenue was £19,269 6s. 7d., or 11s. 7.17d. per ton.

The loss for the year was £10,379 2s. 1d. compared with a loss of £7,584 13s. 5d. during 1925. The loss during 1925 was actually £9,084 13s. 5d., but was reduced to the figure stated on account of £1,500 being received from gold premiums.

Details will be found in the following tabulated synopsis.

COMPARATIVE SYNOPSIS OF RESULTS AT STATE BATTERIES FOR 12 MONTHS ENDED 31st DECEMBER, 1925 and 1926.

——	1926.			1925.		
	Tonnage.	Expenditure.	Revenue.	Tonnage.	Expenditure.	Revenue.
		s. d.	s d.		s. d.	s. d.
Milling	17,104½	23/10·08	9/7·56	18,093½	22/7·41	10/8·59
Tailing Treatment	16,122	11/5·76	13/8·25	14,289½	11/6·67	16/2·11
Tin Treatment	...	...	...	268	12/6·55	3/8·66

RECEIPTS AND EXPENDITURE.

——	Tonnage.	Expenditure.	Revenue.	Profit.	Loss.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Milling	17,104½	20,394 7 1	8,235 9 9	...	12,158 17 4
Tailing Treatment	16,122	9,254 1 7	11,033 16 10	1,779 15 3	...
	33,226½	29,648 8 8	19,269 6 7	1,779 15 3	12,158 17 4
			Less Profit ...	... ...	1,779 15 3
			Net Loss ...	... ...	10,379 2 1

OUTPUT SINCE INCEPTION.

Tons of Gold ore milled, 1,436,980.

Production:	£
By Amalgamation ..	4,901,126
„ Sand Treatment ..	764,204
„ Slime Treatment ..	265,266
„ Residue Treatment ..	9,353
	£5,939,949

Tons of Ore treated, 80,728.

Production:	
By Black Tin	93,436
Total ..	£6,033,385

STAFF.

Head Office staff, consisting of the Superintendent, Inspector, Engineer and three clerks, did not undergo any alteration. The resignation of Mr. A. J. G. Browne from the managerial staff to take up a position with the company operating the Wiluna Gold Mines, reduced the number of managers to eight. Mr. Browne was a member of the staff for over twenty-one years, during which period he rendered excellent service at many centres throughout the goldfields.

During the year all members of the staff have had particularly busy periods, and some of them have worked under conditions outback which have been anything but pleasant or easy. I wish to thank the staff for their loyal and efficient work.

The cost of administration, including stationery, postage, telegrams, printing and sundries was £2,948 10s. 5d., compared with £3,006 2s. 10d. during 1925 and £3,340 9s. 8d. during 1924.

GENERAL REMARKS.

The tonnage milled was 988¾ tons less than during 1925, and the 17,104½ tons crushed were handled in 379 parcels at 17 batteries operating in a vast tract of country between Bamboo Creek and Norseman.

The quantity of tailing treated amounted to 16,122 tons, an increase of 1,832½ tons.

The tonnage handled by the mills and treatment plants was 33,226½ tons, an increase of 575¾ tons over the total for 1925.

During the year small quantities of ore from Widgiemooltha, Bullfinch, Laverton and districts along those railway routes were treated at Coolgardie. The battery was called upon to crush only 2,452½ tons during the year, but the fact that it is a central plant for such a number of distant centres necessitates frequent campaigns. We crushed a little ore each month of the year, except January, a somewhat expensive procedure, but of considerable assistance to the prospecting community. Keeping crushing and treatment plants available for the convenience of prospectors at a score of centres throughout the goldfields for infinitely small tonnages is expensive.

The cost of transport of small quantities of stores required at each plant is heavy, and as facilities are gradually becoming more and more restricted, the cost increases. The difficulty of securing the necessary labour is also increasing and becoming more costly, because men have to be sent from the more populous centres, not being available locally any longer. The maintenance of old plants that are idle most of the year is also very heavy, and in addition to £4,716 14s. 7d. spent on this work from the revenue account, £5,222 7s. 7d. has been spent from the capital account in replacing portions of plants that have given service for many years. The plants are in good order and condition, all vats and tanks used for the treatment of tailings having been reinforced, thus obviating any further expenditure of any consequence. General maintenance costs, however, will continue to be a considerable item.

The assistance given to the mining industry through State batteries is very considerable, when all phases of it are considered.

During the year subsidies for the transport of ore for treatment at our plants were paid on 6,464¼ tons and amounted to £3,454 18s. Last year 5,229 tons were subsidised to the extent of £3,177 14s. 1d. As previously mentioned, rebates for low-grade ores, amounting to £635 15s. 1d., were paid.

The cost of the assistance given to prospectors, not including interest on capital, was therefore:—

	£	s.	d
Loss on operations ..	10,379	2	1
Renewing machinery	5,222	7	7
Cartage subsidies ..	3,454	18	0
Low grade ore rebates	635	15	1
Total ..	£19,692	2	9

Cartage subsidies and rebates were paid from the Mines Development Vote.

This practical form of assistance has enabled prospectors to pursue their calling. From time to time new discoveries have been made, and a considerable amount of mining development has been done subsequently. It is unfortunate that during recent years not one of the new discoveries have developed into a payable proposition which could be regarded as a State asset. The fact remains that one or more new discoveries have been made annually for years past, and it is only reasonable to assume that sooner or later a mine will be found which will prove of great value to the State. The assistance given to prospectors is based on sound principles, and its curtailment would undoubtedly remove the possibility of the search for new lodes in the future.

Appended will be found twelve schedules showing the details of operations for the year and returns since inception of the system in 1898.

I have, etc.,

A. M. HOWE,
Superintendent of State Batteries.

Schedule 1.

Return showing the Number of Tons crushed, Gold Yield, Average per Ton in Shillings, and Total Value for the year 1926.

Battery.	Tons Crushed.	Gold Yield, Bullion.	Average per ton in shillings.	Yield Value.
				£
Bamboo Creek ...	590·00	1,113·65	135·90	4,009·14
Boogardie	1,082·50	2,242·80	149·16	8,063·28
Coolgardie	2,452·50	2,428·25	71·29	8,741·70
Cue	2,342·25	2,393·85	73·59	8,617·86
Marble Bar	540·50	813·00	108·30	2,926·80
Meekatharra	782·75	956·55	87·99	3,443·58
Mt. Ida	189·00	152·65	58·15	549·54
Norseman	711·25	1,056·55	106·95	3,803·58
Ora Banda	736·50	570·58	55·78	2,054·08
Payne's Find	276·50	387·05	100·79	1,393·38
Peak Hill	2,006·00	1,260·60	45·24	4,538·16
Sandstone	555·00	599·45	21·60	2,158·02
St. Ives	1,481·25	706·00	34·32	2,541·60
Warriedar	853·50	573·35	48·37	2,064·06
Wiluna	997·75	991·93	71·58	3,570·94
Yarri	426·75	196·28	33·12	706·60
Youanme	1,080·50	226·75	15·11	816·30
	17,104·50	16,669·29	70·16	59,998·62

Schedule 2.

Return showing the number of tons crushed, gold yield, average per ton, and value since inception to 31*st December,* 1926.

Plant.	Milling. Total since inception of the System, to 31st December, 1926. Total Tonnage.	Total Yield.	Total Value.
		ozs.	£
Bamboo Creek	12,326·50	21,623·86	77,845·90
Boogardie	71,994·15	51,496·71	186,771·53
Coolgardie	124,957·25	84,728·19	305,075·12
Cue	18,673·	20,885·8	75,188·87
Darlot	33,210·	37,637·74	138,928·25
Laverton	19,336·75	21,578·63	78,854·79
Leonora	56,753·45	62,817·90	229,618·76
Linden	19,783·	22,531·70	81,114·21
Marble Bar	13,256·25	16,897·45	60,830·97
Meekatharra	83,244·25	98,800·21	358,360·14
Mt. Egerton	7,893·25	4,084·86	13,972·32
Mt. Ida	43,448·15	54,801·51	200,587·61
Mt. Keith	9,787·	8,618·75	31,027·50
Mt. Sir Samuel	9,681·25	7,505·97	27,021·48
Mulline	77,008·45	98,573·64	354,035·25
Niagara	64,866·	57,770·81	210,163·11
Norseman	67,745·70	77,239·36	281,244·16
Ora Banda	24,087·00	13,570·85	48,854·99
Payne's Find	28,507·75	35,489·11	127,760·79
Peak Hill	27,115·80	26,062·59	94,978·56
Sandstone	75,992·90	78,141·62	281,505·16
Siberia...	16,024·00	16,625·59	59,777·45
20-Mile Sandy	12,184·15	19,055·77	68,930·34
St. Ives	8,562·25	5,813·34	20,928·02
Tuckanarra	15,476·85	21,276·06	78,217·53
Warriedar	9,999·00	5,708·70	20,551·32
Wiluna	60,847·75	34,345·17	123,787·78
Yarri	49,334·25	32,945·71	118,604·37
Youanme	33,619·00	11,089·99	39,923·95
Batteries Closed	259,629·34	270,313·31	981,998·47
	1,355,308·44	1,318,030·90	4,776,458·70
Wiluna (Lode)	81,671·75	34,540·18	124,667·40
Total	1,436,980·19	1,352,571·08	4,901,126·10
Ore-Dressing Plant. ...	475·	...	1,082·94
Coolgardie	...	...	...
Tin Plants.		Tons Black Tin.	
Greenbushes	1,451·25	8·242	...
Plants Closed	79,276·75	869·276	...
	...	...	...

Milling.

	tons	ozs.		tons.	ozs.
Up to 1901 (3 yrs.)	68,791	75,553	1914	56,570	45,641
1902	39,517	57,255	1915	49,595	39,095
1903	49,233	58,305	1916	47,330	31,734
1904	71,616	78,309	1917	42,947	38,015
1905	85,018	92,327	1918	39,329	33,523
1906	95,831	94,187	1919	40,291	27,027
1907	95,280	97,962	1920	46,494	28,450
1908	95,624	89,875	1921	34,761	24,035
1909	94,218	83,127	1922	35,722	32,736
1910	89,278	80,074	1923	29,715	21,876
1911	59,373	56,265	1924	18,063	18,515
1912	56,636	53,888	1925	18,093	19,300
1913	60,573	52,515	1926	17,104	16,669

Sand Treatment.	Tons.	*Tailing Treatment.*	Tons.
Up to 1902	29,255	1913	13,078
1903	33,369	1914	32,723
1904	42,559	1915	31,887
1905	54,420	1916	34,725
1906	60,422	1917	24,890
1907	63,778	1918	24,364
1908	62,081	1919	15,764
1909	61,265	1920	15,437
1910	43,915	1921	19,763
1911	27,444	1922	24,234
1912	18,599	1923	14,307
1913	18,300	1924	19,767
1914	6,219	1925	14,289
		1926	16,122

Slime Treatment.

	Tons.		Tons.
Up to 1904	691	1915	3,454
1905	7,028	1916	15,536
1906	...	1917	13,086
1907	8,220	1918	11,892
1908	5,818	1919	12,780
1909	16,848	1920	11,525
1910	28,819	1921	7,370
1911	20,821	1922	7,492
1912	8,085	1923	8,848
1913	6,089	1924	4,615
1914	6,246		

Schedule 3.

Tailing Treatment, 1926.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Bamboo Creek	540	350·61	1,488·96
Boogardie	650	315·70	1,340·80
Coolgardie	2,221	408·22	1,733·78
Cue	1,728	469·96	1,995·93
Laverton	500	159·38	676·92
Leonora	405	74·79	317·67
Meekatharra	2,826	972·83	4,131·64
Norseman	1,275	481·55	1,832·80
Ora Banda	1,080	354·41	1,505·21
Payne's Find	256	11·93	50·70
Peak Hill	736	240·31	1,020·62
Sandstone	715	218·70	928·64
St. Ives	476	55·21	234·51
Warriedar	543	104·01	441·76
Wiluna	1,947	1,102·93	4,684·17
Youanme	224	68·39	290·47
	16,122	5,338·93	22,674·58

Schedule 4.

Sand and Tailing Treatment from Inception to 31*st December,* 1926.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Bamboo Creek	10,578	4,111·20	17,474·86
Boogardie	55,274	14,890·20	62,659·45
Burtville	16,788·75	5,464·13	22,793·76
Coolgardie	76,167	11,847·06	50,159·34
Cue	15,018	3,197·72	13,568·02
Laverton	18,016	3,239·29	13,563·90
Leonora	41,313·50	10,026·18	41,817·21
Linden	18,150	6,054·21	25,731·89
Meekatharra	57,921	12,022·14	50,891·25
Mt. Keith	7,053	816·70	3,468·72
Mt. Sir Samuel	5,988	1,367·56	5,809·39
Mulline	44,794·50	12,261·27	49,868·24
Mulwarrie	23,809·25	4,675·53	19,220·11
Niagara	44,828	6,839·37	28,471·79
Norseman	51,943·50	12,336·66	51,691·41
Ora Banda	12,534	2,947·39	12,519·77
Payne's Find	19,347	2,071·24	8,884·97
Peak Hill	2,359	652·28	2,770·07
Quinn's	7,486	686·56	2,916·43
Sandy Creek	11,496·25	3,512·53	14,639·07
Sandstone	50,668	14,878·57	62,914·69
St. Ives	2,786	505·29	2,145·89
Siberia...	5,550	1,201·56	5,105·20
Warriedar	7,590	3,680·95	15,632·89
Wiluna	20,149	9,408·88	39,868·36
Yarri	47,555	4,790·81	20,086·57
Youanmi	13,602	3,730·98	15,844·76
Batteries Closed	134,971·50	25,074·55	103,894·38
	823,731·25	182,290·81	764,407·39

Residue Treatment from Inception to 31*st December,* 1926.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Linden	670	95·14	349·34
Menzies	24,270	1,579·26	6,679·01
Mulwarrie	4,618	546·85	2,325·02
	29,558	2,221·25	9,353·37

Slime Treatment from Inception to 31st December, 1926.

Battery.	Tons.	Yield.	Value.
		Fine ozs.	£
Mulwarrie	4,733·50	751·79	3,194·22
Wiluna	96,784·00	37,665·46	159,961·27
Slime Plants Closed... ...	111,196·25	25,088·87	102,110·62
	212,713·75	63,506·12	265,266·11

Tin Residue Treatment from Inception to 31st December, 1926.

	Tons.
Greenbushes, Bunbury End	315
Greenbushes, Salt Water Gully	1,444
	1,759

Schedule 5.

Return showing Number of Parcels treated and Tons crushed at State Batteries for the Year 1926.

No. of Parcels crushed.	Battery.	Tons.	Yield by Amalgamation. Bullion.			Yield by Amalgamation. Fine Gold.			Gross Contents of Tailings. Fine Gold.			Total Contents of Ore. Fine Gold.			Average per ton. Fine Gold.		Gross Value of Ore. per ton.		
			ozs.	dwts.	grs.	ozs.	dwts.	grs.	ozs.	dwts.	grs.	ozs.	dwts.	grs.	dwts.	grs.	£	s.	d.
13	Bamboo Creek	590	1,113	13	0	943	19	20	233	18	0	1,177	17	20	39	22	8	9	8
42	Boogardie	1,082½	2,239	16	0	1,898	11	17	632	2	4	2,530	13	21	46	17	9	18	6
94	Coolgardie	2,452½	2,428	0	0	2,058	2	5	466	3	2	2,524	5	7	20	14	4	7	6
50	Cue	2,302¼	2,393	18	0	2,029	4	3	566	10	3	2,595	14	6	22	13	4	15	10
13	Marble Bar	540½	813	0	0	689	2	21	93	11	11	782	14	8	28	23	6	3	1
24	Meekatharra	782¾	956	11	0	810	16	12	134	10	15	945	7	3	24	4	5	2	8
3	Mt. Ida	189	152	13	0	129	7	21	37	8	14	166	16	11	17	16	3	15	1
19	Norseman	711¼	1,056	11	0	895	11	20	260	15	12	1,156	7	8	32	12	6	18	0
11	Ora Banda	736½	570	11	15	483	13	2	154	0	7	637	13	9	17	8	3	13	8
8	Payne's Find	276½	387	1	0	328	1	8	21	16	0	349	17	8	25	7	5	7	6
31	Peak Hill	2,006	1,260	12	0	1,068	11	2	458	9	11	1,527	0	13	15	5	3	4	7
7	Sandstone	500	599	9	0	508	2	13	253	8	1	761	10	14	30	11	6	9	4
14	St. Ives	1,481¼	706	0	0	598	8	22	298	10	14	896	19	12	12	3	2	11	6
15	Warriedar	863½	573	7	0	486	0	2	308	10	11	794	10	13	18	10	3	18	3
20	Wiluna	997¾	991	18	23	840	16	15	496	18	1	1,337	14	16	26	20	5	14	0
11	Yarri	426¾	196	5	16	166	7	13	62	15	18	229	3	7	10	18	2	5	8
4	Youanme	1,080½	226	15	0	192	4	3	248	0	14	440	4	17	8	3	1	14	6
379		17,019½	16,666	2	6	14,127	2	7	4,727	8	18	18,854	11	1	22	4	4	14	2
	Plus tons not cleaned up, 31st December, 1926 ...	95																	
		17,114½																	
	Less tons not cleaned up 31st December, 1925 ...	10																	
		17,104½																	

Schedule 6.

Expenditure from Consolidated Revenue Vote and Loan Expenditure Fund on Erection of State Batteries for the year 1926, and Totals since Inception.

—	From Revenue.	From Loan.
	£ s. d.	£ s. d.
Replacement of Machinery, Sandstone ...	...	2,017 10 8
„ Mortar Blocks, Wiluna	...	698 18 0
„ Foundation Timbers, Youanme ...	...	91 10 11
„ Machinery, Boogardie ...	...	1,061 4 0
„ Foundation Timbers, Meekatharra	...	380 9 11
„ Foundation and Machinery, Peak Hill ...	...	853 4 9
„ Parts, Payne's Find ...	...	119 9 4
		5,222 7 7
Erection of State Batteries—Expenditure to 31st December, 1907	91,981 1 8	...
Loan Expenditure to 31st December, 1925	...	311,240 8 5
	£91,981 1 8	316,462 16 0
Total	£408,443 17 8	

Schedule 7.

Direct Purchase of Tailings for the year 1926.

Battery.	Tons.	Cost of Purchase.
		£ s. d.
Bamboo Creek	413½	528 1 10
Boogardie	795¾	1,609 5 2
Coolgardie	1,334	779 6 8
Cue	1,317½	964 16 3
Laverton	166¾	181 10 2
Leonora	6	2 15 6
Meekatharra...	416¾	770 1 7
Norseman	647¾	665 16 8
Ora Banda	651¼	269 10 5
Payne's Find	7¼	3 13 2
Peak Hill	505¾	473 9 5
Sandstone	321¾	481 17 4
St. Ives	778¼	314 11 4
Warriedar	889¾	710 12 10
Wiluna	1,262¾	1,951 5 4
Yarri	168¾	78 4 4
Youanme	749¼	441 10 2
	10,432¾	10,226 8 2

Schedule 7a.

Return showing Tailing payable and unpayable and Gross Contents for the year 1926.

Battery.	Tailing payable. Tons.	Tailing payable. Gross Contents.			Tailing Unpayable. Tons.	Tailing Unpayable. Gross Contents.			Totals. Tons.	Totals. Gross Contents.		
		ozs.	dwt.	grs.		ozs.	dwt.	grs.		ozs.	dwt.	grs.
Bamboo Creek	414½	226	2	2	89¾	7	15	22	504¼	233	18	0
Boogardie	918¾	631	7	4	7½	0	15	0	926¼	632	2	4
Coolgardie	1,208	384	13	19	852¾	81	9	7	2,060¾	466	3	2
Cue	1,381½	520	17	16	576¼	45	12	11	1,957¾	566	10	3
Marble Bar	391½	89	4	15	64	4	6	20	455½	93	11	11
Meekatharra	289¾	102	5	2	376½	32	5	13	666¼	134	10	15
Mt. Ida...	136¾	37	0	17	9	0	7	21	145¾	37	8	14
Norseman	566½	258	1	13	37¼	2	13	23	603¾	260	15	12
Ora Banda	559¾	142	2	21	104½	11	17	10	664¼	154	0	7
Payne's Find	7¼	2	2	7	239	19	13	17	246½	21	16	0
Peak Hill	1,118	429	18	3	606	28	11	8	1,724	458	9	11
Sandstone	425	253	8	1	...		...		425	253	8	1
St. Ives	778¼	242	16	20	520¾	55	13	18	1,299	298	10	14
Warriedar	701	277	17	16	47¾	30	12	19	748¾	308	10	11
Wiluna	830¾	495	16	10	16¾	1	1	15	847½	496	18	1
Yarri	168¾	45	15	4	193¼	17	0	14	362	62	15	18
Youanme	749¼	235	1	20	172½	12	18	18	921¾	248	0	14
	10,645¼	4,374	11	22	3,913½	352	16	20	14,158¾	4,727	8	18

Schedule 8.

Statement of Receipts and Expenditure for the Year 1926.

MILLING AND TIN.

Plant.	Tonnage.	Management.	Wages.	Stores.	Total Working Expenditure.	Cost per ton	Repairs and Renewals.	Sundries.	Gross Expenditure.	Cost per ton.	Receipts.	Per ton.	Profit.	Loss.
		£ 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	590	107 15 2	329 6 4	206 3 11	643 5 5	21 9·67	116 13 9	136 0 8	895 19 10	30 4·46	363 8 9	12 3·84	...	532 11 1
Boogardie	1,082·5	163 3 8	325 2 4	337 11 0	825 17 0	15 3·09	148 19 0	190 16 10	1,165 12 10	21 6·43	545 12 10	10 0·97	...	620 0 0
Coolgardie	2,452·5	344 17 1	634 1 3	755 17 1	1,734 15 5	14 1·75	368 0 5	360 2 0	2,462 17 10	20 1·00	1,219 19 0	9 11·37	...	1,242 18 10
Cue	2,342·25	352 6 6	661 9 9	615 19 8	1,629 15 11	13 10·99	93 12 1	320 1 6	2,043 9 6	17 5·37	1,174 6 6	10 0·31	...	869 3 0
Darlot	...	...	...	...	...	...	...	9 13 0	9 13 0	...	...	...	...	9 13 0
Laverton	...	16 3 2	55 19 11	10 16 2	82 19 3	...	...	22 17 6	105 16 9	...	...	...	...	105 16 9
Leonora	...	10 1 10	47 19 0	88 4 7	146 5 5	...	6 12 8	51 9 5	204 7 6	...	16 6 1	...	...	188 1 5
Linden	...	...	1 13 5	17 10 8	19 4 1	...	...	1 12 6	20 16 7	...	39 17 9	...	19 1 2	...
Marble Bar	540·5	191 10 8	389 4 2	272 8 10	853 3 8	31 6·72	191 8 11	112 15 3	1,157 7 10	42 9·91	331 15 1	12 3·31	...	825 12 9
Meekatharra	782·75	87 13 1	328 0 5	307 8 1	723 1 7	18 5·68	167 19 11	119 12 3	1,010 13 9	25 9·88	389 18 8	9 11·54	...	620 15 1
Mt. Ida	189	260 13 3	104 16 8	51 16 3	417 6 2	44 1·92	51 6 2	16 6 5	484 18 9	51 3·79	89 16 9	9 6·07	...	395 2 0
Mt. Sir Samuel	...	...	...	0 11 7	0 11 7	...	...	...	0 11 7	...	13 18 10	...	13 7 3	...
Niagara	...	...	...	...	...	...	...	...	...	...	7 17 0	...	7 17 0	...
Norseman	711·25	140 4 8	348 16 4	242 18 2	731 19 2	20 6·98	281 0 1	99 7 7	1,112 6 10	31 3·33	365 12 8	10 3·37	...	746 14 2
Ora Banda	736·5	191 9 7	252 13 10	246 2 7	690 6 0	18 8·92	57 11 4	83 8 4	831 5 8	22 6·88	316 2 7	8 7·00	...	515 3 1
Paynes Find	276·5	47 6 0	125 6 6	135 1 10	307 14 4	22 3·12	76 13 0	32 9 4	416 16 8	30 1·80	145 19 3	10 6·69	...	270 17 5
Peak Hill	2,006	149 15 9	344 0 1	429 5 2	923 1 0	9 2·42	163 14 4	218 8 0	1,305 3 4	13 0·14	780 9 8	7 9·37	...	524 13 8
Sandstone	555	165 7 3	256 1 0	255 17 3	677 5 6	24 4·87	342 7 7	129 12 10	1,149 5 11	41 4·99	287 16 6	10 4·46	...	861 9 5
Sandy Creek	...	...	...	11 13 6	11 13 6	...	...	18 8 10	30 2 4	...	20 0 0	...	...	10 2 4
Siberia	...	...	...	...	...	...	...	...	...	...	9 0 0	...	9 0 0	...
St. Ives	1,481·25	136 16 1	562 15 11	428 1 6	1,127 13 6	15 2·71	362 10 6	219 11 11	1,709 15 11	23 1·03	713 1 9	9 7·53	...	996 14 2
Tuckanarra	...	...	...	...	...	...	...	...	...	...	12 16 6	...	12 16 6	...
Warriedar	853·5	93 18 7	259 7 0	190 16 3	544 1 10	12 8·97	434 4 9	106 11 9	1,084 18 4	25 5·06	436 18 11	10 2·85	...	647 19 5
Wiluna	997·75	228 13 4	398 1 2	191 5 6	818 0 0	16 4·75	86 3 3	281 9 9	1,185 13 0	23 9·12	487 11 2	9 9·26	...	698 1 10
Yarri	426·75	150 15 3	182 6 2	196 16 10	529 18 3	24 10·00	249 5 1	111 19 10	891 3 2	41 9·16	160 2 6	7 6·04	...	731 0 8
Youanme	1,080·5	107 1 3	245 9 0	238 2 2	590 12 5	10 11·18	354 18 3	119 19 1	1,065 9 9	19 8·66	303 8 6	5 7·39	...	762 1 3
	17,104·5	2,945 12 2	5,852 10 3	5,230 8 7	14,028 11 0	16 4·82	3,553 1 1	2,762 14 7	20,344 6 8	23 9·36	8,231 17 3	9 7·48	62 1 11	12,174 11 4
Greenbushes	...	21 1 5	21 16 10	...	42 18 3	...	5 0 0	2 2 2	50 0 5	...	3 12 6	...	...	46 7 11
	17,104·5	2,966 13 7	5,874 7 1	5,230 8 7	14,071 9 3	16 5·42	3,558 1 1	2,764 16 9	20,394 7 1	23 10·08	8,235 9 9	9 7·56	62 1 11	12,220 19 3

Schedule 9.

Statement of Receipts and Expenditure for the Year 1926.

TAILING TREATMENT.

Plant.	Tonnage.	Management.	Wages.	Assays.	Stores.	Total Working Expenditure.	Cost per ton.	Repairs and Renewals.	Sundries.	Gross Expenditure.	Cost per ton.	Receipts.	Per ton.	Profit.	Loss.
		£ 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 ...	540	155 17 11	202 9 3	26 1 9	103 0 2	487 9 1	18 0·64	438 13 6	72 10 11	998 13 6	36 11·85	647 2 9	23 11·61	...	351 10 9
Boogardie	650	45 0 0	111 2 7	10 2 11	113 6 7	279 12 1	8 7·22	4 1 11	69 19 6	353 13 6	10 10·58	200 15 8	6 2·13	...	152 17 10
Coolgardie	2,221	76 10 1	379 19 8	42 3 1	213 17 0	712 9 10	6 4·99	47 0 7	142 1 10	901 12 3	8 1·41	916 10 5	8 3·02	14 18 2	...
Cue	1,728	69 1 4	251 6 0	26 18 8	194 3 11	541 9 11	6 3·19	17 3 7	118 16 8	677 10 2	7 10·09	1,122 15 8	12 11·92	445 5 6	...
Laverton	500	66 3 3	93 5 4	16 0 10	75 17 4	251 6 9	10 0·62	4 12 8	41 15 11	297 15 4	11 10·92	391 4 8	15 7·77	93 9 4	...
Leonora	405	61 4 7	123 18 4	15 8 0	89 8 9	289 19 8	14 3·84	8 15 0	15 0 8	313 15 4	15 5·92	54 0 0	2 7·99	...	259 15 4
Meekatharra ...	2,826	124 9 6	70 0 6	478 0 6	307 11 0	980 1 6	6 11·23	27 10 5	390 19 10	1,398 11 9	9 10·77	1,879 19 7	13 3·64	481 7 10	...
Norseman	1,275	88 4 10	287 16 3	30 19 5	164 11 7	571 12 1	8 11·59	37 3 7	158 16 7	767 12 3	12 0·49	1,188 19 2	18 7·80	421 6 11	...
Ora Banda	1,080	51 11 8	147 8 6	29 6 10	106 16 4	335 3 4	6 2·47	6 2 11	94 15 4	436 1 7	8 0·93	891 6 1	16 6·04	455 4 6	...
Paynes Find ...	256	17 0 0	38 5 1	2 1 2	38 19 1	96 5 4	7 6·24	4 19 0	16 9 7	117 13 11	9 2·32	41 10 0	3 2·90	...	76 3 11
Peak Hill	736	35 17 8	133 5 0	4 3 0	70 2 10	243 8 6	6 7·36	154 1 3	56 13 0	454 2 9	12 4·08	400 11 7	10 10·60	...	53 11 2
Sandstone	715	51 17 10	142 19 6	20 19 9	91 2 4	306 19 5	8 7·03	1 12 0	48 11 8	357 3 1	9 11·88	352 15 4	9 10·39	...	4 7 9
St. Ives	476	56 1 5	132 19 8	14 5 11	73 13 3	277 0 3	11 7·65	270 16 8	37 15 6	585 12 5	24 7·27	140 18 0	5 11·04	...	444 14 5
Warriedar	543	37 0 0	84 11 2	20 17 10	86 10 10	228 19 10	8 5·20	...	58 15 11	287 15 9	10 7·20	258 6 10	9 6·16	...	29 8 11
Wiluna	1,947	166 16 1	367 16 3	24 4 9	328 0 7	886 17 8	9 1·32	136 0 5	180 9 0	1,203 7 1	12 4·32	2,473 19 8	25 4·94	1,270 12 7	...
Youanme	224	11 15 6	29 15 0	8 17 8	35 2 4	85 10 6	7 7·63	...	17 10 5	103 0 11	9 2·40	73 1 5	6 6·28	...	29 19 6
	16,122	1,114 11 8	2,596 18 1	770 12 1	2,092 3 11	6,574 5 9	8 1·87	1,158 13 6	1,521 2 4	9,254 1 7	11 5·76	11,033 16 10	13 8·25	3,182 4 10	1,402 9 7

Schedule 10.

Balance Sheet—December 31st, 1926.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Capital Expenditure :—			By Batteries Tailing and Slime Plants	408,443 17 8	
From General Loan Fund ...	316,462 16 0		Less Depreciation ...	345,877 12 11	
,, Consolidated Revenue	91,981 1 8				62,566 4 9
		408,443 17 8			
To Treasury		167,860 13 11	By Stores		11,539 10 9
,, Interest and Sinking Fund		384,799 14 3	,, Sundry Debtors		5,992 14 10
,, Sundry Creditors		2,104 13 8	,, Profit and Loss Account		883,110 9 2
		£963,208 19 6			£963,208 19 6

Profit and Loss Account.

	£ s. d.		£ s. d.
To Expenditure	1,472,967 15 8	By Revenue	1,320,534 13 8
		,, Loss on working carried down	152,433 2 0
			1,472,967 15 8
,, Loss on Working brought down ...	152,433 2 0		
,, Interest at 3½% and Sinking Fund at 1¼% on Capital Expenditure	384,799 14 3		
,, Depreciation	345,877 12 11		
	£883,110 9 2	By Gross Loss	£883,110 9 2

Schedule 11.

Working Profit and Loss Account for the Year 1926.

	£ s. d.		£ s. d.
To Working Expenditure—		By Revenue—	
		,, Batteries and Tin Plants	8,235 9 9
,, Batteries and Tin Plants	20,394 7 1	,, Tailing Plants	11,033 16 10
,, Tailing Plants	9,254 1 7	,, Loss on Year's Operations	10,379 2 1
	£29,648 8 8		£29,648 8 8

Schedule 12.

State Battery Statistics from Inception to 31st December, 1926.

Year.	Milling.						Sand and Tailing Treatment.						Slime Treatment.						Tin Treatment.						Gross Loss. ‡
	Tons.	Expenditure per ton.		Revenue per ton.		Loss.	Tons.	Expenditure per ton.		Revenue per ton.		Profit.	Tons.	Expenditure per ton.		Revenue per ton.		Loss.	Tons.	Expenditure per ton.		Revenue per ton.		Loss.	
		s.	d.	s.	d.	£		s.	d.	s.	d.	£		s.	d.	s.	d.	£		s.	d.	s.	d.	£	£
1899 ...	18,806	...		...		2,827	...	...		...		...	...	...		...		...	...	...		...		...	2,827
1900 ...	22,675	22	10·1	17	4·5	7,611	...	...		...		...	...	...		...		...	...	...		...		...	7,611
1901 ...	26,775	18	0·0	16	6·0	1,983	9,534	16	9	...		1,337	...	...		...		...	...	...		...		...	646
1902 ...	39,516	14	8·6	14	8·2	169	9,721	22	3	...		724	...	...		...		...	1,170	12	2	...		286	†269
1903 ...	49,233	13	6·8	12	10·6	1,250	33,369	7	7	...		1,442	...	...		...		...	2,009	8	2	...		153	†2,539
1904 ...	71,616	14	4·4	12	6·5	6,423	43,251	7	10	...		1,448	...	...		...		...	2,337	8	2	...		165	5,141
1905 ...	85,018	12	4·0	12	2·5	957	54,420	7	3	9	8·5	6,689	7,028	12	1	...		410	3,697	5	8	5	0·3	324	†3,342
1906 ...	95,831	12	2·0	11	3·8	4,076	65,159	7	4	9	2·1	5,549	4,737	11	8	12	1·1	†2,254	11,428	4	2	4	3·3	†156	†2,880
1907 ...	95,280	12	6·0	11	4·8	8,724	64,514	6	8·7	9	2·8	6,474	8,220	8	7·6	13	5·5	†1,983	10,496	4	4·4	4	8·8	†191	1,688
1908 ...	95,628	12	1·9	9	3·6	13,669	62,272	6	4·7	8	11·0	8,017	5,818	12	0·9	11	8·0	120	5,573	4	5·2	3	6·3	254	7,278
1909 ...	94,218	11	1·7	9	6·6	7,568	61,032	6	5·8	8	9·7	7,096	16,848	10	0·7	9	6·7	423	5,043	4	8·2	3	7·5	267	1,965
1910 ...	89,278	11	3·3	9	6·6	7,709	43,391	6	2·9	8	6·1	4,903	28,600	8	9·1	9	11·5	†1,723	3,769	5	5·5	3	4·1	401	2,365
1911 ...	59,373	12	6·9	9	10·3	8,058	27,362	6	5·9	8	9·7	3,173	28,183	10	10·5	9	5·3	1,666	6,061	4	0·3	3	4·9	188	7,490
1912 ...	56,636	12	9·2	9	8·7	8,616	18,600	8	3·5	8	8·6	397	8,085	11	8·6	10	5·2	519	5,330	4	5·1	3	7·6	210	9,786
1913 ...	60,573	12	5·6	9	5·4	9,155	31,378*	7	5·0	9	5·2	3,160	6,089	12	4·1	9	6·1	862	8,032	5	5·1	4	1·7	513	7,711
1914 ...	56,570	12	6·8	9	2·9	9,413	38,942	6	6·5	8	2·2	3,202	6,246	10	10·2	9	0·0	578	3,340	7	10·6	4	6·6	557	7,418
1915 ...	49,595	11	10·7	9	2·6	6,642	31,887	6	9·3	8	0·6	2,041	3,454	12	6·2	9	10·1	462	1,767	8	1·2	3	11·7	364	5,415
1916 ...	47,304	12	6·7	9	1·9	8,018	35,665	7	1·7	8	7·3	2,510	15,536	8	8·2	8	7·3	56	943	11	11·6	4	0·3	374	5,982
1917 ...	42,947	12	1·5	9	0·0	6,714	24,674	8	3·3	8	10·3	727	15,408	9	8·5	8	3·1	1,104	1,118	11	2·9	3	8·2	422	7,554
1918 ...	39,330	13	2·9	8	11·4	8,442	24,364	8	3·7	9	5·7	1,420	11,892	9	4·8	7	9·0	982	5,985	4	10·2	3	0·2	558	8,650
1919 ...	40,290¾	12	4·1	8	2·0	8,426	15,764	9	2·4	9	3·8	91	12,780	9	1·1	7	4·6	1,089	1,204	10	0·9	3	11·2	369	9,925
1920 ...	46,494¼	12	6.4	7	11·5	8,954	15,437	9	0·4	13	4·1	3,325	11,525	9	11·2	8	8·4	713	737	8	11·2	9	3·3	†12	6,363
1921 ...	34,761	17	3·8	9	0·7	14,361	19,763	10	0·8	17	10·0	7,677	7,370	10	11·6	8	5·7	918	54	82	0·5	8	0·4	200	7,802
1922 ...	35,722	16	11·8	9	2·3	13,862	24,234	9	11·7	15	8·9	6,988	7,492	11	10·5	8	5·8	1,271	...	...		...		55	8,200
1923 ...	29,714	17	0·4	9	6·8	11,044	14,307	11	5·5	14	2·1	1,943	8,848	11	1·3	8	11·7	945	...	...		...		26	10,072
1924 ...	18,063	21	0·1	10	9·5	9,231	19,767	10	8·6	10	7·8	§69	4,615	12	4·1	8	7·6	854	392	13	4·8	3	7·7	192	10,346
1925 ...	18,361½	22	7·4	10	8·5	10,768	14,289	11	6·6	16	2·1	3,301	...	...		...		...	268	12	6·5	3	8·6	118	7,585
1926 ...	17,104½	23	9·3	9	7·5	12,113	16,122	11	5·7	13	8·2	1,780	...	...		...		...	...	...		...		46	10,379

* Tailing Treatment commenced 1913. † Profit. ‡ Details of Ore dressing and Residue Treatment not shown, but financial result included in the figure of this column. § Loss.

DIVISION IV.

ANNUAL PROGRESS REPORT

OF THE

GEOLOGICAL SURVEY

FOR THE

YEAR 1926.

With Seven Plates.

TABLE OF CONTENTS.

LIST OF PLATES.

Annual Progress Report of the Geological Survey for the Year 1926.

Compared with previous years the greater proportion of the time of the somewhat limited personnel has, during the calendar year 1926, been devoted to writing reports, though such field work as was found possible to carry out has been on similar lines to those adopted in the past.

THE STAFF.

There were six classified officers engaged upon the manifold work of the geological survey during the year 1926, and there have been some changes in the staff.

I was retired from the Service on the 1st November, under Section 66 of the Public Service Act, after having continuously served as Government Geologist since the 1st November, 1896.

Mr. A. G. D. Esson, temporary Field Geologist, severed his connection with the Department on the 11th December, after having served in that capacity for nearly five years.

FIELD WORK.

The table hereunder shows in brief the distribution of the field work carried out during the year, together with the names of the officers engaged, and the districts in which they were employed.

Table showing the distribution of Field Work during the year 1926.

Goldfield or Land Division.	F. R. Feldtmann.		A. G. D. Esson.	
	No. of days in the field.	Percentage of working days.	No. of days in the field.	Percentage of working days.
South-West Division	...	...	52	14·2
East Coolgardie Goldfield	22	6	...	...
Total ...	22	6	52	14·2

F. R. Feldtmann, Field Geologist.

Mr. Feldtmann took his annual leave for the year 1925 in the early part of January. The period intervening between his return to duty on the 6th January and the 14th May was devoted to the preparation of the report and maps on the Gypsum deposits of the South-West Division, which appeared in the progress report of 1925; the report, maps, and sections on the work carried out in connection with the underground geological survey of Kalgoorlie; the revision of proofs of bulletins (with plates and maps) in the hands of the Government Printer; together with various duties incidental to the work of the office.

Mr. Feldtmann commenced his long service leave on the 19th June, and was in consequence absent from duty until the end of the year. It was, in consequence, only possible for him to devote 22 days to active field work.

A. G. D. Esson, Field Geologist.

Mr. Esson's field work during the year 1926 comprised a series of visits of short duration to certain localities in the South-West Division. These included: three weeks of the month of April devoted to an examination of the peat deposits of Bayswater, of which the results have appeared in the progress report for the year 1925, q.v.; a short visit to Muja on the Collie Coalfield in June; an investigation into a clay deposit at Clackline, under the provisions of the Mining Act; a visit of a similar nature to a silver-lead deposit at Mundijong; and an examination of the alunite deposit of Lake Brown between the 7th and the 25th of November. Fifty-two days were devoted to field work, which was solely confined to the South-Western Division. Mr. Esson's term of service expired on the 11th December, when he severed his connection with the Survey.

PRINCIPAL RESULTS OF THE YEAR'S FIELD OPERATIONS.

1.—PROGRESS REPORT ON THE KALGOORLIE SURVEY.

(F. R. Feldtmann, Field Geologist.)

During 1926, field operations were mainly confined to the examination and survey of underground workings, in particular of those of Messrs. Black and Levy on the northwest slope and near the northern end of the Brown Hill Consols ridge, and in the northwest portion of G.M.L. 5247E. The country rock of this area is much sheared fine-grained greenstone, mostly oxidised in the workings examined, and with a capping of dense laterite on the top of the Brown Hill Consols ridge. A long dyke of albite porphyrite occurs immediately northwest of the workings described, but should pass a few feet west of the ladderway of the southwest workings and none of this rock was seen in the workings examined.

The most extensive of these workings are from a shaft about 200 feet southeast of the westernmost corner of G.M.L. 5247E. Two lodes have been cut in the workings from this shaft, which has a vertical depth of 66 feet. The more westerly lode should outcrop from 4 to 8 feet east of the shaft. The average strike of this lode is approximately N. 19° W.

From the shaft, levels have been driven at vertical depths of 42 feet and 66 feet. The rock at both levels is completely oxidised. The shaft is practically vertical as far as the 42 feet level, but thence has a slight westerly dip.

The western lode, which is in the shaft at the 42 feet level, has been driven on at this level, north for about 26 feet and south for 35 feet. From the south drive a crosscut has been driven east for 15 feet. An incline crosscut, which meets the south drive about eight feet south of the shaft, connects these workings with a small shaft, 130 feet west of the first (hauling) shaft at a depth of 14 feet. This second shaft is used as a ladderway.

Payable ore only extended a few feet north and south of the hauling shaft at this level, the ore body being stoped underfoot to about 15 feet south of the shaft, but the lode is fairly well defined and ferruginous. The walls of the lode, particularly south of the shaft, are marked at this level by narrow zones of intense shearing accompanied by brecciation.

At the 66 feet level the lode has been driven on south for 58 feet. The north drive had been mullocked, but was said to be about 40 feet in length. The lode, which was not so well defined at this level, averages a little more than two feet in width in the south drive. It was only payable for a short distance north and south of the shaft.

From the end of the south drive at this level a crosscut extends east for 123 feet. From 43 to 52 feet east of the drive an ill-defined shear zone, in which a fair amount of manganese oxide is present and carrying a trace of gold, was cut by this crosscut. Traces of gold were also obtained at the end of the crosscut from a steep narrow shear zone of somewhat mullocky appearance. This shear zone was driven on north for 16 feet and south for about 80 feet. No gold, however, was found in the drives and the shear zone is barely traceable near the end of the south drive.

Another crosscut was being driven east from the shaft at this level, at the time of my survey. From about 43 feet east of the shaft to the then face—60 feet east of the shaft—of the crosscut, the rock is much sheared and near the face some ferruginous matter is evident, but little or no gold appears to be present. The sheared rock in the last six or seven feet of this crosscut without doubt represents the shear zone or lode cut in the crosscut to the south, from 43 feet to 52 feet east of the south drive.

About 265 feet north of the hauling shaft and immediately north of the northwest boundary of G.M.L. 5247E is a shaft, 47 feet in vertical depth and on a westerly underlay of about 70°, on a lode which from its position and strike is obviously the northerly continuation of that cut at 43 feet to 52 feet in the east crosscut off the south drive from the hauling shaft.

From this northern shaft levels have been driven at vertical depths of 29 feet and 47 feet. Owing to the difference in the surface levels at the two shafts, the 47 feet level from the northern shaft is practically equivalent to the 66 feet level from the hauling shaft.

At the northern shaft the lode has been driven on for 88 feet at the 29 feet level and for 72 feet at the 47 feet level. The lode in these workings strikes, on the average, about N. 10° W., and averages a trifle more than two feet in width. It is cut by a series of narrow, nearly vertical shear zones, striking about N. 40° W., along which it appears to be faulted a few inches to the east, going north.

A few small cross joints and cross veins of quartz were noted. These appear to cut the lode, but to be cut by the later shears.

The lode is not very well defined and, owing to the shearing of the country rock both prior to and later than the period of lode formation, is difficult to follow, particularly at the 47 feet level. It is, however, as a rule more ferruginous than the enclosing rock.

Only one small shoot of payable ore was obtained in these workings, between about 37 feet and 57 feet north of the shaft at the 29 feet level and about 48 feet and 54 feet north at the 47 feet level. This shoot has been stoped between the two levels and for eight or nine feet above the floor of the 29 feet level.

It was stated in the Annual Report of the Survey for 1925 (page 10) that two parallel zones of intense shearing, observed a few feet southeast of the south-eastern boundary of the Lucelle G.M.L. 5375E and east of an old shaft with a high dump, were possibly the southerly extensions of the lodes worked by Sassella Bros. in the former Williamstown G.M.L. 4499E, later covered in part by G.M.L. 5375E. The strike of these shear zones is about N. 42° W.—approximately parallel to that of the later shears cutting the lode in Black and Levy's north shaft—and they should meet the southerly continuation of Sassella's lodes a short distance north of the Williamstown-Brownhill road. The two lodes cut in Black and Levy's working, however, strike about N. 10°-20° W. and should meet Sassella's lodes, which in the southernmost workings examined during the survey of the North end averaged about N. 32° W. in strike, a little south of the road. It should be stated that in the workings mentioned Sassella's lodes appeared to be bending in a more southerly direction.

I am now of the opinion that Black and Levy's lodes are the southerly continuations of Sassella's lodes and that Sassella's south shaft, immediately north of the Brownhill Road, is too far east to cut the lodes, except by crosscutting. The old shaft south of the road is probably between the two lodes at the surface.

2.—THE SILVER-LEAD DEPOSITS AT MUNDIJONG, COCKBURN SOUND DISTRICT, SOUTH-WEST DIVISION.

(A. G. D. Esson, M.A., Field Geologist.)

I.—Introduction.

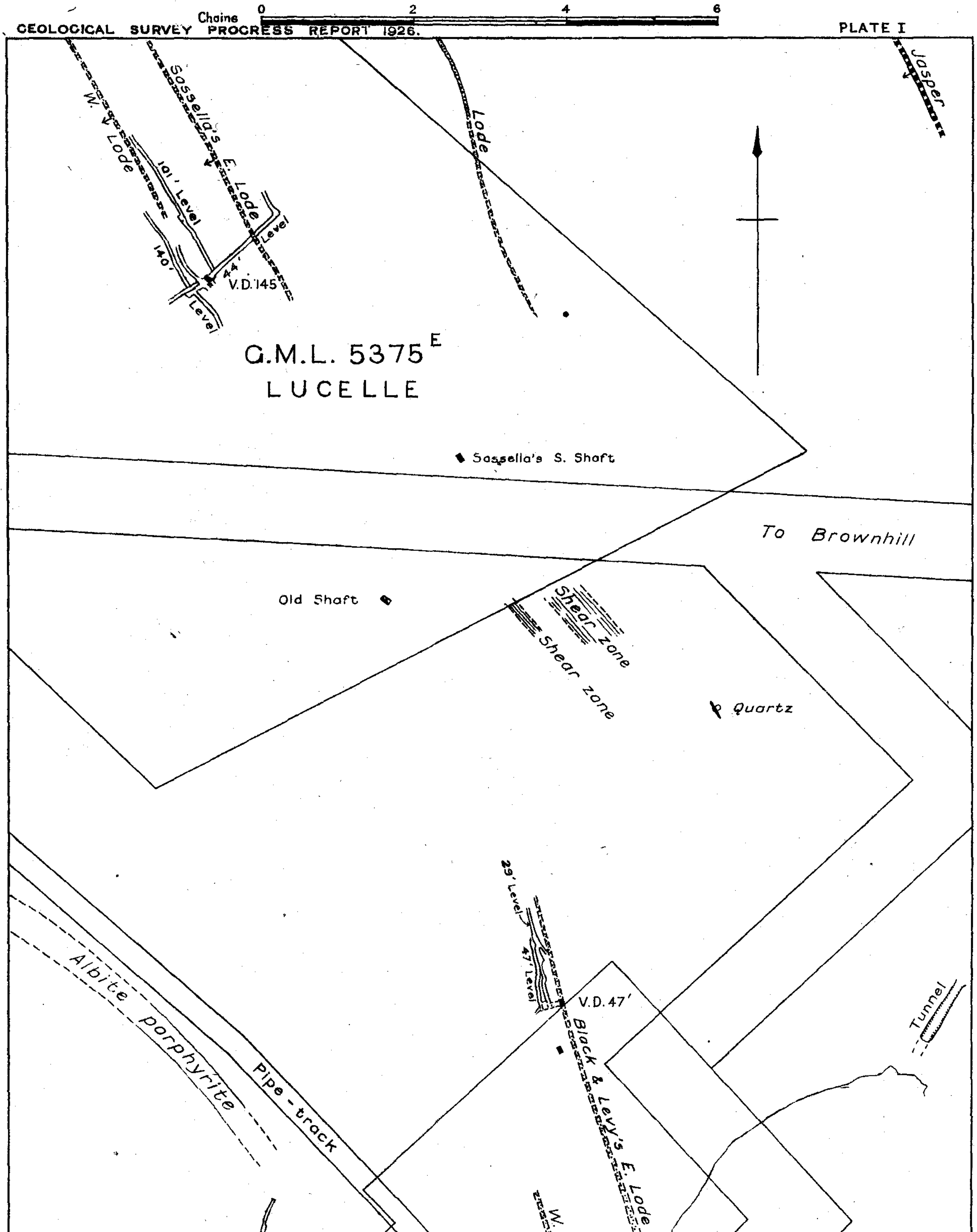
In accordance with instructions an examination of the country comprised in and around Prospecting Areas Nos. 474H, 475H, Mundijong, has been made by the writer. This followed upon instructions issued to the Government Geologist in accordance with Section 197 of the Mining Act to enter, inspect and report on this land to ascertain whether there is reasonable probability of the land containing minerals lead and zinc in payable quantities.

When visited, the areas were deserted, and would appear to have been so for some considerable time. Workings were inaccessible, and the deep main windlass shaft upon Prospecting Area No. 474H was filled with water to within seven or eight feet of the surface. Notwithstanding, the writer was able to make a brief examination of the surface indications of mineralisation and of the geology of some of the sur-

The Hon. M. F. Troy, M.L.A.
Minister for Mines.

PLAN SHOWING RELATIVE POSITIONS OF BLACK AND LEVY'S AND SASSELLA'S LODES
KALGOORLIE, EAST COOLGARDIE G.F.

GEOLOGICAL SURVEY PROGRESS REPORT 1926. PLATE I



By Authority: FRED. WM. SIMPSON, Government Printer, Perth.

A. Gibb Maitland
Government Geologist

rounding country. A map has been prepared by the writer and accompanies this report. Boundaries between rocks were found to be much obscured—in some places by laterite, and in others by deep alluvium. Hence the writer does not claim that the examination, made in so short a time as was available, is definitely conclusive, and minor alterations in geological boundaries may be found necessary with more detailed field work. Traverses made by the writer will, nevertheless, give a reasonable degree of accuracy to the map.

The occurrence of silver-lead in this locality has been known for many years. As far back as 1907, Mr. Montgomery, State Mining Engineer, reporting on this ground as Leases Nos. 6H and 7H, says that first discoveries of silver and lead here were reported to have been made many years before 1907. A shaft was sunk to 40 feet, and later deepened to 86 feet.

Various syndicates and owners have held the land comprised in these leases and prospecting areas, which have had a chequered career and indifferent success up to the present.

The present applicants were not in evidence at the time of examination so that nothing could be found out from them regarding the exact places on the prospecting areas at which silver, lead and zinc were found. Only on Prospecting Area No. 474H has any serious attempt been made to prove the existence of metalliferous bodies or lodes, and the writer relied solely on his own observations in making this report.

II.—Locality.

Prospecting Areas Nos. 474H and 475H are situate about two miles east of Mundijong Railway Station. Prospecting Area No. 474H lies partly within Locations, 23, 407, and 410, the latter of which is the Jarrahdale-Rockingham Timber Company's Railway Reserve. Prospecting Area No. 475H, as applied for, would lie in Location 653, and a small portion possibly in Location 269, although adjustment of the prospecting area boundaries could be made to get over this difficulty.

Location 23 is held by the Crown for asylum purposes, and the other locations mentioned are held by private parties.

III.—Geology.

(a)—*General Geology of the District.*

The underlying formations are largely obscured by the ordinary concretionary laterite, found so commonly throughout the Darling Ranges, and from near Mundijong townsite there is a gradual transition and rise to the lower slopes and foothills of the southern extension of the Darling "Range" Fault Scarp.

Near to Mundijong the surface is covered by low level laterite which may obscure extensions of some of the sedimentary beds underlying the metropolitan area. On Location 500, immediately south of Mundijong, the writer found some fragments of shale similar to the Cardup-Byford-Armadale shales in close proximity to a windmill-well upon the block. He was assured by Mr. Walsh, the holder of the block, that these came from the shaft of the well when it was being excavated. If this is so, and if there is any solid bed of shale, then there is here a probable extension of the Armadale shales and possibly a correlation in age between these shales and those of the metropolitan area. No shale outcrops were observable at this point, and small sections upon an adjacent creek showed clay loam to sandy loam overlying lateritic formation and detritus.

Further east the laterite gives way in places to white sand upon the surface, and nearing the intersection of the Bunbury Road and the Rockingham-Jarrahdale Timber Company's line, the surface becomes more lateritic, and there is a gradual transition to red clay.

At the intersection of the Bunbury Road and Mundijong Road there are small quarries upon the same Cardup-Armadale shales, and these latter are overlain by laterite.

Going still further east into the Darling Ranges proper, there are occasional outcrops of the underlying rocks, but except upon the higher points of the ridges and hills laterite and alluvium obscure most of the rocks.

In the vicinity of Location 23, the fundamental rocks are seen to be foliated hornblendic granite gneiss with a distinctly north-west foliation strike, intruded by later epidiorite dykes so characteristic of the whole Darling Range escarpment.

Enfolded in the gneiss are beds of shales similar to the so-called Kelmscott clay deposits. These shales are highly argillaceous, and in cross section are beautifully banded with alternating blue or black and white laminae. In the vicinity of the prospecting areas there would appear to be at least three separate belts of shales, all with a very high dip.

In one place at a shallow shaft in the north Prospecting Area No. 474H, porphyrite with large bleached felspar crystals was noticed. No absolute strike of this rock was seen, but it seems likely that it would occur in dyke formation with a main strike direction closely approximating to the general north-west foliation strike of the igneous fundamentals. It is possible that this foliation strike would develop closely parallel zones of weakness suitable for intrusion of the porphyritic magma.

Topographically, the country in the neighbourhood of the prospecting areas consists of deep gullies and steep ridges forming the lower foothills of the Darling Range escarpment. Through Prospecting Area No. 474 H runs a deep gully north-westwards down which flows Mundijong Brook. To the northeast is Manjedal Brook also running north-west towards the sea along a somewhat more mature gully. In both gullies there is a good depth of alluvial matter largely derived—in the Mundijong Brook gully—from disintegration of slates and epidorite.

(b)—*The Rocks.*

(1)—*Gneiss.*

Granitic rocks occupy a great portion of the Western Australian Plateau, and in the Darling Ranges they are very prominent in association with intrusive dykes of later epidiorite greenstone. These granitic rocks along with various metamorphic schists, greenstones, and epidorite dykes are considered to be pre-

Cambrian in age, and it would appear that these pre-Cambrians form the ultimate fundamental rocks of the whole Western Australian Plateau.

The granitic rocks vary a great deal in composition from biotite-microcline granites to hornblende granites throughout the ranges, but they would seem to be products of the same magma varying only by segregation. There are later granitic rocks, but it is not necessary to consider them meantime. In the vicinity of Mundijong the predominant type would appear to be the hornblendic type. Most of the outcrops of this type observed by the writer were seen to be distinctly gneissic in structure. Possibly there has been metamorphism or segregation or both processes perhaps, to produce a more basic form which would be known as hornblende schist.

Hornblende gneiss has been observed by the writer at Armadale and Cardup, and also at Clackline many miles further north, but still, in common with the other places mentioned, upon the Darling Ranges. The continuance of gneissic structure in much the same direction throughout the ranges would point to a possibility of it being due to strain developed at time of faulting of the Darling Scarp, but this assumption is not meantime accepted conclusively by the writer.

The strike of foliation planes of the gneiss near the prospecting areas varies from place to place, and the general direction throughout the district appears to conform largely to that of the reefs, viz., roughly northwest to north-north-west. At times upon first examination, the gneiss in close proximity to the main reef at the deep windlass shaft seemed to be almost basic in character, but closer examination revealed the fact that it is merely a phase of the gneissic fundamental. In this it closely resembles the occurrences at the reported gold discoveries of Mundijong some 1½ miles south-east of the silver-lead shows. This would lend some credence to Campbell's supposition (Geological Survey Annual Report) that these reefs in the gneiss are also particular phases of the gneiss due to the separation of quartz from hornblendic and other material.

This, however, was not definitely clear to the writer at the main shaft of Prospecting Area No. 474H, and further work would be necessary before agreeing with Campbell's supposition in its entirety. If Campbell is correct, then there will be little likelihood of finding any great ore body in association with the reef. In places the reefs have a somewhat foliated apearance, and in others they are decidedly bucky.

At the south-west corner of Location 23, a very much weathered and rather fragmentary outcrop was found. A specimen collected here is seen to consist largely of quartz, and ferruginous minerals have been altered to limonite and other iron oxides, thus giving the rock in section a banded appearance with white and red or yellow stripes. The banded appearance is due to an original gneissic structure, and evidently the iron minerals are derived from the alteration of hornblende. There is little doubt in the mind of the writer that this is merely a surface alteration product of the hornblende gneiss, although upon first examination it would appear to be a sandstone when coarse in grain or even a quartzite when more compact. It is possible that an occurrence such as this might give rise to the idea that sandstones are associated and interbedded with the shales.

In places small stringers of quartz are found filling what evidently has been faults across the folia of the gneiss. The writer is not quite clear as to the derivation of that quartz, but in a specimen from the main windlass shaft in Prospecting Area 474H it would appear to be secondary in origin, and it is there associated with crystalline pyrites.

(2)—*Porphyrite.*

It has already been pointed out that this intermediate to basic rock, usually occurring in other parts of Western Australia as later dykes intrusive into older rocks, was observed in the north Prospecting Area No. 474H, and that in the limited time available it was impossible to find out exactly its connection with adjacent rocks. It would appear, however, to be a dyke striking roughly northwest alongside an intrusive epidorite dyke. In the map it has been suggested that the porphyrite dyke is of comparatively short extent southwards, but this is not absolutely conclusively proved, although boundaries were delineated from observations made on a few traverses.

The age of such rocks in other areas has not yet been determined, although it has been suggested by Dr. Larcombe that these are most probably post-gold in age as they are not, in general, found to be mineralised in any way.

In fresh specimen the rock is of a greenish colour, and shows plentiful flat crystals of plagioclase felspar which are much bleached and altered. It weathers to a reddish-brown rock with dirty yellowish-white phenocrysts of felspar.

It is understood that this same rock is found to occur at a number of places along the Darling Range escarpment. The writer is informed of its occurrence at Serpentine, Cardup, and Byford. He has not verified these occurrences, but it seems likely that at a late period of activity these dykes of porphyrite would be intruded along lines of weakness from a sub-acid (?) or intermediate magma.

(3)—*Greenstones.*

Among the rocks of the district, greenstone also finds a place. This greenstone consists of fine-grained to medium-grained epidiorite intrusive in the form of dykes. At various points through the ranges, this greenstone has been found in close proximity to and indeed often intruding the shale beds.

Clarke and Williams in their "Geology and Physiography of Parts of the Darling Range near Perth" (*Journal Royal Society, W.A.*, Vol. XII.), mention the fact that at certain places in the Darling Ranges there would seem to be evidence of more than one age of epidiorite dykes, but certain occurrences lead them meantime to accept the idea of all epidiorite dykes being of the same age.

In the writer's Mundijong examination, time was too limited to permit of very detailed examination of epidiorite dykes in the vicinity, so that it is impossible to say meantime if there is here definite evidence of more than one age in these dykes. It is suspected, however, that there may be evidence of this kind here and also at Armadale and Cardup. The writer, in the Annual Report, Geological Survey, W.A., 1922, has drawn attention to the strange parallelism of such dykes at Wongong Brook Weir site (which is also in the Darling Range), with two main directions of strike, and he suspected there also different ages of such dykes.

In the map accompanying this report the writer has shown dykes of epidiorite running in two main directions, northwest to north-northwest and north-northeast. These dykes seem to occupy lines of weakness closely conforming to their strike. It is somewhat remarkable that the quartz reefs observed had a main northwest to north-northwest strike conforming to one of the main shear directions observable right throughout the Western Australian Plateau. It seems likely that this is one of the oldest—if not the oldest—of the shear directions of Western Australia, and from point of view of age would point to the possibility of mineralisation having ample time for being at work.

If this is accepted, it may be presumed—although perhaps not proved—that epidiorite dykes conforming to this strike are of greater age than those conforming to the north-northeast strike.

(4)—*Shales.*

The writer has been able to find evidence of four *possible* belts of shales in the Mundijong district. Two are in the immediate vicinity of Prospecting Area No. 474H, and these have a main northerly strike which varies at times to almost north-northeast. Definite outcrops were hard to find except in small cuttings on the Jarrahdale railway line and in a costean northwest of the northwest cornerpost of Prospecting Area No. 474H. In general one had to be satisfied with fragmentary deposits derived by weathering of upended deeply dipping shales underlying or presumably closely adjacent to the detritus. For this reason it was somewhat hard to fix boundaries with any degree of exactitude. The shales rest upon their edges, and have a steep dip which in places closely approximates to vertical.

Essentially the shales are altered mudstones and are highly argillaceous. Bedding planes are observable in narrow bands of alternating blues, black and white. In places there is evidence of alteration by pressure and also probably by intruded heated dykes such as the epidiorites.

In the vicinity of Prospecting Area No. 474H it would appear that one of the epidiorite dykes intrudes the shales, and this might be taken as definite evidence of the comparative age of the shales. It has generally been assumed that similar intrusive epidiorites are pre-Cambrian in age—although not admittedly so in this case—and this would point to the shales being of great age. It is to be noted that the Government Geologist has suggested that these "Armadale Shale Beds" are possible extensions of the Yandanooka Beds (*Mining Handbook,* G.S., Mem. No. 1, Chap. 2, Economic Geology, Chap. II., Lead Deposits of W.A., page 6). The writer could not find any evidence of mineralisation of shale beds further than that of the occasional development of pyrites—evidently by pressure. E. de C. Clarke has suggested that these beds of much jointed shales are representatives of the Yilgarn Series (Handbook, Aust. Assoc. Adv. Science, 18th Meeting, Perth, 1926 page 26).

At Mundijong the writer could find no evidence that the shales are in any way concerned with lead deposition, and they are not in themselves mineralised.

Occasionally a very finely-banded, close-grained, highly metamorphosed phase of the shales was found. This, upon first examination, was thought to be, from its appearance, a "jaspilite" similar to those so common on the various goldfields, but closer examination soon revealed its true nature.

Sometimes the shales were found to break across the bedding planes and to approach a blue slate, but normally they are to be considered merely as highly metamorphosed shales.

No fossils of any kind are to be found in these shales, and this may perhaps give some idea of their age and of the amount of metamorphism that they have undergone. Normally these shales would be expected to yield plentiful fossils but, so far, negative results have been obtained.

Iron material in the weathered shales produce red hydrated oxide of iron, and ultimately by degredation a very heavy black loam. With a somewhat youthful, but full maturity, the lower valley of the Mundijong Brook in the vicinity of the prospecting areas is largely cloaked by such black material to a fair depth.

Economically these shales are of value for brick-making, and for some years the Armadale deposits have been utilised for this purpose by private enterprise. There seems to be no reason why the Mundijong shales should not be developed in the same way.

(5)—*Laterite.*

Laterite covers much of the surrounding country, and obscures the underlying rock relations. In general, the laterite is of the normal red, ferruginous concretionary type, but occasionally it is somewhat more ferruginous, especially when ultimately derived from greenstone.

(6)—*Reefs.*

In general, the reefs were found to have a main northwest to north-northwest strike in conformity with the strike of shearing already mentioned above. Although at times they exhibit a sheeted to laminated appearance, consideration of the fact that they are found in shear zones in the greenstone as well as in the gneiss would lead to the supposition that those reefs came probably after the intrusion of epidiorite dykes of largely the same strike. It is possible that the intrusion of these dykes was along prevailing lines of weakness which again were opened up at a later time, perhaps, by the intrusion of the greenstones or, perhaps, by the intrusion of the later deep-seated acid granite magma.

Throughout Western Australia it is now recognised that the intrusion of deep-seated acid magmas has been responsible for the circulation of hot solutions, which in turn deposited quartz and contained minerals in convenient fissures and places where conditions were favourable for doing so.

(c)—*Particular Geology of Prospecting Area No.* 474H.

A brief resumé of the salient points of the geology of this prospecting area is given herewith. The prospecting area is situate along a deep valley through which runs the brook designated Mundijong Brook. This valley seems somewhat mature, but it is doubtful if it is more than youthful. Its bottom and sides are largely cloaked with a deep deposit of alluvial material derived from the weathering of laterites and of the underlying rocks.

The fundamental rock is gneissic hornblende granite. In this upon edge lies a belt of shales with a main north-northeast to north strike. These shales appear to be thinning out towards the southern portion of the prospecting area.

These have been intruded by greenstone (epidiorite) dykes and by porphyrite, the exact boundaries of which rock are by no means certain. It is possible that in the area, marked porphyrite on the map, there are more than one separate dyke.

A long line of reef on the southwest side of the prospecting area has been followed and mapped by the writer. This has a main northwest strike and lies in the gneiss with a strike almost parallel to the epidiorite. Upon this line are the main workings. There are other workings off this line in the north of the prospecting area but none of these is of any great importance.

Upon the main line of workings is Main Windlass Shaft. In 1907 Mr. Montgomery made an examination of this shaft and of the adjacent workings. In this report use will be made of details supplied by him, as owing to the height of water in the shaft it was impossible for the writer to make any examination of these underground workings. The shaft is 86 feet deep (or more) with levels at 30 feet, 52 feet, and 70 feet. Very little work was done at any level but the 70 feet level, where a crosscut was made for 23 feet northeast through the reef and a winze sunk 30 feet. The reef seems to widen considerably with depth and with a dip northeast of 85° or more it passes out of the shaft between 50 feet and 70 feet levels. In the crosscut it was seen to be about 16 feet wide, and the lode matter consisted of strings and bunchy patches of blende and galena in quartz. Very little pure galena was exposed, and hand-picking would have to be resorted to so that material of commercial value should be obtained. An examination and assay of samples was made for Mr. Montgomery by the Government Mineralogist and Analyst and the following results were obtained:—

Lead	8·30% (wet assay).
Zinc	5·31%
Copper	Slight Trace
Silver	14dwts. 8grs. per ton.
Gold	Trace.
Silica	77·71%

The assay results are not promising and, apart from lead and zinc, minerals are of no consequence. There seems to have been small justification for calling this a "silver-lead show." There seems to be no reason, however, why, with shoot and ore body increasing with depth, a good ore body should not be obtained at depth.

The work done in this shaft seems to have been more or less of an exploratory nature, rather than developmental.

Specimens of ore obtained by the writer from the dump at the Main Windlass Shaft head consisted of pure white semi-transparent glassy quartz, much fractured and occasionally re-silicified, with bunchy deposits of galena and zinc blende. Unfortunately, the amount of zinc is too great in these specimens to permit of the ore being treated in the ordinary way and a special treatment will be necessary. Careful sampling at depth from various points upon the ore body would reveal the possible utility and value of the ore.

Southeast of the Main Windlass Shaft is a small tunnel into the reef. This probably was cut in for the purpose of testing the extent of the reef. Further southeast along the same line of the reef are two costeans across the reef. In these there is no great mineralisation and the quartz is somewhat bucky.

Northwest of Main Windlass Shaft is a long costean along the reef, and east of this there is a shallow shaft. It is not known what the function of this shallow shaft was, as it also was found to be full of water, but from its dump materials it appears to have been put down on a narrow stringer quartz reef contacting with the main reef near the Main Windless Shaft, and lying wholly in hornblende gneiss.

Other reefs are marked upon the map accompanying this report, but none seem to have had any mineralisation worth noting.

IV.—Conclusions and future possibilities.

There are two aspects worthy of consideration in determining whether the land in this area should be alienated for mining purposes.

1st.—Minerals of economic value are to be found, and, in the writer's opinion, they occur only upon the reef in which are the main workings. Upon the evidence of the writer and of Mr. Montgomery, lead (galena) and zinc (blende) are found in a shoot in the Main Windlass Shaft. Hence there is justification for permitting the mining of these minerals.

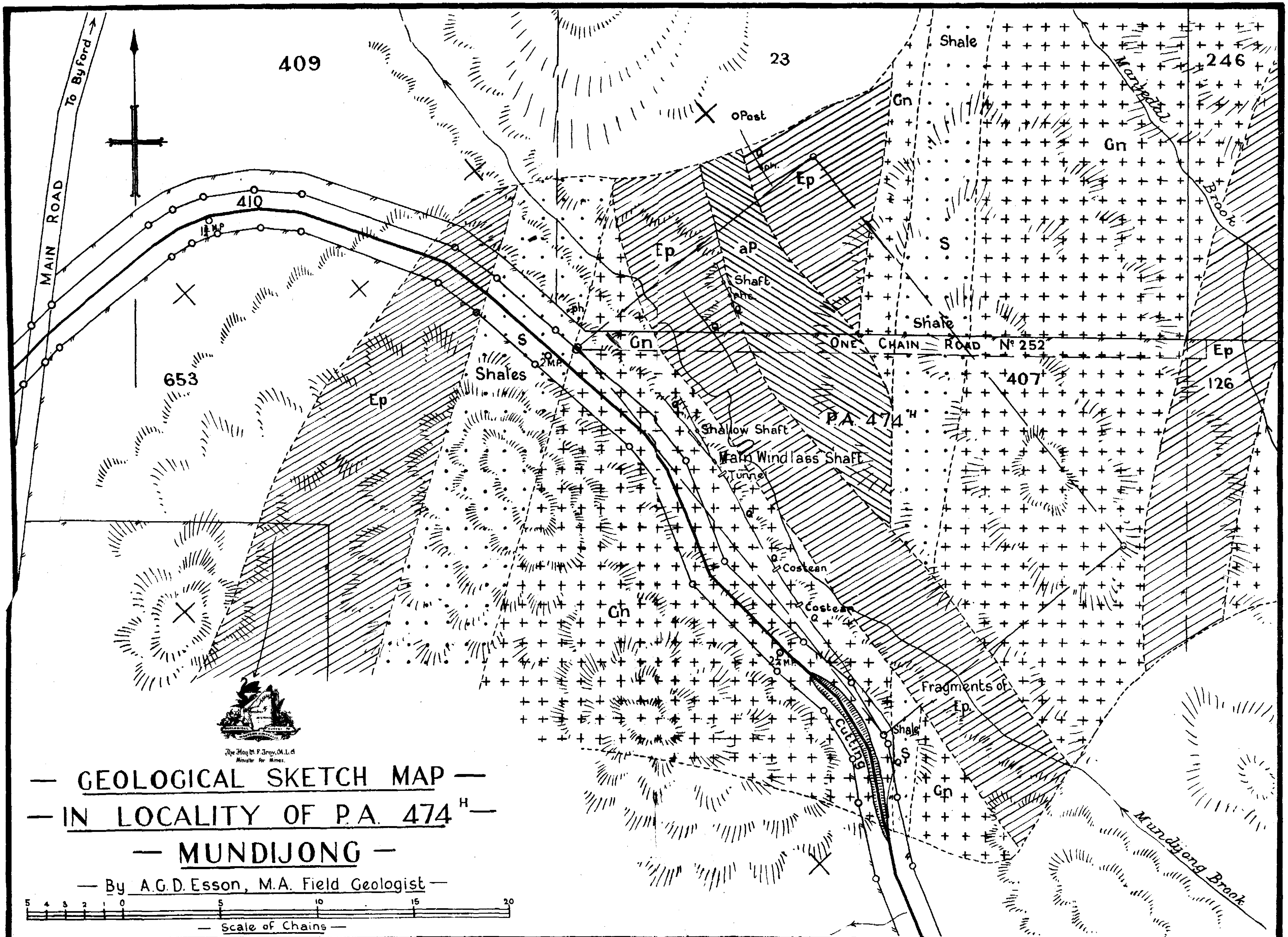
2nd.—There are two large beds of shales, similar to those which have been found to be of value for brick-making at Cardup, Byford and Armadale.

In addition, railway facilities are comparatively close to both occurrences.

Against these it must be considered that the areas lie in private land as well as in Crown reserves for lunacy purposes. The writer could see no justification for considering that the area south of Jarrahdale Railway Reserve Location 410 was mineralised, especially as the reef in Main Windlass Shaft dips northeast away from the railway. A rough examination of this country south of the railway was made and the writer could find no signs of any attempt at prospecting it and certainly no signs of mineralisation. It is not claimed that mineralisation does not occur there, but no trace of it was observed.

Another point at issue is the fact that it will be necessary to alienate "private" lands. It is likely that this will be a question for decision by the Warden, as it is understood that the prospectors were unable to come to any agreement with the owners of the lands.

It seems highly probable that the ore in the Main Windlass Shaft will be bunchy, but there is no reason why it should not make into a profitable body at depth. It was noted that occasionally there is a development of pyrites in specimens from the dump



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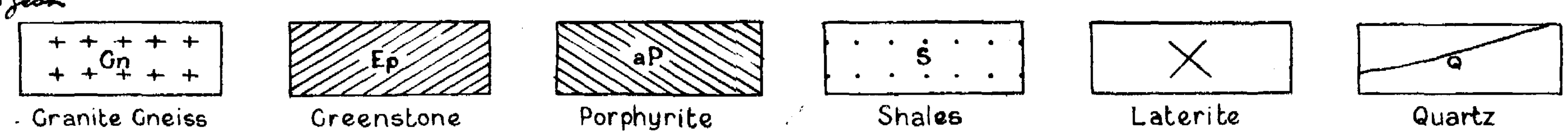
A Gibb Maitland
Government Geologist

— LEGEND —



but it is not known from what depth such samples came. Probably the lode will make into copper deposits at depth. Before making any development of the show, some attempt should be made to prove the extent and value of the shoot.

It might be noted in conclusion that somewhat sporadic deposits of gold, copper, zinc, lead and silver have been noted at various places along the Darling Range escarpment going northwards from this area, but in most cases they have proved unprofitable. In this connection is mentioned the barytes deposits at Cardup, where a barytic-quartz body has been worked and is now abandoned.

3.—ALUNITE SALT LAKE DEPOSITS, CAMPION, AVON DISTRICT.

(A. G. D. Esson, M.A. (Aberd.), Field Geologist.)

1.—Introduction.

During 1925 Mr. J. Chandler, of Campion, a comparatively new agricultural district recently opened up for wheat growing, submitted for examination samples of the muddy beds of salt lakes situate in Campion. These samples were examined by the Government Mineralogist, and were found to contain alunite. Subsequently the Government Mineralogist (Dr. Simpson) and the Government Geologist (Mr. Maitland) made a short examination of these lakes. At the time of their visit little more could be done than to verify the deposits and to take samples, owing to the fact that the lakes were under water to a depth of two or three inches.

Owing to the importance of the alunite for agricultural and other purposes, the writer was instructed to proceed to the district and to map out the deposits in detail, so that information could be obtained regarding the quantity of alunite available. Leaving Perth on 1st November, 1926, the writer occupied three weeks in the examination, and this report is the result of his investigations. A geological sketch map acompanies this report and embodies the main work done by him on the field.

2.—Location.

The alunite deposits are found on two lakes designated Reward Lake and Chandler's Lake, both of which lie about 22 miles slightly west of north of Burracoppin and 24 miles by road in a main northerly direction from Burracoppin. Roads to the deposits are, in the main, fairly good, although there is some distance of lake country to be passed through.

3.—Topography.

The salt lake system, loosely designated Lake Brown, consists of a series of salt lakes and playas, which appear to have been at an early stage in Western Australian history—although possibly late geologically—an old river system running westwards to the sea. Cartographers seem to have suggested that this river system at one time joined up with the River Avon. Whether that be so or not, the writer cannot say definitely at present, but he found the lakes in the Campion area to have a general fall southwards. In addition it seems likely that in the south the drainage turns west and northwest towards the main Lake Brown, as the general fall of the country is in that direction.

There are natural barriers to perfect drainage in the form of kopai ridges, and it is likely that only in flood periods is water able to move towards the main Lake Brown, as in every case, where there was opportunity of testing, the writer found water in the lakes to be extremely salt. Hence, evaporation must account for a considerable amount of the water collecting on these lakes. So salt were the lakes found to be that it was sufficient when collecting salt from them to dig trenches and to allow seepage waters to collect. Dissolved salts crystallise out as a thick crust upon the waters, and can be easily collected. The most common salt observed was common salt or sodium chloride.

The salt lakes in this western extension of Lake Brown lie in depressions in a gently sloping surface through which occasionally bare granitic rocks appear. These playas or salt lakes are divided from each other by ridges of kopai, and occasionally of impure to pure white seed gypsum. These ridges, which presumably are blown up by prevailing winds, rise to a height of 20 or 25 feet above the level of the lake beds.

To the writer it seems likely that igneous rock outcrops—perhaps lateritic—form the cores of many of these kopai dunes. Probably these cores would form convenient places against which to deposit gypseous matter blown off the dry lakes in summer weather. This blowing-up of the powdery gypseous matter was actually seen by the writer during his examination.

Occasionally flat granitic outcrops are met, and in one of these on Block 14340 a small gnamma hole of characteristic form was found. The capacity of this hole is about 50 gallons, and it is the only fresh surface water observed in the district. For agricultural purposes water is conserved by means of dams. The district is decidedly dry, and is largely dependent for water upon the nearest standpipe of the Goldfields Water Supply Scheme.

4.—General Geology.

Rock outcrops are not numerous except in one or two places in the area under discussion. In most cases, rock outcrops were found to consist of some form, altered or fairly fresh, of gneissic granitic rock. In addition, in one or two places small fragments of jaspilite and of epidiorite greenstone were found. The greenstone fragments were by no means common, and they may have been derived from occasional narrow intrusive dykes.

Various forms of laterite largely obscure outcrops and, although in the main these lateritic forms appeared to be granitic, in one or two cases they had an appearance such as might indicate derivation from greenstone.

Except for a few narrow dykes of greenstone, the rocks observed on the road while travelling from the alunite deposits to Burracoppin *via* Goomarin were found to be upon examination granite, generally of a gneissic form. The same is true of the country rock observed while travelling from Merredin to the alunite deposits. The rocks observed for about six miles north, four miles east, and two miles west were mainly granitic.

In the vicinity of the alunite deposits, the granitic rocks were found to outcrop more strongly on the western side of Chandler Lake. They form low rounded ridges of characteristic granite-weathering form, and occasionally the bare granitic rock—fairly fresh—outcrops at the surface. In most cases these granites were seen to be distinctly gneissic, although occasionally a pegmatitic or an aplitic phase was observed. Possibly these latter forms would be later intrusive granites, but there is no reason why they should not be particular phases of the main country rock.

This gneissic country rock was observed at many places between Burracoppin and Campion, and between Merredin and Campion.

Specimen 27 L.B., collected by the writer from the near vicinity of the gnamma hole in Block 14340 ↑ 11210 northwest of Chandler Lake, may be taken as being characteristic of the main country rock of the district. It was found to be gneissic biotite granite of a speckled greyish colour and a banded appearance. This specimen was examined by Dr. Larcombe, the Acting Petrologist, and the following is his report:—

> "A medium grained, banded and somewhat granulated biotite-gneiss. The more acidic bands contain only quartz and felspar. This gneiss may be regarded as of igneous origin, representing a partially transformed and differentiated granite."

It is to be noted that Dr. Larcombe does not consider this gneiss to be of sedimentary origin, and that gneissic granite of this nature has been observed by the writer at a number of places throughout Western Australia. Macroscopically there seems to be little difference essentially between occurrences. In short, in the writer's opinion this granite is the characteristic gneissic granite found forming a large portion of the Western Australian plateau.

Close to the edge of the northwest corner of Chandler Lake, granite again outcrops, forming a low rugged steep bank for some ten chains. This granitic rock is highly altered and decomposed, and its most outstanding feature is the pronounced banding—evidently relict structure of an original gneissic form. Felspars are almost completely kaolinised, and from field examination the writer is of the opinion that this is merely an altered phase of the gneissic biotite granite already discussed.

Borings in the Chandler Lake revealed the fact that this rock is found continuing below the lake clay and other deposits, and forms probably the ultimate fundamental bed of the lake. If borings had been deepened sufficiently all over the lakes, it is likely that they would bottom on this igneous country rock. The lakes appear to lie in a depression in this gneissic granite, and undoubtedly the latter will be found to grade from highly altered rotten rock to the fresh and less altered gneiss.

Specimen 28 L.B., collected by the writer from the bank on the northwest corner of Chandler Lake, was examined by the Acting Petrologist, and the following is Dr. Larcombe's report:—

> "A highly decomposed rotten granite rock, consisting essentially of white clay with protruding quartz grains due to their resistance to weathering. On fractured surfaces, a distinct banding was noticed and the fresh, unaltered rock is probably gneissic."

The writer put down a number of bore holes of shallow depth—up to 12½ feet—throughout the lakes and kopai ridges. In some cases ferruginous material that might be referable to lateritic origin, was brought up in the borings, and it seems possible that the floor of the depression, in which the lakes are, was at one time covered by lateritic material.

5.—The Alunite Deposits.

Alunite is a hydrous sulphate of aluminium and potassium, whose chemical formula is generally represented as $K_2O.3Al_2O_3.4SO_3, 6H_2O$. From an agricultural point of view, the valuable ingredient is the potash (K_2O), which is extractable by calcining the alunite and by subsequent treatment with water to leach out soluble potash compounds either in the form of alum (potassium aluminium sulphate) or in the form of potassium sulphate. The residue after full treatment should be alumina of high grade suited for porcelain manufacture.

Generally alunite is found as a white or pink, compact or granular substance in nodular masses or in veins in other rocks, and the theories regarding its origin are that it is produced from felspathic rocks (containing potash felspars) either (1) by the action of sulphurous vapours such as emanate from fumaroles or from volcanoes; or (2) by the action of percolating waters containing sulphuric acid derived from sulphides such as pyrites by oxidation.

It is reported that alunite has been found in various localities in Western Australia, and an extensive deposit found at Kanowna in commercial quantities has been described by Mr. T. Blatchford in Geological Survey Bulletin 77.

The Campion deposits of alunite are, however, somewhat different in occurrence and nature to other deposits previously examined. They occur as sedimentary deposits, forming the beds of salt lakes designated Chandler Lake and Reward Lake, and they consist of very fine powdery material with which is mixed kaolin and fine quartzose sand.

To a depth of up to nine inches, the alunite consists of a bluish material, and with depth this grades through greys and browns to pure white with occasional layers of brilliant-red material, below which gritty clay and sand are found.

Occasionally there is a fair amount of gypsum mixed with the surface material, and near the outer edges of the lakes alunite material becomes more admixed with and is gradually replaced by either seed gypsum or kopai.

It is understood that Mr. H. Bowley has observed on the west side of Chandler Lake a quartz reef from which crystals of pyrites have been weathered.

(*Vide* p. 18, Annual Report of Government Mineralogist and Analyst, 1925.) Further, Mr. Chandler, the holder of M.C. 37H and of M.L. 38H, informed me that Mr. Bowley found distinct evidence of the presence of sulphuric acid in certain portions of Chandler Lake.

The writer observed that the gneissic biotite granite in the vicinity of the lake edge and for some distance below the lake had undergone considerable alteration. Felspathic material was almost completely changed to kaolin, and material of the same nature as the alunite in the top surface of the lake bed was found to be gradually leaching out from these granites. On the east side of Chandler Lake, granitic material of the same nature was found very close to the surface.

Hence the writer has little hesitation in ascribing the formation of alunite in this area to the action of sulphuric acid—produced from weathering of the sulphides of the nature of pyrites—upon the potash-bearing felspars of the gneissic biotite granite forming the country rock of the district. In this connection an examination and analysis of Specimens 27 L.B. and 28 L.B. by the Government Mineralogist and Analyst would be of great value.

In one case hard white material of the appearance of ordinary compact white alunite was encountered at a depth of 4 feet 4 inches in borehole P. 9 in the north of Chandler Lake at a point about twelve chains due south of the most northerly corner post of M.L. 38H. Unfortunately no drill was included in the boring outfit, and it was found impossible to collect a decent sample of this harder material. In view of this the writer can, meantime, give no opinion regarding the possibility of compact alunite vein or nodular deposits being found in the country rock underlying the lakes. If such veins do occur, there is a possibility that the whole of the lake deposits are derived from the weathering and disintegration of these veins.

A number of samples of material from various depths were taken by the writer when he was boring, and, until these have been examined by the Government Analyst, it will be impossible to form a correct estimation of the amount of alunite available in the two lakes.

In Chandler Lake the area of the surface over which alunite extends is 18,340,200 square feet approximately, or 421 acres approximately. In Reward Lake the area of alunite deposit is 1,429,400 square feet approximately, or 32.8 acres approximately. Altogether the area of alunite deposits in these lakes amounts to 453.8 acres, and if a conservative average depth of nine inches be taken meantime, pending the examination of borings, the amount of alunite available is in the region of 733,000 tons.

6.—The Economic Aspect of Utilisation of the Alunite Deposits.

In utilising these alunite deposits one or two points, for and against, need consideration.

Sources of potash have been and will be of prime importance in the extension and development of a country such as Australia. For many years the chief supplies of potash throughout the world have been drawn from Germany. During the Great War such supplies were not available and the cost became prohibitive. This induced various States in Australia to make a stocktaking of their own potash reserves, and from this necessity arose the idea of utilising such substances as alunite for potash content. If the potash necessary in agriculture for local requirements can be commercially produced at a cost that will enable it to compete with the imported article, then there is every reason for utilising such deposits as those that form the subject of this report.

In this connection it might be well to note that the available alunite will be easily excavated as it is a surface deposit, and it seems likely that material of commercial value will be able to be recognised by its colour—a fact that is of some importance when dealing with unskilled labour. Further examination chemically has revealed the fact that about seven per cent. on an average is a fair estimate of available potash in this alunite.

Preliminary treatment by calcination and lixivation of the material can be well done upon the field so as to reduce the cost of transport. Wood for this purpose is available in plenty upon the field.

Roads to and from the deposits are fairly good, and transport to railhead should be easily and cheaply obtainable. Labour in excavating the material would seem to be available, and costs will be kept down if the work is let at contract.

It will be necessary to expend some capital in special machinery and in buildings.

Against these must be considered the following:—

Owing to the want of a decent water supply lixivation may be somewhat expensive, as before water can be obtained it may have to be carted for some distance. Preliminary washing of the alunite also will form an item to be considered.

There is no railhead nearer than about 12 miles.

All things considered, however, there seems reason for believing that the opening up and utilisation of these lake deposits may be far reaching in its effects, and that they will form a new industry of immense value and importance to Western Australia.

7.—Gypsum in the same Locality.

It has been already noted by Dr. Simpson (Annual Report, 1925, Gov. Min. and Anal.) that gypsum occurs in large quantities as ridges in this area. He appends analyses of both seed and kopai gypsum samples which he collected north of Reward Lake, and it is unnecessary for me to repeat these here. It is to be noted, however, that he found the kopai to yield a dirty green plaster which would not set hard. The seed gypsum yielded a pinkish plaster which set hard in two hours.

Mention has already been made by the writer of the extent of seed gypsum occurring on the ridges dividing lakes and partly surrounding them in some cases; particularly to the west, southwest and south of the lake that is designated on the geological sketch map accompanying this report as Red Lake. In this locality there is a very great extent of seed gypsum in addition to the ordinary kopai that forms the bulk of the dunes. In the south and west of Chandler Lake there is also a large deposit of seed gypsum, but not of so good a quality as that nearer Red Lake.

The exploitation of these deposits must, however, remain in abeyance until better and cheaper railway facilities are available in this district and until deposits nearer to the metropolis are depleted.

Sample 25 L.B. is of fine seed gypsum from the large deposit at the southeast corner of Red Lake, and sample 26 L.B. is of large crystals of gypsum from the middle west bank of Red Lake.

List of Specimens and Samples collected at Campion by A. G. D. Esson.

1. L.B. Salt from S. 28 intermediate chaining post on southeast boundary of M.L 38.
2. L.B. White pug from S. 29.
3. L.B. White pug from S. 30.
4. L.B. White pug from S. 31.
5. L.B. Red pug from S. 32.
6. L.B. Samples of borings from various depths of bore at S. 38.
7. L.B. Samples of borings from various depths of bore at Q. 86.
8. L.B. Brilliant red ochreous pug from S. 40.
9. L.B. Blue and grey pug from S. 41.
10. L.B. White pug from S. 41.
11. L.B. Brilliant red ochreous pug from S. 41.
12. L.B. Lowest white pug from S. 41.
13. L.B. Borings from O—15½in. at S. 43.
14. L.B. Borings from O—15½in. to 45½in. at S. 43.
15. L.B. Borings from O—45½in. to 49½in. at S. 43.
16. L.B. Borings from O—49½in. to 117½in. at S. 43.
17. L.B. Borings from O—117½in. to 129in. at S. 43.
18. L.B. Seed gypsum from Q. 120 B.
19. L.B. Blue pug mixed with large gypsums from Q. 120 D.
20. L.B. White pug 23in. to 73in. in bore at Q. 119.
21. L.B. Miscellaneous samples of borings at Q. 75.
22. L.B. Miscellaneous samples of borings from Q73.
23. L.B. Miscellaneous samples of borings from P. 9.
24. L.B. Miscellaneous samples of borings from I. 21 .
25. L.B. Samples of fine to coarse seed gypsum from the seed and kopai dunes at southeast corner of Salt Lake.
26. L.B. Large crystals of gypsum from middle west edge of Salt Lake.
27. L.B. Gneissic biotite granite from vicinity of gnamma hole in Loc. 14340 ↑ 11210.
28. L.B. Rotten gneissic granite from bank on northwest corner of Chandler Lake.
29. L.B. Sample of blue top material at K. 9 Reward Lake.
30. L.B. Sample of blue top material at C. 14 Reward Lake.

N.B.—Samples from 1 to 24 L.B. are from Chandler Lake.

The following are partial analyses of nine samples of Alunite from Lake Chandler (M.C. 30H), Campion:—

No.	25/27	26	27	28	328	329	330	331	233
Mark ...	6LB	7LB	22LB	23LB	13LB	14LB	15LB	16LB	17LB
On Washed Sample—	%	%	%	%	%	%	%	%	%
Potash, K_2O	6·74	6·79	7·00	6·88	6·96	7·35	7·62	6·59	...
Soda. Na_2O	·68	·91	·85	·82	·99	·95	1·45	·57	...
Sulphur trioxide, SO_3 (Soda soluble)	23·70	23·44	25·46	24·58	25·29	26·68	26·79	22·74	8·49
Water soluble Salts ...	6·99	7·79	5·90	5·44	8·02	5·32	5·80	5·36	5·60

4.—THE FIRECLAY DEPOSIT ON MINERAL CLAIM 50H, CLACKLINE.

(A. G. D. Esson, M.A., Field Geologist.)

I.—Introductory Remarks.

In accordance with instructions a brief examination of the proposed Mineral Claim (50H) for fireclay, situate at Clackline, was made by the writer with, at the same time, a short and rough examination of as much of the surrounding country as was found feasible to be examined in the limited time available and under the prevailing stormy weather conditions. Owing to floods and consequent washaways upon the railway line, the examination was deferred for a short time.

Clackline station is situate at a distance of some 51 miles by rail from Perth, upon the Eastern Railway line, close to the intersection of that line with the Toodyay (formerly Newcastle) branch line, and it lies in the South-West Division of the State.

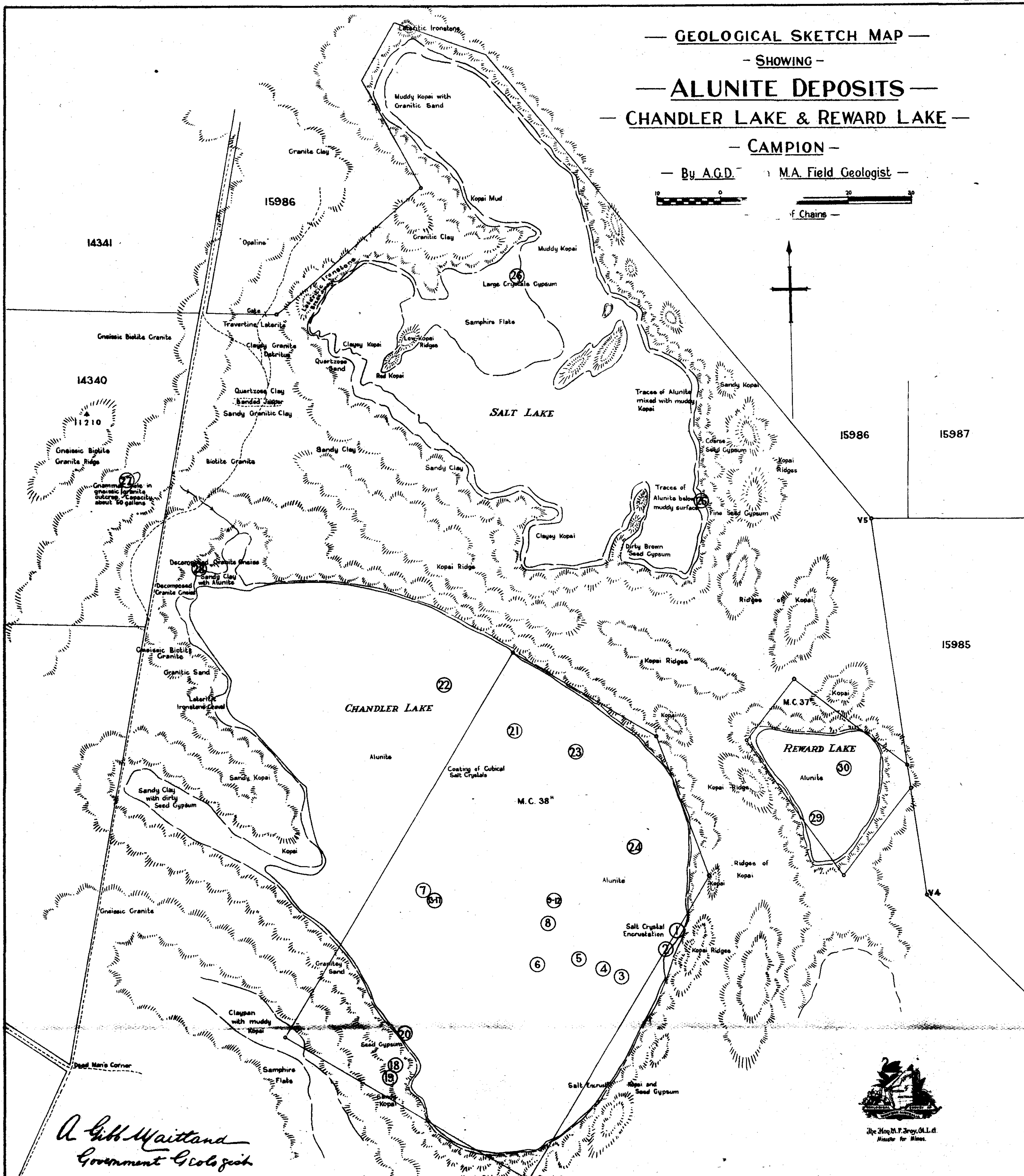
Two local residents of Clackline, Messrs Coates and Ellsom, have made application for a Mineral Claim, No. 50H, with the object of working a clay pit for fireclay, upon Location 19454, which is already held by Mr. H. B. Ellsom, one of the abovenamed applicants for M.C. 50H. Both applicants have had experience of fireclay deposits in the Clackline district. Location 19454 is leased to a depth of 200 feet, but in view of the fact that the lessee is one of the applicants for this mineral claim, any adjustment in regard to compensation would be a matter of mutual arrangement between applicants.

2.—Topography.

Clackline district is upon a slight fall eastwards of the Darling Ranges, and the height of the railway station above sea level is given as 756 feet. It is a very hilly locality, and the numerous ridges are intersected and divided by steep gullies carrying water in the wet season. The most notable creek in the vicinity lies north of the railway line and roughly parallel to it for some distance in Clackline Gully, and it is fed by numerous small tributary creeks which follow side gullies leading into Clackline Gully.

At the time of visit (winter) Clackline Gully was running a "banker," and much damage had been done by the swiftly flowing waters. Beautiful examples of the work of the stream in erosion and deposition could be noted.

PLATE III


GEOLOGICAL SKETCH MAP
SHOWING
ALUNITE DEPOSITS
CHANDLER LAKE & REWARD LAKE
CAMPION
By A.G.D.
M.A. Field Geologist
Chains
SALT LAKE
CHANDLER LAKE
REWARD LAKE
M.C. 38H
M.C. 37H
15986
14341
14340
15987
15985
11210
V5
V4
Lateritic Ironstone
Muddy Kopai with Granitic Sand
Granite Clay
Kopai Mud
Muddy Kopai
Granitic Clay
"Opaline"
Large Crystals Gypsum
Samphire Flats
Gate
Travertine Laterite
Gneissic Biotite Granite
Clayey Granite Detritus
Clayey Kopai
Low Kopai Ridge
Quartzose Sand
Red Kopai
Quartzose Clay
Banded Jasper
Sandy Granitic Clay
Traces of Alunite mixed with muddy Kopai
Sandy Kopai
Gneissic Biotite Granite Ridge
Sandy Clay
Biotite Granite
Coarse Seed Gypsum
Kopai Ridges
Traces of Alunite below muddy surface
Fine Seed Gypsum
Clayey Kopai
Dirty Brown Seed Gypsum
Decomposed Granite Gneiss
Sandy Clay with Alunite
Kopai Ridge
Ridges of Kopai
Kopai Ridges
Gneissic Biotite Granite
Granitic Sand
Lateritic Ironstone Gravel
Kopai
Alunite
Coating of Cubical Salt Crystals
Sandy Kopai
Sandy Clay with dirty Seed Gypsum
Kopai Ridge
Ridges of Kopai
Salt Crystal Encrustation
Kopai Ridges
Gneissic Granite
Granitey Sand
Claypan with muddy Kopai
Seed Gypsum
Dead Man's Corner
Samphire Flats
Sandy Kopai
Salt Encrust
Kopai and Seed Gypsum
Kopai Ridges and Seed Gypsum
A. Gibb Maitland
Government Geologist
The Hon. M. F. Troy, M.L.A.
Minister for Mines.

Occasionally, in gullies, it was possible to see sections showing the underlying rocks, and had the time been available a fairly accurate geological map of the immediate district could have been prepared probably in a few weeks.

In general the hills are very rough and rugged owing to the lateritic cap of ironstone found upon them.

A geological map based partly upon personal field work and partly upon the work of members of the Geological Survey accompanies this report.

3.—Vegetation.

The ridges are fairly heavily timbered with, in the main, white and red gums as well as with occasional banksia and blackboy. Sometimes shrubs of the variety of *Hakea Illicifolis* were noted, and York poison and box are fairly common.

4.—Geology.

I.—General Geology of the Clackline District.

The general geology of the Clackline district is largely that of the Darling Range among the heights and gullies of which it lies. Fundamentally the rocks are the slightly altered Pre-Cambrian igneous rocks forming the mass and basis of the Western Australian Plateau.

It is generally agreed that the face of the Darling Ranges westwards towards the sea marks a fault line along which a further coastal strip broke off and slipped down to below sea-level. Eastwards from the Darling Ranges this old plateau still persists, somewhat eroded in places and in other places hidden by young or old sediments.

Evidently a fault plane would be a suitable place for the intrusion of later igneous rocks, but whether these later intrusives came after faulting along induced lines of weakness or whether the intrusion of these later igneous rocks caused weakness which ultimately assisted in or developed into faulting is not quite clear meantime. In any case there has been more than one age of faulting, as has been pointed out by Jutson in his "Physiographical Geology of Western Australia," Bulletin 61, G.S. W.A.

The fundamental rocks of the Clackline district are granites which occasionally are gneissic. The said granites are, in turn, intruded by later epidiorite dykes, some of which are of considerable extent. These dykes vary much in texture and in ultimate composition, but they all seem to be derived from the same basic magma. They form throughout the extent of the Darling Ranges an outstanding feature on account of their hardness and their resistance to weathering—a fact that may be taken as proof of their comparative youth in contradistinction to the rocks they intrude. There is a possibility that some basic dykes may be of later age than the main member. These igneous rocks, acid and basic, are, in general, all capped by lateritic formations which are so characteristic of the rock formations of Western Australia. Laterite, of course, may not be confined to igneous rocks alone, but in the Clackline district there seems to be little doubt that it is derived directly from the igneous rocks underlying

A few additional remarks regarding the rocks enumerated above may not be out of place.

(a) Granite.—It has already been pointed out that granite forms the fundamental rock of the district. This granite was found to vary considerably in comparative mineral composition from biotite granite to hornblende granite. Occasionally it is coarse and even pegmatitic or porphyritic. Both varieties would seem to result from magmatic segregation in one main mass—an occurrence that is quite common in most large bodies of igneous rocks.

At different points there appears to have been much shearing of the granites and a resultant change in them to granite gneiss. This gneiss occasionally takes the form of biotite mica schist in which by extreme shearing the quartz and felspars are ground down and dissolved and biotite mica collected in fairly thick bands along the shear planes. This biotite mica can be dug out fairly easily as it is quite soft. Sometimes an intermediate form is found when on first examination one would say that it is a laminated jasper similar to those found on most of the eastern goldfields. In the writer's opinion this form might be more correctly named a highly sheared augen gneiss.

Both of the two latter forms, biotite mica schist and augen gneiss, were found on Location 860 a few chains south of the railway line and about 1½ miles westsouthwest of the Clackline siding. Biotite mica schist was observed also in a gully south of the railway line and about 10 chains east of the Clackline station. A question regarding the possibility of using the decomposed biotite mica schist on Location 860 as a paint was addressed to me by Mr. W. Coates. A sample was submitted to the Government Mineralogist and Analyst, who, however, reported on it as being of no use as a paint making material.

(b) Epidiorite.—Little can be added to what has already been said regarding the basic epidiorite dykes. Mr. Feldtmann has noted that most of these dykes conform to one or two main directions. Most of them strike east or slightly north of east, and the others about northnorthwest. They vary very much in texture from very fine to coarse. During the limited time at the writer's disposal no detailed examination to determine different relative ages, if any, could be made. Kaolin produced from the epidiorite rocks is, in general, of excellent quality and, when of a purely white colour, is highly suited for use as china clay.

It is to be noted that, in common with the granite into which the epidiorite dykes are intruded, they are lateritised, and that the resultant laterite from epidiorite is generally more highly ferruginous than that formed from granite.

(c) Laterite.—It has generally been accepted that laterisation is a process of efflorescence due to normal processes of weathering accompanied by abnormal conditions of rainfall and denudation. The abnormal conditions of rainfall would be complete saturation of weathered products by rainfall followed by complete desiccation of them again, and abnormal conditions of denudation would consist in slow denudation of the products of weathering.

Rainwater attacks rocks consisting largely of metallic silicates and dissolves certain mineral constituents. These solutions soak into the ground and ultimately kaolin and quartz may be left as residuals of the original rock. With very dry summers the rocks are highly desiccated, and by capillarity solutions bearing certain minerals such as iron compounds are brought to the surface and evaporated, thus causing redeposition of the minerals as laterite.

Thus there will be unchanged rock below, and from it are derived ultimately succeeding formations which may be considered to be merely grades of alteration of the original. In this way proceeding upwards there will be found the weathered form of the original rock, followed by white kaolin or clay and quartz. This again is followed by white kaolin, then by ironstained clay, and on the top will be ferruginous laterite.

The kaolin obtained in this way will be found to contain generally a proportion of quartz which will render it suitable for utilisation in the making of fire-bricks.

II.—Detailed Geology of the Proposed Mineral Claim 50H.

Application has been made by Messrs. W. Coates and H. Ellsom for Mineral Claim 50H for the purpose of working fireclay deposits to be found upon it. The area for which application is made amounts to 7 acres and, as pegged meantime, it would comprise about 8 acres. The datum peg is situated about 1½ miles in a direct line almost southsouthwest from Clackline Station and about 23 chains southeast of the westerly peg of Location 19454 in which the claim lies.

As in other places in the Clackline district the fundamental rocks in Location 19454 are various phases of granite with intrusive bars of fine-grained epidiorite. These rocks outcrop in rough ridges with steep sides and deep intermediate gullies. The ridges are everywhere capped by ferruginous laterite beneath which kaolin has been formed from the underlying less altered igneous rocks.

The claim lies on the western side of one such ridge which would appear to be wholly granitic. On the crest (and upper slopes generally) pisolitic laterite still remains in a somewhat table-top fashion and immediately below this hard topping kaolin of varying quality is found forming lower slopes of the hill—often at the surface, and sometimes covered by ferruginous secondary laterite for a depth of a few inches.

At one or two points on the crest of the hill the highly ferruginous nature of the laterite would seem to indicate the possibility of the occurrence there of a small dyke of epidiorite, but there is no definite evidence of this intrusion. On the other hand, the quartzose nature of the kaolin found upon the claim would point to its derivation from an acid rock of the nature of granite. In fact, granite somewhat altered but still recognisable as such, is found upon the north lowermost slopes of the main ridge. West of the datum peg and outside of the lease there is on the side of a small gully an outcrop of a dyke of epidiorite which appears to run almost north and south and which appears to have a width of about 20 feet.

From the examination made the writer was able to see that there is here a very extensive deposit of good quartzose kaolin highly suited for fireclay purposes. In fact, the whole of the ridge beneath the laterite cap would seem to be composed of kaolin of this nature.

5.—The Kaolin upon Mineral Claim 50H.

At present there are six potholes of a shallow depth averaging about 5 feet throughout the claim. These can in no way be considered as workings as they have been put down merely to test the deposits and to prove the extent of good quality material.

In the main, samples taken by the writer prove to be very fine, workable, pure white kaolin in which are set phenocrysts of white transparent quartz of varying size. Sometimes the phenocrysts can be barely seen and they vary from that up to about ⅛in. in diameter. Evidently the deposit will require careful crushing before mixing, but apart from that the available material will require very little work before burning.

The points noted in the various potholes are summarised as follows:

Pothole 1.—This pothole is down for a depth of about 5 feet in a somewhat ferruginous clay which contains much quartz. The ferruginous matter runs in red streaks throughout the clay and it may be due to staining derived from the decomposition of very ferruginous laterite upon higher slopes. This laterite may possibly denote the presence of a narrow dyke of epidiorite as has been mentioned *supra*. The pothole lies in the south end of the claim.

Pothole 2.—This lies in almost pure white kaolin with many phenocrysts of quartz. Evidently the kaolin here is derived from underlying kaolinised medium to coarse-grained granite *in situ*. It may mark a somewhat pegmatitic phase of the granite.

Potholes 3 *and* 5 are similar to No. 2.

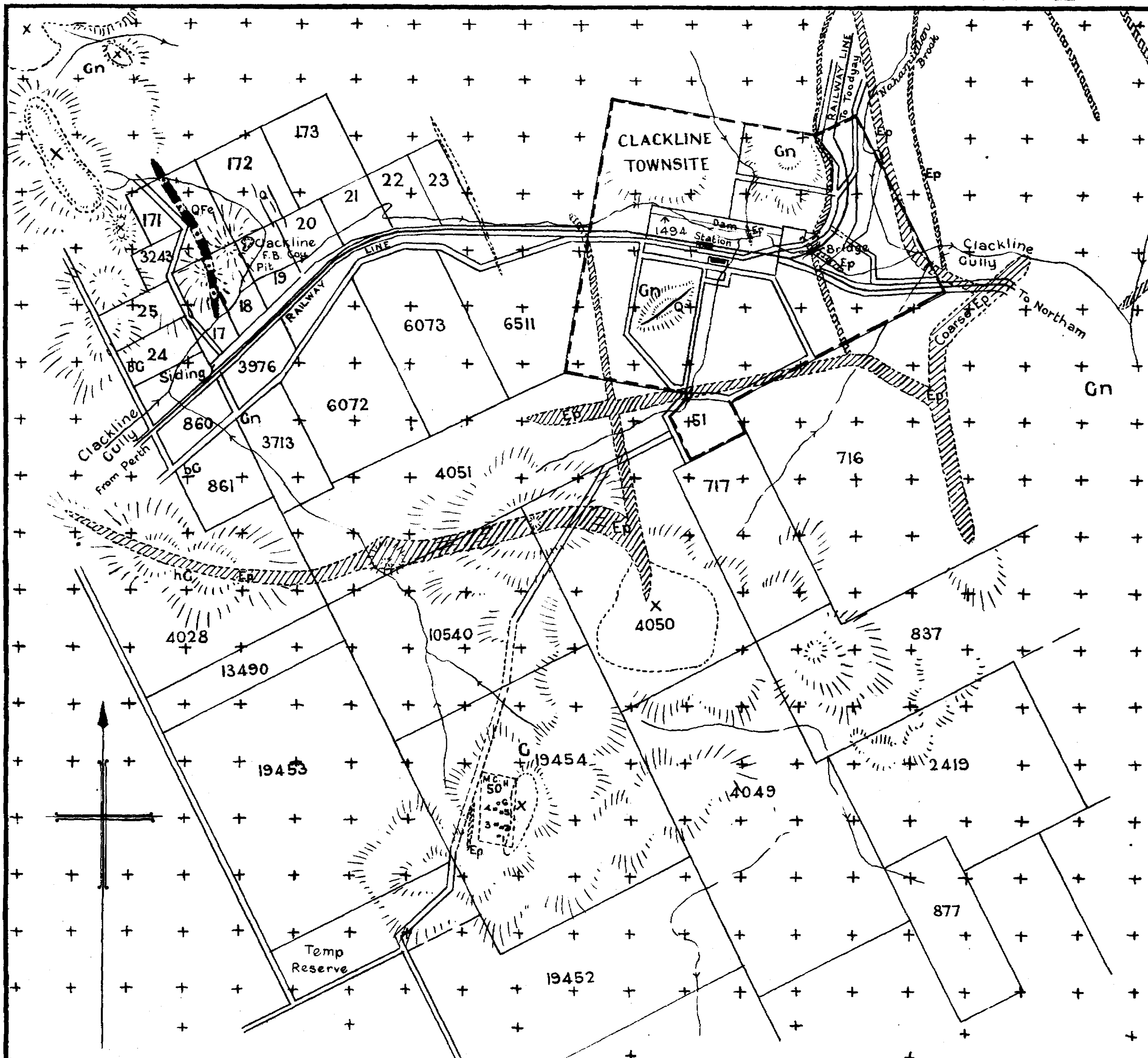
Pothole 4.—Here the material is somewhat more gritty and less coherent and it is probable that this marks a less altered phase of the granite. No large phenocrysts of quartz are to be seen in this material.

Pothole 6.—This lies in the north end of the claim and here the kaolin is of finer quality and of a purer white colour. There are in it phenocrysts of quartz of a very small size and evidently the best quality material in the claim is at this point.

Throughout the claim all the material appears to be of excellent quality and to be highly suited for making into fireclay bricks and locomotive lumps, and with washing it is possible that excellent kaolin will be produced suitable for porcelain making. The deposit of kaolin available appears to be extensive and it would seem to have a thickness of about 20 feet. Practical work only can give an estimate of the exact amount available, but judging from the occurrence in other places the estimate of depth may be found to be a conservative one.

6.—General Remarks.

Clays from Clackline have been used for a number of years for the manufacture of fireclay bricks and "loco. lumps" (locomotive linings, etc.). For some years the Clackline Firebrick Company has been working a deposit situate about 1 mile west of Clackline Station on the north side of the railway line. The Government Mineralogist and Analyst has examined clays from this pit and very satisfactory reports upon them have been given by that officer.



— GEOLOGICAL SKETCH MAP —

CLACKLINE

— By A. G. D. Esson M.A. Field Geologist —

— Incorporating information by W. D. Campbell & F. R. Feldtmann —

20 0 20 40 60

— Scale of Chains —

— LEGEND —

Granitic Rocks	Biotite Granite	Horneblende Granite	Gneiss	Epidiorite dykes	Jasper	Quartz Reefs	Laterite
G	bG	hG	Gn	Ep	QFe	Q	X

By Authority: FRED. WM. SIMPSON, Government Printer, Perth.

A. Gibb Maitland
Government Geologist

In Mr. Campbell's report upon the Clackline Firebrick Company's pit (Annual Report, Geological Survey, 1906), Dr. Simpson's analysis is given. He reports the clay to be of excellent quality and, when burned, to compare favourably with firebricks from Gartcraig in Scotland.

From the examination made by the writer the conclusion is arrived at that the kaolin on Coates and Ellsom's Mineral Claim 50H would appear to be of a similar quality and of similar origin to that in the Clackline Firebrick Company's pit.

Mr. Coates has informed me that he has prepared firebricks from his deposit and has had them burned in a Maylands kiln and that he has received a report to the effect that the resulting firebricks were of good quality.

Without doubt the successful exploitation of Mineral Claim 50H and of its clay deposit will provide very necessary material for an extension of the fireclay industry in the Clackline district and in Western Australia generally.

The results of the analysis and testing of samples are as follow:—

Locality	M. C. 50H South of Clackline station.		
Reg. No.	2506/26	2507/26	2508/26
Mark	E.C.1	E.C.3.	E.C.5
Washing Test—	%	%	%
Clay substance ...	49·24	52·99	52·53
Grit under 90 mesh	5·80	7·45	5·86
„ „ 60 „ ...	2·37	3·30	3·75
„ „ 30 „ ...	8·62	9·45	11·27
„ „ 10 „ ...	30·57	21·76	24·33
Grit over 10 „ ...	3·40	5·05	2·26
	100·00	100·00	100·00

Burning Tests.—Briquettes were made of the clays and burnt at 1,350° centigrade in an assay muffle furnace, the duration of heat being about nine hours each, giving the following figures:—

Linear shrinkage from wet plastic to air dry state, per cent.	7·6	5·3	4·2
1350° C.—			
Linear shrinkage from air dry, per cent.	2·6	3·7	2·8
Porosity (water absorbed), per cent.	23·8	19·3	19·2
Colour	White	Creamy White	Creamy White
Surface	Moderately rough	Rough	Rough
Hardness	Scratched by steel	Scratched by steel	Scratched by steel
Strength	Friable	Brittle	Brittle
Body	Cracked	Finely Cracked	Finely Cracked

Conclusions.—These are granitic fireclays, carrying much coarse quartz grit, showing moderate shrinkage and no signs of softening at 1,350° C., and evidently capable of withstanding a much higher temperature. The body in each case is deficient in strength and in order to make a satisfactory clay they would require an admixture of a stronger clay.

5.—REPORT ON BLOCK WEST OF 2191 AND NORTH OF 1856 (LITHO. SHEET 410D40) COLLIE COALFIELD.

(Alex. G. D. Esson, M.A., Field Geologist.)

Introduction.

Approximately two days were spent in the examination of this proposed block and of the surrounding country. Because of periodical floodings by the Collie River the whole of the eastern end of the Collie Coalfield coal measure basin consists largely of sandy swamp with occasional low hills of laterite. For this reason the exact boundaries are very much obscured and it is impossible to do more than fix a possible boundary between the coal measures and the granite, as the laterites overlying both show little or no difference.

In the short time at the disposal of the writer it was impossible to extend investigation to any great extent so as to correlate similar areas in different parts of Collie Coalfield but the investigations made by the writer would seem to prove that the extreme eastern boundary defined by Woodward is probably as nearly correct as can be ascertained without actual boring.

Geology (General).

It is now more or less agreed that the Collie coal measures are of Permo-Carboniferous age and that they occupy a depression in the Pre-Cambrian crystalline rocks. Faulting would appear to be responsible for the preservation of the coal measures which by this means were let down into troughs in the Pre-Cambian rocks. The exact amount of faulting has not as yet been ascertained.

The coal measures consist of sandstones, grits, micaceous shales, and coal seams, all lying with a slight dip southwards. These beds are covered and obscured by extensive estuarine or lake deposits consisting largely of clays, semi-indurated gravels and sands. Upon these later deposits laterite formed and this laterite is more or less similar to the laterite found upon igneous rocks in the vicinity. This laterite has been eroded and denuded, producing secondary laterite, and residual patches of hard laterite are left here and there throughout the basin with sandy levels and valleys between.

The above brief resumé would show that nowhere will the coal measures be expected to outcrop except possibly in the north if overlying sediments are denuded, and in fact the actual discovery of coal in the Collie coalfield was only found by examination of the Collie River bed in an extremely dry season.

Close to Muja the writer found stratified clays, sandstones, and a specimen (from a shaft) which would appear to consist of the tailing off of a low grade coal seam. Hence it is assumed that the coal measures do extend as far as Muja.

Geology of the Block.

With regard to the particular proposed block in question, very little can be said regarding the geology. A low laterite hill runs the length of the block and fine sands occupy the lower portions on either side of the laterite. No points of special distinction were observed in the laterite. South of the block and about 30 chains south of the northern boundary of block 1856, a prominent bar of later basic epidiorite greenstone was followed in an east and west direction for about 20 chains. There is no evidence of igneous intrusion among the known Collie coal measures and hence it is presumed that this bar lies within the area of the igneous rocks. Probably it lies close to the junction of igneous rocks and sediments. Block 2191 consists largely of laterite and granite can be found south of the block.

Conclusions.

For reasons enumerated above, the writer cannot at present see fit to suggest alteration in Woodward's boundary in this particular portion of the coalfield. There is a possible doubt which could be dispelled only by putting down a series of shallow bores in certain positions—a procedure that would be advisable before considering any further alienation of land in this portion of the Collie coalfield. The Government Geologist is familiar with the legal aspect of alienation and also with the Collie coalfield generally and he will be able to draw his own conclusions and to make suitable recommendation, but the writer is not satisfied that the geological knowledge of this portion of the coalfield is such as to admit of alienation at present.

PETROLOGICAL WORK.

(C. O. G. Larcombe, D.Sc.)

During the early part of the year an investigation was made of material from two Government subsidised bores at the Lady Shenton Mine, Menzies. A large part of the year was devoted to making a detailed examination and study of the core from bores put down in various parts of the State under the new scheme of State boring set out by the Hon. the Minister in November, 1925.

As a result of petrological investigations extending over many years, it was possible to give a good deal of important information to the Technical Committee appointed by the Federal Government. The mining representative of the Committee was taken through the Oroya Shoot and one day was spent in making an all round surface field examination of the Kalgoorlie area.

Much time was devoted to matters connected with the visit of members of the Australasian Association for the Advancement of Science, and special rock sections were prepared for petrographic projection at the lecture given in September.

The ordinary discussions took place with the Government Geologist, field and other officers, and information, the result of petrographic investigation, was supplied to the public when required.

The microscopic examination this year was extensive, on account of the large amount of State boring being carried out, and the necessity for the greatest care in examining the core so as to detect any possibility of the presence of "values," and, in the event of such discovery, to make a proper presentation of the economic aspects of the rock formations in relation to the ore occurrences and their future development. A total number of 261 slides was microscopically examined.

The boring at the North End, Kalgoorlie, where three bores were put down, certainly proved the downward extension of the Hidden Secret channel, but unfortunately at those points where the bores cut the various lodes the "values" were quite unpayable.

On the other hand the No. 2 bore proved the existence of contact lodes between keratophyre and quartz dolerite greenstone, and quartz dolerite greenstone and calc schist. As pointed out further on in this report these contacts are prone to develop lode formations, and there is really no reason why at the surface these lodes may not contain rich patches, depending of course on the sum total of gold in the lodes, the amount of superficial rock removed by weathering, and the agencies controlling the concentration of gold into patches.

Four bores were put down at Yalgoo. Three of these proved nothing at all, but in the No. 3 bore on the Old Emerald Lease 12 feet of quartz was passed through at a depth of 150-162 feet. Most of this quartz contained gold, and one assay yielded 8 dwts. 4 grs. per ton. It cannot be said that these values would not increase along the strike of this reef.

Suitable and representative samples of core from these bores have been registered and put away in the Departmental collection.

The drill has now been removed to Sandstone, where boring is being carried on. Boring has also commenced at Coolgardie, with a view to testing at depth the acid dykes.

The following may be regarded as a summary of the more important work carried out during the year:—

I.—Boring at Kalgoorlie.

II.—Boring at Yalgoo.

III.—Report on subsidised boring at Lady Shenton Gold Mine, Menzies.

IV.—Preparation of material and lecture to members of the Australasian Association for the Advancement of Science.

V.—Report on curious rocks from four miles east of Argyle Station, Ord River, King District, Kimberley Division.

VI.—Petrographic determinations for the Department and for the general public.

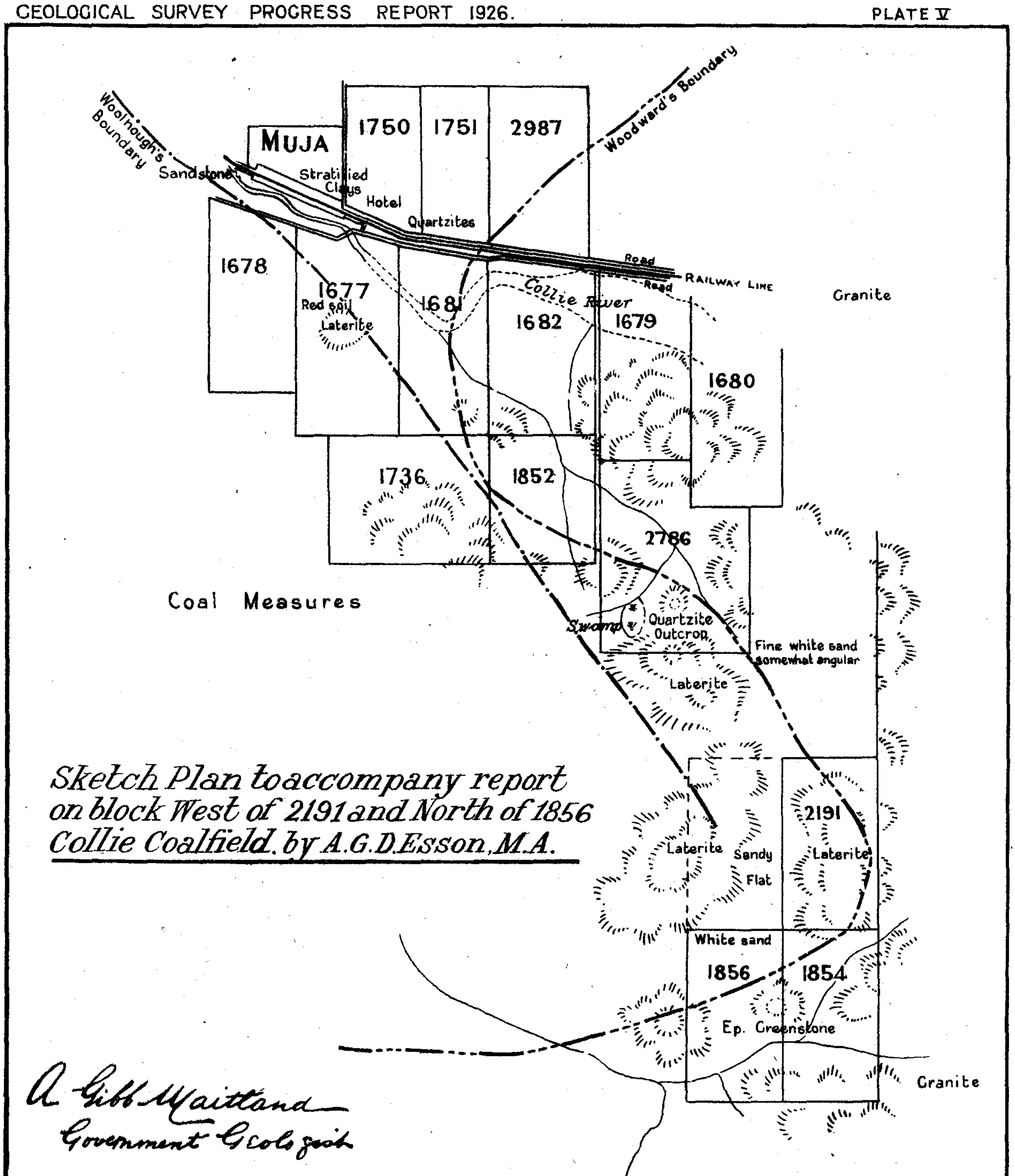
Details of Government Boring Operations.

The Government has initiated a scheme of State boring on a considerable scale in furtherance of its determined policy to assist the mining industry. The object of the boring is to aid the discovery of new ore bodies, help in the search for the continuation of lodes and reefs that have been worked, and prospect and otherwise test unknown ground.

In November, 1925, the Hon. the Minister decided to carry out a system of boring throughout certain goldfields in Western Australia. Consequently, in March, 1926, a programme was set out for boring in the mining centres of Kalgoorlie, Yalgoo, Sandstone, Mt. Magnet and Cue. To this list Coolgardie was added recently, and boring was commenced at that centre in December.

At the close of the year 1926 three bores had been completed at Kalgoorlie, four at Yalgoo, the first of a number (six) started at Sandstone, and one started at Coolgardie. A total of 3,422 feet 4 inches of boring was done at Yalgoo and Kalgoorlie.

The Hon. M. F. Troy, M.L.A.
Minister for Mines.



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In view of the great importance attached to these boring operations with a view to (a) new metalliferous discoveries, (b) determining the economic aspects of rock formation in relation to contained ore bodies, and (c) adding to the geological knowledge of the State and the advancement of science generally, special care has been taken in making a thorough physical, mineralogical, and petrological examination of the core. Every foot of core that showed any signs whatever of silicification, pyritification, shearing or other indications of the possible presence of "values" was sent for assay to the Government Mineralogist and Analyst. In connection with the boring at Kalgoorlie and Yalgoo, 269 samples (including sludges) were assayed. The details will be given when describing the individual bores.

The results of the petrological investigations are set out under the following headings:—

A.—Boring at Kalgoorlie:
- The Williamstown No. 1 Bore.
- The Williamstown No. 2 Bore.
- The Williamstown No. 3 Bore

B.—Boring at Yalgoo:
- Old Emerald Mine—
  - No. 1 Bore.
  - No. 2 Bore.
  - No. 3 Bore.
- Old Ivanhoe Mine—
  - No 4 Bore.

I.—Boring at Kalgoorlie.

It has long been the wish of mine owners and others at the North End of the Kalgoorlie goldfield that the ore bodies of that area should be tested at depth by means of boring. The Government acceded to this request and the first diamond drill bore was commenced at Williamstown on 14th April.

The boring was designed to test the long and persistent line of lodes which pass through Leases 4035E, 4001E and 4036E, constituting the Hidden Secret Area; and also to prospect the untested ground to the west. The gold won from the Hidden Secret lodes, which occur in a powerfully altered channel, was 15,384.83 ozs. from 10,643.95 tons of ore.

Plate VI. has been drawn to show the sites of the three bores, and Plate VII. contains geological cross sections designed to indicate the positions of the lodes and the nature of the rock formations passed through in each bore.

The downward and westward extension of the Hidden Secret lode channel has been positively proved, although at the points intersected by the bores the lodes were not payable.

It has been proved, as a result of the petrological examination, that the favourable quartz dolerite greenstone rock (which forms the country on the eastern slope of Mount Gledden) may be extended under the soil-covered ground as far east as Plumer Street. This enlargement of the quartz dolerite greenstone zone makes it still more remarkable that no payable lodes were discovered. The fine-grained greenstone, which is shown (on sheet 19, Plate XIII., Bull. 69, G.S.W.A.) to end in a V-shaped patch in Baden Street, was also found to continue as far north as Mafeking Street. I have discussed the revision of these boundaries with Mr. Feldtmann, who quite agrees with the alterations.

Details of Boring.—The following are details of the three bores put down:—

—	Inclined depth.	Vertical depth.	Direction.	Inclination.
	ft. in.	feet		
Williamstown No. 1	1,000 4	866	N. 53° E.	60°
Williamstown No. 2	610 0	431	N. 53° E.	45°
Williamstown No. 3	612 0	530	N. 46° E.	60°

The Williamstown No. 1 Bore.

The Williamstown No. 1 Bore was commenced on the 14th April and finished on 3rd August. This bore was put down near the southwestern end of the first block on the southeastern side of Mafeking Street where it junctions with Plumer Street. The direction of the bore was N.53°E. toward the southern side of "C" shaft on Lease 4036E (see Plate VI.).

The depth of the bore was 1,000 feet 4 inches, and the angle of depression 60 degrees (i.e., a horizontal distance of 500 feet and a vertical depth of 866 feet).

This bore was not successful in locating any ore even approaching a payable grade, but the fact of penetrating five distinct bands (two 25 feet through) of pyritic, carbonated, and highly altered rock such as is typical of lode channels, shows that the main southern Hidden Secret channel was cut. If there are shoots at this depth, such as those that carried the rich ore in the Hidden Secret mine, they were not met with in this bore. The five channels referred to contained 74 feet of barren lode material. It is unfortunate that at these points the gold contents, due evidently to some form of selective action, were virtually nil.

Geology.—The rock formations met with were as follows:—

- (a) Oxidised material.
- (b) Fine-grained greenstone.
- (c) Fine-grained amphibolite.
- (d) Dolerite greenstone—
  - (1) Mottled form.
  - (2) Bleached form.
- (e) Mottled carbonate rock.
- (f) Fuchsite-quartz-carbonate rock.
- (g) Lodestuff.

(a) *Oxidised Material.*—This extended from the surface to 122 feet and consisted of the usual brownish-yellow—to purplish in places—soft, and highly decomposed (rotten) greenstone.

(b) *Fine-grained greenstone* extended from 122 to 285 feet. A dense compact dark green soft greenstone, with patches of darker chlorite in places. In section it varied from a mass of pale green scaly chlorite showing shear tracks with some carbonate and a little pyrites to areas of dusky dense carbonated material with patches of scaly chlorite. (Sections 4700, 4701, 4702, and 4703.)

(c) *Fine-grained amphibolite* extends from 285 to 516 feet. It is a dense dark grey to greenish rock showing, with a lens, a distinctly acicular texture. In section it consists of a dense dusky feathery aggregate of brightly polarising colourless to pale green fibrous actinolite or hornblende, throughout which are patches of pale green chlorite, lumps of calcite, and amphibolites grading into actinolite schists.

(d) *Dolerite Greenstone,* together with its bleached and carbonated forms, is the most important rock.

(1) The dark green mottled form extends from 516 to 600 feet. It is distinctly mottled, dark green and white, and more or less evenly granular in grain. In section it is essentially a crystalline aggregate of pale green chlorite (containing colourless grains of epidote) and calcite. Small flakes of biotite are scattered through some sections. A feature of this rock is the small brown rutile needles. Some sections are made up of well-defined plates of calcite set in a mass of pale green chlorite containing rutile prisms.

(2.) The bleached dolerite greenstone is much paler than the dolerite greenstone, and it is still mottled through segregations of chlorite, and with a lens, minute bright green specks of fuchsite are visible. The bleaching is due to increased carbonation, mainly, but there is a litle silicification, some fuchsite and white mica occurs, and pyrites is not uncommon. Rutile is present. In section the rock is mostly a mass of calcite with quite a lot of small flakes of fuchsite. Chlorite occupies the interstices. This rock certainly encloses No 1 lode.

(e) *The mottled carbonate rock* is quite similar in appearance to the bleached dolerite greenstone, but is distinguished by the presence of a curious fine lining. In section it is a dusky carbonate rock with a fair amount of microscopic white to pale greenish mica. Patches of chlorite are common, and there is a little quartz mosaic. The colourless lines may be filled with wisps of sericite, calcite and chlorite; they cross one another without displacement.

(f) *The fuchsite-quartz-carbonate rock.*—This name is only given to that portion which shows distinct green macroscopic patches of fuchsite. The main zone lies between 830 and 880 feet and encloses Lode 3. In hand specimens it is a dense pyritic pale grey carbonate rock studded with bright green specks of fuchsite. In section it is a dusky brown carbonate rock with large spaces filled with ground-down chlorite full of microscopic sericitic wisps, and numerous patches of crystalline calcite. The linings are distinct (Section 4754) in the dusky portion. More altered forms are just patches of calcite, cryptocrystalline silica, patches of scaly fuchsite, with wisps of fuchsite throughout the quartz mosaics and intimately associated with the calcite. Small siliceous veins were noted.

(g) *The lodestuff* is a metasomatic product of the bleached dolerite greenstone, the fuchsite-quartz carbonate rock and the mottled carbonate rock. For the most part it is similar physically, viz., a mottled, silicified, carbonate rock with traces of fuchsite and impregnated with pyrites. In some sections there is strong shearing and segregation of pyrites along the shear lines. Quartz sericite mosaics occur, and pale chlorite with much rutile (Section 4757). Heavy pyritification is at times a feature. Large patches of carbonates are common.

The following may be regarded as the general distribution of rock changes as indicated in Plate VII.

Depth.	Nature of rock.
Ft. in. Ft. in.	
0 0—122 0	Zone of oxidation.
122 0—285 0	Fine-grained greenstone.
285 0—516 0	Fine-grained amphibolite.
516 0—600 0	Dolerite greenstone (mottled).
600 0—728 3	Bleached dolerite greenstone (containing white mica and fuchsite).
728 3—753 3	Lode I. Metasomatic product of bleached dolerite greenstone.
753 3—790 0	Bleached dolerite greenstone.
790 0—822 6	Mottled carbonate rock (micaceous) with curious linings
822 6—830 0	Lode 2.
830 0—880 0	Fuchsite quartz carbonate rock enclosing Lode 3 between 851ft. 6in. and 866ft.
880 0—901 0	Mottled carbonate rock, with strong microscopic fuchsite.
901 0—926 0	Lode 4. Heavily pyritic.
926 0—963 0	Mottled carbonate rock.
963 0—965 0	Lode 5.
965 0—1,000 4	Mottled carbonate rock with strong linings and with microscopic mica.

Lode channels and the occurrence of values:

Five zones were met with in which the carbonation, pyritification and general alteration and shearing were such as to entitle the rock to be termed "lodestuff."

The following table indicates the inclined and vertical depths of these lodes, together with the number of assays and their results.

Lode.	Material. Depth in feet, Inclined.	Vertical.	No. of Assays.	Result.
	ft. in. ft. in.			
No. 1	728 3—753 3	630	25	Seventeen: *Nil.* Eight: 3 grains per ton.
No. 2	822 6—830 0	712	2	One: 3 grains per ton. One: *Nil.*
No. 3	851 6—866 0	737	6	Five: *Nil.* One: 3 grains per ton.
No. 4	901 0—926 0	780	11	No gold at all.
No. 5	963 0—965 0	834	1	Gold, 14 grains per ton.
Core from other places: Between:				
107 and 153 feet ...	...		7	Six: *Nil.* One: 5 grains per ton.
202 and 406 feet ...	...		16	Fourteen: *Nil.* Two: 3 grains per ton.
422 and 583 ft. 7in.	...		11	Ten: *Nil.* One: 3 grains per ton.
889 and 890 feet ...	...		1	Gold, 13 grains per ton.
Assays of sludges: Between:				
20 and 450 feet ...	...		31	Twenty-one: *Nil.* Eight: Traces. One: 3 grains per ton. One: 5 grains per ton.
Total			111	

The five channels referred to contained 74 feet of lode material, and, as the above table indicates, 111 assays were made. Eighty of these were from core; the other 31 were from sludge material that came up the barrel.

The Williamstown No. 2 Bore:

The Williamstown No. 2 bore was started because of some work on an old lode to the west of the Hidden Secret lode, under Plumer Street. The bore was successful in that at an inclined depth of 588 feet, and a vertical depth of 416 feet, seven feet of siliceous jasperoid pyritic lodestuff was met with. This lode contained gold throughout, but the highest assay return was 21 grains of gold per ton. It is evidently the downward extension of the lode under Plumer Street. Another lode was met with between 439 and 450 feet, at a vertical depth of 310 feet. This lode was in shattered quartz dolerite greenstone where it contacts with the eastern wall of a large keratophyre dyke; the highest assay was only 10 grains of gold per ton. Nevertheless this contact zone may be worth prospecting at the surface.

The No. 2 bore started from a point 480 feet southwesterly from and in the same direction (viz., N. 53° E.) as the No. 1 bore. The depth was 610 feet at an angle of depression of 45 degress.

Geology.—The geological information gained from this bore is not only interesting scientifically, but possibly also economically. Petrological investigation has proved the following facts:—

(1.) It is now possible to add a much larger area of favourable quartz dolerite greenstone to the eastern edge of that rock found at Mount Gledden. The new eastern boundary is shown in Plate VI.

(2.) There is a large dyke of keratophyre almost continuous from 257 to 439 feet, *i.e.*, a width of 128 feet. A lode has formed along the eastern wall of this dyke, in the quartz dolerite greenstone, which proves that the contact between keratophyre and quartz dolerite greenstone is favourable to lode formation.

(3.) The calc schist country continues northerly from Baden Street, and it likewise makes lodestuff where it contacts with the strip of quartz dolerite greenstone to the east of the keratophyre dyke.

The contact zones referred to in (2) and (3) may possibly contain rich patches of gold at the surface, depending of course on the sum-total of gold in the lodes, the amount of superficial rock removed by weathering, and the agencies controlling the concentration of gold into patches.

The rock formations met with are as follows:—

(a) Oxidised material.
(b) Quartz dolerite greenstone.
(c) Keratophyre.
(d) Black carbonaceous rock.
(e) Calc schist.
(f) Lodestuff.

(a.) *Oxidised material*.—This extended from the surface to 148 feet. It consisted of yellowish to brown rotten rock.

(b.) *Quartz dolerite greenstone*.—This rock forms the hanging and footwalls of the large keratophyre dyke and occurs between the following depths: 148-257 feet, 270-284 feet, 450-588 feet. It is a dark green, soft, slightly pyritic mottled greenstone showing numerous small pieces of leucoxene scattered throughout the rock. The chlorite renders the quartz almost invisible. In section it is made up of prominent "archipelagoes" of clear quartz and lumps of ragged leucoxene set in a heterogenous mass of chlorite and calcite (Section 4780). Relict felspar textures may be seen, and micropegmatite is present. As the quartz dolerite greenstone approaches the keratophyre the quartzes become almost completely absorbed and disappear.

(c.) *Keratophyre*.—This forms a large dyke 128 feet wide between the depths of 257 and 439 feet. It is a dense pale brownish felsitic rock with, if anything, a sub-resinous lustre—as compared with the dull lustre of the calc schist. The fresher form —and the only form showing distinct felspars—is at 269 feet, where the microscope shows it to be made up of minute, clean, microlitic felspars set in a mass of carbonate granules, wisps of sericite, and small flakes of chlorite, with some needles of brown rutile. The bulk of the rock is extremely fine in grain, cryptocrystalline and carbonated, considerable areas consisting of dusky-coloured material of low birefringence.

(d.) *Black carbonaceous rock* enclosed within the keratophyre dyke, and evidently derived from it.

(e) *The calc schist* is a dense, soft, dull-lustred, felsitic, ash-coloured rock, full of dark spots, and traversed by minute veinlets of chlorite and calcite. In section it is a dusky cryptocrystalline dense carbonated rock, traversed by straight lines of a dirty grey substance. Scattered throughout this mass are colourless patches—sometimes with straight edges—of calcite and chlorite.

(f) *Lodestuff*.—This occurs in (1) quartz dolerite greenstone from 439 to 450 feet, and (2) in calc schist from 588 to 595 feet. The quartz dolerite greenstone lode is shattered and traversed by carbonate veins; pyrites is present and there is evidence of shearing. In section it is a strongly fractured mass of carbonates and chlorite, with a little pyrites. The calc schist lode is strongly silicified and jasperoid, heavily pyritic, and in part carbonaceous.

The general order of succession of the rock formations described above is as follows. (See Plate VII.)

Depth in feet.	Nature of rock.
0—148	Rotten rock from zone of weathering.
148—257	Quartz dolerite greenstone with ferruginous patches.
257—270	Keratophyre.
270—284	Quartz dolerite greenstone.
284—311	Keratophyre.
311—337	Keratophyre with veinlets.
337—395	Carbonaceous zone.
395—439	Keratophyre.
439—450	Lode in quartz dolerite greenstone.
450—588	Quartz dolerite greenstone.
588—595	Pyritic flinty jasperoid lode in calc schist.
595—610	Gray calc schist.

Assay results and distribution of values.—The Government Mineralogist and Analyst made a total number of 50 assays; 33 from core submitted and 17 from sludge.

The highest assay value was, however, only 21 grains of gold per ton from core taken between 591 and 592 feet. The next highest assay was 10 grains per ton; all the rest were lower in value.

In view of the importance of the boring at Kalgoorlie, and in order thoroughly to test the ground passed through, every precaution was taken to detect the presence of values, as the following details will show:—

Source of Material.	No. of Assays.	Result of Assay.
1. Oxidised material from 20 to 108 feet	1	3grs. gold per ton.
2. Quartz dolerite greenstone between 157ft. 9in. and 207ft. 9in.	3	1 : 5grs. gold per ton. 2 : *Nil.*
3. Keratophyre between 264ft. 6in. and 327ft.	14	1 : 5grs. gold per ton. 1 : 3grs. „ „ 12 : *Nil.*
4. Carbonaceous rock between 384 and 385 feet.	1	Gold, *Nil.*
5. Lode 1. In quartz dolerite greenstone from 439 to 450 feet	7	3 : 10grs. gold per ton. 1 : 3grs „ „ 3 : *Nil.*
6. Lode 2. In calc schist from 589 to 595 feet	7	1 : 21grs. gold per ton. 1 : 10grs. „ „ 1 : 7grs. „ „ 2 : 5grs. „ „ 2 : 3grs. „ „
7. Sludges between 120 and 610 feet	17	5 : 3grs. gold per ton. 12 : *Nil.*
Total ...	50	

The Williamstown No. 3 Bore.

This bore was put down in order further to test at depth the southern end of the Hidden Secret line of lodes. It started from a point 66 feet north of Baden Street and 112 feet west of Barton Street, its direction being N. 46° E., straight for "A" shaft near the southeastern corner of Lease 4036E (see Plate VII.). The total depth reached was 612 feet and the angle of depression was 60 degrees from the horizontal.

The bore was successful in cutting at depth the southern extension of the Hidden Secret lode channel. Three distinct lodes were met with, but the highest assay was only 6 dwt. 11 grs. of gold per ton at a depth of 513 to 514 feet.

Geology.—The rock formations met with were as follows:—

(a) Oxidised material.
(b) Fine-grained greenstone.
(c) Dolerite greenstone.
(d) Talc-chlorite-carbonate rock.
(e) Fuchsite-carbonate rock.
(f) Lodestuff.

The order of succession in which these formations were met with is shown in Plate VII. The following is a detailed description of the rocks from point to point:—

Depth in feet.	Nature of Rock.
ft. in. ft. in.	
0 0—127 0	Rotten brownish and yellow decomposed rock. The bottom of the zone of the weathering was reached at 127 feet.
127 0—325 0	Fine-grained greenstone; in some places mottled and consisting of about equal proportions of dark green chlorite and dirty grey material. The latter is bleached, feathery and fibrous hornblende. Some of the rock is a uniform microscopic and dense aggregate of carbonates and chlorite.
325 0—420 0	Dolerite greenstone: a mottled soft greenstone made up of patches of chlorite and carbonates. Microscopically it is a mass of pale green scales of chlorite with patches of calcite which in places form perfect rhombohedra. A feature of the rock is minute crystals of pale brown rutile.
420 0—428 0	Dolerite greenstone, much disturbed, somewhat sheared—evidently an aftermath of lode-making forces—partly pyritic and slightly carbonaceous.
428 0—430 0	Carbonaceous pyritic black rock with quartz veinlets.
430 0—434 9	Dark pyritic chlorite rock.
434 9—458 0	Lode 1. 23 feet 3 inches of lode stuff. The first 4ft. 3in. was finely pyritic and flinty grey to white quartz, with bunches of massive pyrites. The rest of the ore was dense, dark, fine-grained and pyritic, with strong evidence of shearing and even schisting in places. The mineral contents are carbonates, chlorite, pyrites, quartz, and a little rutile. This lode is a highly altered and metasomatic form of dolerite greenstone.
458 0—471 0	Footwall of Lode 1. A dense grey felsitic rock crowded with curious lines and radial markings filled with chlorite. It contains a lot of carbonate distributed through cryptocrystalline material that may be bleached actinolite zoisite rock
471 0—494 0	Lode 2. Dark grey dense and somewhat sheared pyritic siliceous ore made up of cryptocrystalline silica with carbonate grains scattered throughout it. The carbonates become strongly segregated in places, and there are patches of chlorite. In parts there is a general impregnation of grains of sulphide of iron.
494 0—508 0	Footwall of Lode 2 and hanging wall of Lode 3. Similar to rock between 45 and 471 feet. Fine-grained dense felsitic-looking rock with a feathery texture. It may be calc schist, though there is a resemblance to the actinolite zoisite amphibolites.
508 0—518 0	Lode 3. A compact dark green chloritic siliceous ore, strongly impregnated with minute grains of iron pyrites. In section it is mainly an aggregate of chlorite, carbonates and cryptocrystalline silica studded with small crystals and grains of iron pyrites.
518 0—575 0	Dark green soft chloritic and somewhat mottled rock, showing evidence of schisting and a somewhat sheeny surface on which lumps of carbonates stand up in relief. At 533 feet the rock contains quite a lot of talc, the plates of which are arranged in parallel direction. Rhombohedra of carbonate appear as pseudo-phenocrysts. Chlorite is intimately mixed with the talc. In one place there is a large plate of biotite and muscovite combined. The rock is a talc-chlorite-carbonate species.
575 0—587 0	A connecting link between the talc-chlorite-carbonate and fuchsite-carbonate rock. It contains large plates of carbonate and plates of secondarily developed plagioclase.
587 0—612 0	Fuchsite-carbonate rock, bright green at 593 feet, but becoming less fuchsitic and a mass of carbonate containing white quartz veins at 612 feet.

GEOLOGICAL MAP SHOWING SITES OF BORES No's 1, 2 & 3

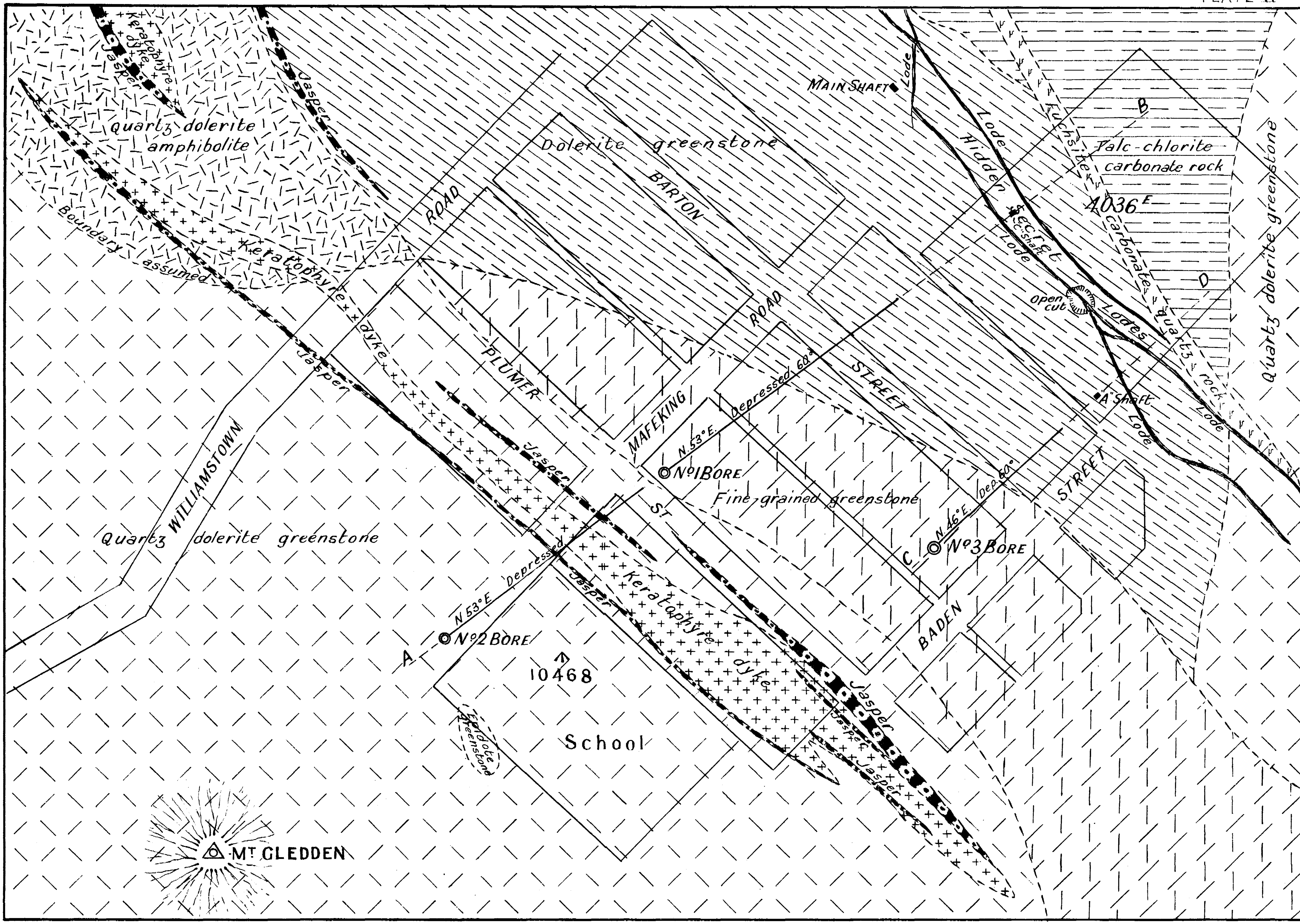
NORTH END (HIDDEN SECRET AREA) KALGOORLIE

By

C.O.G. Larcombe D.Sc.

GEOLOGICAL SURVEY PROGRESS REPORT 1926.

PLATE VI



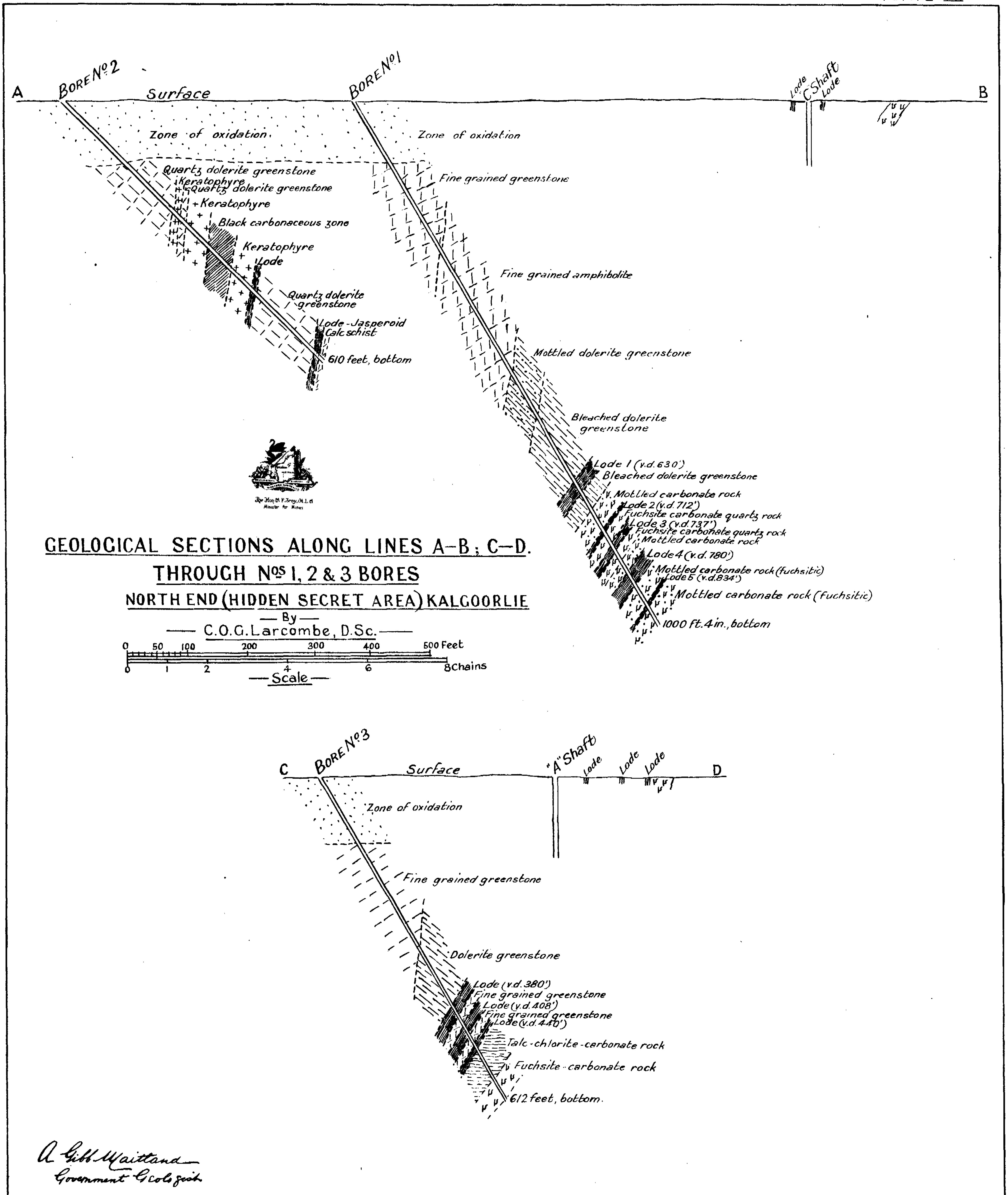
0 50 100 200 300 400 500 Feet

0 1 2 4 6 8 Chains

Scale

A. Gibb Maitland
Government Geologist

By Authority: FRED. WM. SIMPSON, Government Printer, Perth.



GEOLOGICAL SECTIONS ALONG LINES A–B; C–D.
THROUGH Nos 1, 2 & 3 BORES
NORTH END (HIDDEN SECRET AREA) KALGOORLIE
— By —
C.O.G. Larcombe, D.Sc.

By Authority: FRED. WM. SIMPSON, Government Printer, Perth.

Lode channels and distribution of values.

Every sample of stone showing the slightest signs of silification, mineralisation, the development of pyrites, or other features indicative of lodestuff, was sent for assay. Out of a total of 54 assays the highest value was 6dwts. 11grs. of gold per ton; the remaining 53 assays were unpayable.

The three lodes met with had all the appearance of good ore, consisting of dense, fine-grained, somewhat dark-looking pyritic, siliceous and strongly carbonated rock, with frequent evidence of shearing and in places marked siliceous zones.

The following table indicates the inclined and vertical depths of these lodes together with the number of assays and their results:—

Lode.	Depth. Inclined.	Depth. Vertical.	No. of Assays.	Result of Assay.
	ft. in. ft.	ft.		
No. 1	434 9—458	376	22	2: 14grs. gold per ton. 1: 13grs. " " 1: 10grs. " " 2: 5grs. " " 2: 3grs. " " 14: *Nil.*
No. 2	471 0—494	408	22	1: 1dwt. 5grs. gold per ton. 1: 10grs. gold per ton. 6: 5grs. " " 6: 3grs. " " 8: *Nil.*
No. 3	508 0—518	440	10	1: 6dwt. 11grs. gold per ton. 1: 2dwt. 17grs " " 1: 1dwt. 12grs. " " 1: 1dwt. 5grs. " " 1: 3grs gold per ton. 5: *Nil.*

The assays, 54 in number, were made mostly in 1ft. lengths; 22 from Lode 1; 22 from Lode 2; 10 from Lode 3.

With the exception of one assay of 6dwt. 11grs. from 513 to 514 feet; one of 2dwts. 17grs. from 511-512 feet; one of 1dwt. 12 grs. from 508-509 feet; and two assays of 1dwt. 5grs. each from 492-494 feet and 512-513 feet, respectively, there was nothing of more than half a dwt. to the ton. Twenty-seven assays yielded no gold at all.

II.—Boring at Yalgoo.

In furtherance of the policy of the Government, boring was commenced at the Old Emerald Mine on 22nd June.

The bores put down at Yalgoo are as follows:—

No. of Bore.	Location.	Inclined depth.	Vertical depth.	Inclination.
		feet.	feet.	degs.
No. 1 ...	Old Emerald Mine	300	260	60
No. 2 ...	do. do.	300	260	60
No. 3 ...	do. do.	300	260	60
No. 4 ...	Old Ivanhoe Mine	300	212	45

Old Emerald Mine.

The Acting Government Geologist states that—

"In the vicinity of Yalgoo two mines were worked in the early days, the Lake View and Emerald (late Royal Mint) Of these the Emerald produced 8,700 ozs. of fine gold from 3,061 tons of ore treated . . . . . . There are quartz leaders showing in some of the old shafts, and there is no evidence of a defined lode. In any case the ore was rich and would possibly warrant development below the shallow water-level if a bore revealed good values . . . . To prove the proposition three bores of 300 feet would be sufficient. The country rock has a slight dip if any to the east, and a bore set at an angle of 60 degrees, two chains to the west, would cut through the ore channel at approximately 200 feet from the surface. I would suggest that the hole be started two chains east from the eastern corner of the concrete foundation of the old 5-head mill which has since been removed."

The general result of the boring at the old Emerald Mine showed that (1) the three bores were all in the same country rock, viz., a medium grained greenstone consisting largely of hornblende; (2) there was no definite lode met with in the No. 1 Bore, but the country rock contained many glassy quartz veins mostly about a foot wide, though one measured 2 feet 6 inches; (3) there was no true lodestuff in the No. 2 Bore—in other respects it was similar to No. 1 Bore; and (4) in the No. 3 Bore a definite quartz reef was met with at 150 feet; it extended to 162 feet, *i.e.,* 12 feet, and assayed up to 8 dwts. 4 grs. of gold per ton between 153 feet and 154 feet 6 inches.

The following are further details of the three bores put down at the old Emerald Mine, Yalgoo.

No. 1 *Bore.*—This bore reached a total depth of 300 feet at a depressed angle of 60 degrees. There was no zone of oxidation. The country rock was the same throughout the whole length of the bore, viz., a medium-grained greenstone consisting almost entirely of hornblende of metamorphic origin, with in places a fair amount of biotite. More crushing would make this rock a typical hornblende schist.

No definite lode was met with, but in places there was evidence of crushing and incipient schisting. The only part of this rock likely to carry values were the small veins of pure glassy quartz. A number of these was met with, the largest being two and a half feet wide.

A total of nineteen assays was made, but the results were negative. Seventeen assays gave no gold at all, and two assays yielded 3 grains of gold per ton.

No. 2 *Bore.*—This bore reached a total depth of 300 feet at a depressed angle of 60 degrees. There was no zone of oxidation. The country rock was similar to that passed through in No. 1 Bore, but more actinolitic. In places the rock is schisted.

No true lode was met with. The only parts likely to carry gold were the glassy quartz veins and actinolitic rock with quartz veinlets.

Ten assays were made. Six of these yielded nothing; three yielded 3 grains of gold per ton; and one from between 222 and 224 feet—at a point where there was some evidence of iron sulphide—yielded 1 dwt. 2 grains per ton. This bore cannot be regarded as having passed through anything worth sinking for.

No. 3 *Bore.*—This bore reached a total depth of 300 feet at a depressed angle of 60 degrees. The country rock was the same throughout the full length of the bore, viz., a dense, dark green, actinolitic hornblende rock similar to that met with in Nos. 1 and 2 bores. This rock is made up entirely of plates of fibrous actinolitic hornblende, with feathery aggregates of the same mineral. It is a reconstructed amphibolite. A small zone of oxidation extended to 32 feet.

At a depth of 150 feet (vertical 130) the bore cut a reef made up of glassy white quartz. This reef continued to 162 feet—a total of 12 feet.

Samples of this reef were sent for assay to the Government Mineralogist and Analyst. The following are the results:—

Depth.	Assay results.
ft. in. ft. in.	
150 0—153 0	Gold, *Nil.*
153 0—154 6	Gold ; 8dwts. 4grs. per ton.
154 6—156 0	Gold ; 21 grs. per ton.
156 0—158 0	Gold ; 1dwt. per ton.
158 0—160 0	Gold ; 21grs. per ton.
160 0—161 0	Gold ; 10grs. per ton.
161 0—162 0	Gold ; 14grs. per ton.

Not knowing anything about the dip of the ore body, the question is whether this reef is in the ore channel of the Emerald Lease. The reef has a considerable width and contains consistent values over 9 feet out of the 12 feet where it was penetrated by the bore. It cannot be said that these values would not increase along the strike of this reef.

In view of a statement that fine gold could be got between 62 feet 2 inches and 64 feet 6 inches, further assays of core were made with the following results:—

Depth.	Assay result.
ft. in. ft. in.	
61 4—62 4	Gold ; *Nil.*
62 4—64 1	Gold ; 3grs. per ton.
64 1—70 7	Gold ; 5grs. per ton.
72 0—76 8	Gold ; *Nil.*

No. 4 Bore, Old Ivanhoe Mine, Yalgoo.

This bore was finished at a depth of 300 feet. There was no zone of oxidation, the whole bore being in greenstone.

The country rock (Section 4785), of which a sample from a depth of 213 feet may be regarded as typical, consists of a mediumly dense dark greenstone with an uneven fracture, and showing in places minute facets of cleavable hornblende. Very small grains of iron pyrites are scattered throughout the rock. It is a reconstructed amphibolite, and under the microscope is seen to be made up of large plates of pale green hornblende which, in places, has been broken up into minute plates. Strain shadows and numerous fractures filled with waterclear material bear evidence of the stresses to which this rock has been subjected. A little shapeless quartz occurs in places.

Nothing in the way of a continuous lode, reef, or ore body was met with in this bore, but the country from the surface to 53 feet was more or less schisted, and ten assays were made from this material. One assay yielded five grains of gold per ton; four yielded each three grains of gold per ton; and five yielded no gold at all.

Between 112 feet 6 inches and 113 feet 6 inches there was a pure white quartz vein containing pale massive pyrites, a little copper pyrites and a trace of galena. This sample assayed 1 dwt. 15 grains of gold per ton.

The details of the assays made are as follow:—

Depth.	Assay results.
ft. in. ft. in.	
7 0— 9 0	Gold ; 5grs. per ton.
14 0— 14 6	Gold ; 3grs. per ton.
15 0— 16 0	Gold ; *Nil.*
24 0— 25 0	Gold ; 3grs. per ton.
28 0— 30 0	Gold ; 3grs. per ton.
30 0— 31 0	Gold ; *Nil.*
31 5— 32 9	Gold ; *Nil.*
33 0— 34 0	Gold ; 3grs. per ton.
43 0— 45 0	Gold ; *Nil.*
47 5— 51 6	Gold ; *Nil.*
112 6—113 6	Gold ; 1dwt. 15grs. per ton.

The No. 4 Bore began on 24th August and finished on 24th September. It was the last bore put down on the Yalgoo Goldfield. The drill was then removed to Sandstone.

III.—Subsidised Boring at Lady Shenton Gold Mine, Menzies.

1. In connection with a subsidy from the Government two bores were put down in the Lady Shenton gold mine at Menzies on G.M.L. 5423Z.

2. The No. 1 Bore was put down to a depth of 157 feet at an angle of 40 degrees east of the bottom level. The No. 2 Bore reached a depth of 69 feet, and was put down at an angle of 55 degrees 107 feet south from the centre of the shaft.

3. The No. 1 Bore was confined to a dense medium-grained reconstructed amphibolite which, in places, has been crushed down to a hornblende schist. Four assays were made from core between 61 feet 7 inches and 80 feet 7 inches; three of these assays went traces and the remaining one assayed 13 dwts. 19 grains of gold per ton. Four assays were made of core from between 104 feet 4 inches and 125 feet, but none of these went more than 5 grains of gold per ton.

4. It will thus be seen that out of a total of 8 assays, only one assayed more than 5 grains per ton.

5. The assays were made by bulking two compartments at a time (the core in one compartment measured 2 feet 2 inches).

6. The No. 2 Bore contained core somewhat more amenable to examination. The greater part of the rock passed through in this bore was hornblende schist, derived from the breaking down of a reconstructed amphibolite similar to that met with in the No. 1 Bore.

7. A slightly auriferous zone occurred between 48 feet 4 inches and 60 feet 9 inches, between which depths five assays were made, the highest result being 21 grains of gold per ton between 52 feet 6 inches and 54 feet 6 inches. This is to be regretted because between 50 feet and 58 feet the rock showed signs of great alteration, and mineralogical and other physical conditions favourable to the occurrence of gold, *e.g.*, at 52 feet 6 inches, there is a powerful silicification accompanied by the introduction of biotite; at 53 feet and again at 54 feet 6 inches there is silicification with a fair proportion of iron sulphide.

8. In conclusion it might be added that the petrographic investigation indicates that the country passed through in these two bores is favourable to the occurrence of gold. Sheared auriferous lines are likely to be met with in hornblende schist, and it is hoped that shoots other than those that have been already worked may yet be discovered.

IV.—Lecture to Members of the Australasian Association for the Advancement of Science.

Some members of the Association (Section C, Geology and Mineralogy) visited Kalgoorlie under the leadership of Professor Sir Douglas Mawson, D.Sc., F.R.S., President of the Section. Opportunity was taken prior to the visit for a visit to special localities with the view to the preparation of rock sections for projection purposes in order that the more important facts regarding the geology and petrology of the Kalgoorlie goldfield might be made available to the visiting members.

The visitors were taken (a) for a geological excursion covering a large area around Kalgoorlie as far as Kurrawang; (b) for a trip to Kanowna; and (c) for an underground excursion through the Oroya Shoot.

In the evening a lantern lecture illustrated by numerous rock sections, was given by myself on the Geology and the Petrology of the Pre-Cambrian complex of Western Australia.

At the conclusion of the lecture an address was given on (1) the economic and utilitarian aspect of geology applied to mining and (2) the future of the mining industry.

V.—Some Rocks from Four Miles East of Argyle Station, Ord River, King District, Kimberley Division.

Macroscopic Features.—A dense, compact, beautifully banded rock made up of alternate bands of dark reddish brown material half an inch in width, and white bands of similar consistency about one-fifth of an inch wide. The reddish-brown and white bands have a hardness of about 3, the former yielding a pale pinkish-brown streak, the latter a white streak.

The white material is of a clayey nature, is practically infusible, and gives a reaction for alumina. Carbonates, if present, are negligible.

Minute white specks—pale brownish in the dark portion—are scattered throughout the rock. On exposed surfaces these white specks are represented by holes.

Microscopic features.—Under the microscope this rock is so dense that it takes high powers of the microscope to resolve it at all. The white parts are essentially fine clay with numerous wisps of sericite. Minute clear and angular quartz grains are scattered through the clay. The largest quartz grain seldom exceeds 1/500 of an inch. The grain of the rock is so fine as to suggest original material of the consistency of silt.

The dark reddish brown bands are simply ferruginous zones intercalated with the clay; they contain similar quartz grains to the white bands, into which they pass by insensible gradations. There is no absolute line of demarcation between the white bands and the ferruginous reddish-brown bands; they pass gradually one into the other.

Classification.—The rock may be regarded as a somewhat siliceous banded ferruginous claystone of sedimentary origin. (See rock 1/3962; Sections 4673, 4676, 4677.) In December, 1924, two rocks were described for Mr. Blatchford, one from near Ivanhoe Station on Ord River, and one from a creek on Barramine Station on the Oakover River. Mr. Blatchford's rocks may be regarded as similar to the specimens from four miles east of Argyle Station.

Origin.—It is reasonable to suggest that this rock was formed in quiet waters and at considerable depth. The alteration in the colour and composition of the layers is so frequent and so constant that no hypothesis will account for their originally massive character. Sedimentation seems to be the only answer. The microscope shows most perfect gradations between the white and reddish-brown bands. If orogenic or earth movements had been responsible for this banding, surely incipient shear or other planes would have separated the layers?

The general microscopic appearance indicates origin by means of very slow deposition either in quiet or deep waters, accompanied by the addition at repeated and frequent intervals of deposits of hydrated oxide of iron, followed again by siliceous clayey deposits.

This interlamination of siliceous and ferruginous material is quite common in the older rocks of America, *e.g.*, the Penokee District. It is moreover well known that iron ores have formed by chemical reactions in bodies of water, and these yield a notable proportion of the iron production of the world. The iron has been supplied from the land areas in the form of solutions. The oxide comes apparently from dissolved iron salts and not from detrital minerals of iron, so far as genesis is concerned. The surface waters extracted iron from the ferromagnesian silicates, as well as oxide or other minerals such as would be abundant in the older Pre-Cambrian land surfaces of that portion of Western Australia. The dissolved iron was carried into the sea.

Sea water contains dissolved air to the extent of 14 to 28cc. per litre, and this gas is present at great depths as well as at the surface. Hence, reactions in sea water would favour the forming of ferric compounds, unless reducing agents like organic matter were present, which is improbable. In fact, the red mud that is so abundant in the deep sea basins of the ocean is comparatively rich in ferric oxide.

The possibility of the reddish-brown ferruginous bands resulting from the oxidation of ferrous carbonate is small, because thick beds of siderite are not likely to be deposited in the open sea, since the oxygen in the water would tend to oxidise the ferrous compound. Limonite is an actual sedimentary deposit.

In specimen 1/3962 the bands are quite perfect and parallel, but in Mr. Blatchford's specimen the bands were not continuous and some forms presented curious elliptical cross sections. It is really a question of the segregation of the iron oxide from point to point: lenticular layers taking the place of irregular rounded nodules—certainly a distinction of no great importance.

It does not seem reasonable to suggest that the iron was introduced into this rock by atmospheric waters along the line of outcrop or downward through the overlying strata.

It might be remarked that it took 26 years to accumulate several inches of limonite in a Swedish deposit in shallow water along the shores. (Geikie, A., *Text Book of Geology,* 4th Edition, page 187.) The process in the Ord River area must have been infinitely slow in this deep sea deposit, particularly as suggested by the number of contacts of the white and reddish-brown bands examined microscopically. A feature of importance revealed by the petrographic investigation of this rock is the light it throws on the time question involved in some sedimentation, and the enormous periods of time represented by the pre-Cambrian and early Palaeozoic periods.

VI.—Petrographical Determinations for the Department and General Public.

The most interesting of these determinations are as follows:—

G.S. 13/25.—The occurrence of cyanite in gneiss from a little to the east of Lake Needoonga in the Upper Chittering Valley near Gingin. Since the collection of this cyanite gneiss some beautiful blue cyanites have been discovered in quartz veins in the Chittering Valley.

The gneiss is powerfully foliated, and consists of numerous bands of black and white mica with somewhat granulated looking quartz. In section the cyanite is pale pinkish, of high refractive index, strongly cleaved, and with high extinction angles (30°) measured from the trace of the cleavage. Microscopic features indicate a possible sedimentary origin for this cyanite-gneiss.

G.S. 220/21.—Three rocks were examined from Logan's Find, Gnalbain, Coolgardie Goldfield. All three were typical of auriferous country. No 1/3997, S. 4690, was a coarse-grained epidiorite made up of about equal proportions of uralite and plagioclase. No. 1/3998, S. 4688, was a very dense fine-grained amphibolite consisting of minute prisms, shreds, and plates of hornblende. The felspar was negligible. No. 1/3999, S. 4689, was a granulated and crushed felspar-porphyry.

G.S. 2/25.—Rocks submitted from Marie's Find, Bullfinch, Yilgarn Goldfield, by the Inspector of Mines, were made up of hornblende-schist and acid intrusives in the form of aplite.

G.S. 281/10.—A massive greenish rock (1/4010, Busselton) with the appearance of a mudstone or decomposed fine-grained greenstone. It proved to be of sedimentary origin. Under the microscope it was made up of dirty green and yellowish-brown ferruginous material in about equal proportions. Throughout this material irregular-shaped quartz grains are scattered, together with occasional pieces of felspar, one piece being certainly microcline.

G.S. 45/02.—Rock from half a mile east of Burrambie Station, Braeside, Pilbara Goldfield. This was a very dense greenish-grey felsitic, almost flinty-looking rock, throughout which numerous small dark patches and areas of chlorite were distributed. In section it consisted of a dense dirty grey lithoidal groundmass throughout which may be seen excessively minute microlites that appear to represent incipient stages of felspathic crystallisation. It is probable that this rock is an amygdaloidal lava of great age. In some aspects it is not unlike the lavas from the Nullagine series.

G.S. 86/12.—Rock from Goomalling, South-West Division. A medium-grained granite that has been intruded by a dense black basalt dyke, fragments of which may be seen adhering to the granite. Microscopic investigation showed the black rock to consist of a very dense irresolvable groundmass studded with black specks of oxide of iron. Exceedingly minute microlites of felspar are set in the groundmass in all azimuths. Perfectly colourless idiomorphic phenocrysts of plagioclase are distributed throughout the base.

G.S. 253/11.—A curious rock from Mingenew, South-West Division. This rock is of a decided metamorphic origin. It consists of black lustrous biotite and a soft dark-grey massive and somewhat resinous lustred substance. In section it is made up of large plates of biotite, associated with a mass of scaly and vividly polarising material that is evidently a form of pinite, most probably after cordierite. This rock was apparently a cordierite-biotite-schist, in which the cordierite has changed into pinitic growths.

G.S. 34/26.—Sample from Balfour Downs Station, about two miles west of the new gold find on the Curana Goldfield. This is an epidote-bearing coarse-grained basic epidiorite, a rock not uncommon on the goldfields.

G.S. 50/26.—From 15 miles north of Glenburgh Station, via Mullewa. This is a rather fine specimen of epidote and zoisite, with some pale green chlorite and interstitial quartz with water-clear felspar. The rock may be called epidosite.

GEOLOGICAL SURVEY MUSEUM AND COLLECTIONS.

Progress in connection with the sadly needed rearrangement, etc., of the Geological Survey Collections has not been found possible during the year 1926.

The collection which has been acquired by the survey officers in the ordinary course of departmental duties, or acquired by purchase or donation, forms the basis of the Geological Museum and now amounts to 18,101 registered specimens, most of which are in triplicate. During the calendar year 1926, 154 rocks were received and registered, in addition to eight minerals. Rock sections cut and registered amounted to 216, bringing the total number of microslides in the possession of the survey to 4,814. Two new meteorites (1/4077, Ticraco Creek, North Murchison; 1/4078, Mount Stirling, Avon District, South-West Division) were added to the collection, and 5,942 feet of bores were received.

The collection of geological photographs now amounts to 2,169, there having been 31 added to the list during the year. As has been previously pointed out, the photographs cover a wide range of geological subjects, representative of the different portions of the State in which departmental activities have extended.

The set of prints from the survey negatives is contained in 44 special albums and in the library; such a collection is of considerable scientific and historic value, which increases as years go by.

LIBRARY.

The additions to the Geological Survey Library amounted to 613 publications from all the Geological Survey and cognate institutions throughout the world, in addition to 24 purchases, bringing the total number of publications, including maps, up to 20,992 registered.

The distribution of the official publications issued during 1926 amounted to over 2,000; these were transmitted to the addresses on the regular exchange list and to others in response to requests for specially named reports, bulletins or maps.

GENERAL.

The present is the thirtieth and last in the series of Annual Progress Reports issued under the auspices of the writer. The regret with which I close the official relations with the staff of the department is mitigated by the kindly feeling which prompted the expressions at the meeting of the 9th December.

A. Gibb Maitland

Government Geologist.

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DIVISION V.

SCHOOL OF MINES OF WESTERN AUSTRALIA.

The Under Secretary for Mines.

School of Mines,
Kalgoorlie, 7th January, 1927.

I beg to forward, for the information of the Hon. the Minister, my report for the year 1926.

The closing down of the Golden Horseshoe and the continued unsettled condition of mining have had a marked influence on the attendance at the school. There has been little inducement for youths to undertake courses of study which do not give immediate promise of profitable employment in the district. A number of the students who joined the classes left during the year in search of employment, and there are no present signs of permanency.

The preparatory classes, which formerly were well attended, showed a further decrease. This will probably have an influence in lowering the enrolment in senior classwork in future years. It has been suggested that the school should give preparatory courses of instruction which will enable youths to take up positions on farms and engage in agricultural pursuits generally. In arithmetic, drawing, chemistry and the elementary principles of steam and internal combustion engines, classwork could be arranged at the School of Mines to meet the special requirements of those who intend to go on the land. Workshop practice in fitting and turning, carpentry and blacksmithing, could be given either at the School of Mines or at the Boulder Technical School. Youths undertaking such a course of training would derive considerable benefit, and would be well fitted to enter upon farming operations.

Students and staff worked steadily throughout the year and the results of the annual examinations were satisfactory. One junior and one senior scholarship and one bursary were awarded. Partly because no one at the end of 1925 was successful in gaining a junior scholarship, there were no competitors for the entrance scholarship. This has a value of £60 per year for three years and is offered for proficiency in the preparatory subjects of the school work. As the entrance scholarship enables the successful candidate to enter upon a full diploma course, it is to be regretted that existing conditions were such that no students came forward to compete for it.

The classes in 1st year Mathematics and Elementary Mechanics were well attended and students made good progress. The results in the preparatory classes were indifferent. Classwork in Mathematics was conducted tutorially, as far as possible, and students were encouraged to devote extra time to working out exercises, but the subject offers considerable difficulties to students who come to the School with insufficient preparation.

A small class in Gas Engine and Indicator worked steadily throughout the year. The Engine-driving classes which were recommenced in 1926 will be combined into a single class in the future.

The Drawing and Engineering classes maintained their usual high standard. Students were regular in attendance and made good progress. The Lecturer is very desirous of adding a testing machine and various models to his equipment in order that the scope of the classwork may be extended. The classes in Fitting and Turning were popular and accomplished a large amount of useful work. Small classes were held in 1st and 2nd year Mining and Surveying. A knowledge of these subjects has always proved of great value in assisting students to obtain lucrative positions. The class in Preparatory Physics was well attended. On the occasion of a visit to Dawe's Electrical Welding Plant, students witnessed the cutting and welding of iron, and greatly appreciated the demonstration of the fusing of heavy gauge iron wires under a current of 400 amperes. During the year the Assistant in Physics installed a small motor generator in the physics laboratory, and with it carried out for the benefit of students a number of experiments with heavy currents. The Lecturer in Physics and Electrical Engineering, besides conducting his usual classes, gathered together a large amount of data concerning power and supplied the Federal Technical Committee with copies of the collected evidence, papers and blue prints, together with a copy of a paper he had prepared for the School Science Society on "The trend of modern power generation and its influence on production costs.''

The senior classes in Geology, Mineralogy, and Petrology were regularly attended by a moderate number of earnest students who did good work, but the preparatory classes suffered by the withdrawal of junior students who left the district. During the year the Lecturer prepared new synopses of classwork which will be of considerable benefit to future classes. The students were given field practice in geology round about Kalgoorlie and were taken on a geological excursion to Siberia where a study was made of the deep lead. The serpentines and the acid eruptives and quartz blows at Smithfield were investigated, and a geological section was made over a stretch of 20 miles of country.

In September members of the Geology Section of the Australasian Association for the Advancement of Science, and among them the President, Sir Douglas Mawson, visited Kalgoorlie and were given opportunities of gaining an acquaintance with the geology of the district. The Lecturer in Geology personally conducted the party over a 13-mile cross section of the Kalgoorlie area. He took them underground to examine the Oroya chute and the lode formations of the South Kalgurli, and conducted them on a geological trip to Kanowna. The address dealing with portion of the geology of Western Australia, which was delivered by the Lecturer in Geology at a meeting of the School Science Society, was attended by the visiting members of the Association and was greatly appreciated. The coloured lantern slides specially prepared for the occasion considerably enhanced the interest of the address. During the third term, Professor Geissler, who was preparing data in connection with Siever's geographical work, and the members of the Technical Committee appointed by the Federal Government to investigate the mining industry, visited the school and were shown the main geological features of the district.

During the year experimental work was conducted in the metallurgical laboratory on problems of ore treatment submitted by the State Mining Engineer and various mining companies. Ores from the following mines were treated:—

Celebration Gold Mine.
Ivanhoe Gold Mine
Perseverance Gold Mine
Great Boulder Proprietary Gold Mine
Golden Horseshoe Estates Gold Mine
Surprise Lead Mine
Whim Creek Copper Mine.

Tests were also made for the State Mining Engineer on a sample of Hematitic Ilmenite from Mornington Mills in the Darling Range; and for Mr. W. H. Vale on ore from the La Fortuna Mine, Siberia.

All the Kalgoorlie ores were investigated with a view to treatment by the flotation process, and very good results were obtained. An endeavour was also made to treat the Surprise Lead slimes by this method, but as the slimes contained a large proportion of oxidised material, treatment by flotation was not a success.

In June, a heap leaching test on a 3-ton parcel of copper ore was commenced for Mr. H. R. Sleeman, Manager of the Whim Creek Copper Company, using, at his request, ferrous sulphate as process reagent. During the progress of the test, a large number of small experiments were made in the laboratory in an endeavour to ascertain the most suitable conditions, and many interesting points were brought to light. Further tests were afterwards made with varying success.

In May, Dr. Edwards, one of the London Directors of the Boulder Perseverance, spent a month in Kalgoorlie and, on several occasions, visited the experimental plant at the School. For his benefit the flotation treatment of Perseverance ore was demonstrated and various tests were conducted on the company's mill residues and other products. Some of the matters investigated were—

(1) The blanketing effect of gangue particles on the pyritic particles during roasting.
(2) The effect of granular grinding.
(3) The testing of roasted cyanide residues.
(4) An investigation of the accumulated material in the agitators.

Dr. Edwards expressed his satisfaction with the results of the experiments made at the School.

Up to the middle of October the following assays were made in connection with investigation work in the metallurgical laboratory:—

Gold assays	1,000
Lead assays	85
Copper assays	200
Iron assays	610
Other determinations	55

At the end of the year an investigation, which is not yet complete, was in progress as to the possibility of obtaining satisfactory extraction of the gold values from flotation concentrates by direct cyanidation without previous roasting.

The printing in pamphlet form of the results of the investigations carried out in the Experimental plant was greatly appreciated. Copies of the pamphlets were eagerly sought after and all those supplied have been distributed.

The school vacation in August was made to coincide with the visit of the Australasian Association for the Advancement of Science. Members of the staff attended the meetings in Perth and derived considerable benefit from the lectures and from the opportunities of meeting and conversing with the visiting scientists. The Lecturer in Chemistry and the Research Metallurgist read at the Perth meeting a paper on "The Treatment of Low Grade Ores," in which their work on pyritic gold ores and on low grade copper ores was described and suggestions were put forward which were considered capable of leading to a decrease in the cost of treatment of these ores.

In December, Mr. F. F. Allsop, B.Sc., Assistant in Chemistry, was transferred to the Analytical Department in Perth. During his year of service at the School he performed his duties in a satisfactory manner and was of considerable assistance in connection with the work in the experimental plant.

Several interesting papers were read at the meetings of the School of Mines Mining, Metallurgical and Engineering Society.

The University has notified the School that courses in Chemistry I., and Geology, Mineralogy and Petrology will be recognised during the coming year as qualifying towards graduation. Associates of the School who wish to enter upon the Engineering Course at the University can obtain a reduction of the period of attendance at University classes. At the end of the year examinations in degree subjects for University undergraduates at Kalgoorlie were held at the School of Mines and were supervised by Messrs. E. H. Illidge, B.Sc., and Mr. F. F. Allsop, B.Sc., both graduates of the University of Western Australia.

The visit of the Hon. the Minister for Mines to the School on the occasion of the Annual Dinner of the Students' Association was greatly appreciated. There was a record attendance of students and mine managers and several interesting speeches were made during the course of a most successful evening.

By furnishing reports as to assay values, and by indicating means of utilising and disposing of base metal ores, every effort has been made to give prospectors information likely to be of assistance to them. During 1926, 296 free assays and mineral determinations were made for prospectors of material from Crown lands not held under lease for mining purposes, as follows:—

Assays for gold and silver	237
Assays for copper, lead and tin ..	7
Analyses	4
Determinations of rocks, minerals, etc.	48
	296

The statistics dealing with the enrolment of students and the examination results are forwarded herewith.

F. B. ALLEN,
Director School of Mines.

SCHOOL OF MINES OF WESTERN AUSTRALIA.

Examiners.

The following Examiners conducted the Examinations in November, 1926:—

Subject.	Examiners.
Preparatory Mathematics ...	F. B. Allen, M.A., B.Sc., ; R. Davis, B.Sc., and E. Illidge, B.Sc.
Preparatory Chemistry	F. F. Allsop, B.Sc.
Preparatory Physics and Electricity	C. Cecil, A.W.A.S.M.
Preparatory Geology	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S.
Preparatory Mechanical Drawing...	C. Cecil, A.W.A.S.M.
Mathematics I.	E. H. Illidge, B.Sc., and R. Davis, B.Sc.
Mechanics—Theoretical	R. Davis, B.Sc., and E. H. Illidge, B.Sc.
Physics I.	R. Davis, B.Sc., and D. McDougall, A.I.E.E.
Chemistry I.	F. F. Allsop, B.Sc., and R. R. Baxter, B.Sc.
Engineering Chemistry I. and II.	L. W. Phillips, B.Sc., and B. H. Moore, B.E., F.S.A.S.M.
Assaying I. ... ... Assaying II. ... ... Metallurgy I. and II. ...	B. H. Moore, B.E., F.S.A.S.M., and G. S. Compton, B.Sc.
Petrology ... ... Mineralogy ... ... Geology	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S., and G. S. Compton, B.Sc.
Mining Geology	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S.
Practical Mathematics	E. H. Illidge, B.Sc.
Mechanical Drawing I. and II. ...	J. H. Tate.
Applied Mechanics ... Building Construction ...	B. H. Moore, B. E., F.S.A.S.M., and J. H. Tate
Mechanical Engineering I. and II. Machine Design	J. H. Tate and T. Butement, A.O.U.S.M.
Surveying I. and II. ... Mining I. and II.	T. Butement, A.O.U.S.M.
Electrical Engineering I. and II. ...	D. McDougall, A.I.E.E.
Fitting and Turning I. and II. ...	C. D. Slee.
Engine Driving I. and II. ...	C. C. Meredyth.
Gas Engine ... ... Indicator	A. R. E. Bosustow.

JUNIOR SCHOLARSHIP.

Subject.	Examiners.
Physical Geography	C. O. G. Larcombe, D.Sc., F.S.T.C., F.G.S.
Mathematics ... ... English	F. B. Allen, M.A., B.Sc.

ATTENDENCES, 1926.

Subjects.	Effective Enrolment.		
	1st Term.	2nd Term.	3rd Term.
Elementary Mathematics	24	16	13
Preparatory Mathematics	25	17	17
Preparatory Mechanical Drawing ...	36	21	18
Preparatory Physics	30	22	17
Preparatory Chemistry	28	22	18
Preparatory Geology	10	2	2
Mathematics—First Course	28	25	21
University Mathematics	1	1	1
Practical Mathematics	6	6	4
Theoretical Mechanics	7	6	7
Physics—First Course	10	7	7
Chemistry—First Course	16	11	11
Engineering Chemistry—First Course ...	3	3	3
Assaying—First Course	3	3	3
Assaying—Second Course	2	2	2
Metallurgy—First Course	1	1	1
Geology	4	4	4
Geology (Education Dept., "A" Certificate)	1	1	1
Mineralogy	4	4	3
Petrology	2	2	2
Mining—First Course	2	2	2
Mining—Second Course (Mine Sampling)	1	...	1
Mining—Second Course (Ore Dressing) ...	...	1	1
Surveying (University, First Year) ...	2	2	2
Surveying—First Course	4	4	4
Surveying—Second Course	3	3	3
Mechanical Drawing—First Course ...	22	19	19
Mechanical Drawing—Second Course ...	7	7	7
Building Construction	9	8	7
Machine Design	6	4	4
Mechanical Engineering—First Course ...	7	6	6
Mechanical Engineering—Second Course	1	1	1
Electrical Engineering—First Course ...	2	1	1
Electrical Engineering—Second Course ...	2	2	2
Fitting and Turning—First Course ...	25	16	15
Fitting and Turning—Second Course ...	6	6	6
Gas Engine and Indicator	10	8	5
Engine Driving—First Course	14	8	6
Applied Mechanics	2	2	2
Total Enrolments	365	274	247
Individual Students	140	108	98

	1925.			1926.		
	1st Term.	2nd Term.	3rd Term.	1st Term.	2nd Term.	3rd Term.
Total Enrolments ...	419	331	291	365	274	247
Individual Students	169	128	110	140	108	98

EXAMINATION RESULTS.

The following table shows the passes obtained by students of the Western Australian School of Mines, Kalgoorlie, at the Annual Examinations held in November, 1926, including the Supplementary Examinations held in February, 1926:—

Subject.	Class of Pass.		
	Credit.	Pass.	Totals.
Elementary Mathematics	2	8	10
Preparatory Drawing	7	10	17
Preparatory Physics	9	5	14
Preparatory Chemistry	...	7	7
Preparatory Geology	1	...	...
Preparatory Mathematics (Arithmetic) ...	...	1	1
Preparatory Mathematics (Algebra) ...	...	1	1
Preparatory Mathematics (Geometry) ...	...	1	1
Mathematics, First Course	1	5	6
Mathematics—First Course (Algebra) ...	...	4	4
Mathematics—First Course (Trigonometry)	...	2	2
Theoretical Mechanics	1	2	3
Physics	...	7	7
Chemistry—First Course	1	9	10
Engineering Chemistry—First Course ...	1	2	3
Assaying—First Course	...	2	2
Assaying—Second Course	1	1	2
Metallurgy—First Course	...	1	1
Metallurgy—Second Course	...	1	1
Geology	...	4	4
Mineralogy	...	3	3
Petrology	1	1	2
Mining—First Course	...	2	2
Mining—Second Course (Mine Sampling)	...	1	1
Surveying—First Course	1	2	3
Surveying—Second Course	...	8	8
Mechanical Drawing—First Course ...	7	8	15
Mechanical Drawing—Second Course ...	6	1	7
Applied Mechanics	2	2	4
Mechanical Engineering—First Course ..	1	4	5
Mechanical Engineering—First Course ... (Gas Engine)	2	1	3
Mechanical Engineering—First Course (Indicator)	2	1	3
Buidling Construction	2	4	6
Engine Driving	2	3	5
Electrical Engineering—First Course ...	...	1	1
Electrical Engineering—Second Course	...	3	3
Fitting and Turning—First Course ...	2	12	14
Fitting and Turning—Second Course ...	2	4	6
Machine Design	6	...	6
Mechanical Engineering—Second Course	1	...	1
Practical Mathematics	...	4	4
Totals	61	138	199

ASSAYER'S CERTIFICATES.

The following have gained Certificates:—

Adams, H.	P.T.S.	March, 1904.
Adams, P.	P.T.S.	February, 1905.
Beech, S. J.	K.S.M.	November, 1906.
Brown, T.	P.T.S.	November, 1906.
Brooking, J.	P.T.S.	November, 1906.
Hutchinson, D. M.	K.S.M.	November, 1906.
Banks, R.	K.S.M.	November, 1908.
Gabel, J.	K.S.M.	November, 1908.
Pike, R. W.	P.T.S.	November, 1908.
Woolf, M.	K.S.M.	November, 1908.
Baxter, R. R.	P.T.S.	November, 1909.
Bradley, W. S.	K.S.M.	November, 1909.
Burrows, M. F.	P.T.S.	November, 1909.
Compton, G. S.	P.T.S.	November, 1909.
Cook, H. J.	P.T.S.	November, 1909.
Klem, L. G.	P.T.S.	November, 1909.
Fraser, W.	K.S.M.	November, 1910.
Rowledge, H. P.	P.T.S.	November, 1910.
Benjamin, L. R.	P.T.S.	November, 1911.
Jackson, L. T. C.	P.T.S.	November, 1911.
Leevers, J. C.	K.S.M.	November, 1911.
Lapsley, R. G.	P.T.S.	November, 1912.
Kurth, E. E.	K.S.M.	November, 1913.
Grace, J. N. A.	P.T.S.	November, 1916.
Noall, J. C.	K.S.M.	November, 1917.
Cecil, Clyde	K.S.M.	November, 1918.
Terrell, J. H.	K.S.M.	November, 1918.
Nairn, T. W.	K.S.M.	November, 1918.
Roberts, T. J.	K.S.M.	November, 1919.
Chapman, F. E.	P.T.S.	November, 1920.
Lethlean, H. V.	K.S.M.	November, 1921.
Carrigg, C. G.	K.S.M.	November, 1922.
Greer, J. H.	K.S.M.	November, 1922.
Mundle, E. B.	K.S.M.	November, 1922.
Esdaile, A. N.	K.S.M.	November, 1923.
Paterson, A. V.	K.S.M.	November, 1923.
Simons, H. H. J.	P.T.S.	November, 1924.
Brown, C. W.	K.S.M.	November, 1926.
Lynch, T.	K.S.M.	November, 1926.

INDUSTRIAL CHEMIST'S CERTIFICATES.

The following have gained certificates :—

Cecil, C.	K.S.M.	November, 1921.
Chapman, F.	P.T.S.	November, 1922.
Carrigg, C. G.	K.S.M.	November, 1922.
Esdaile, A. N.	K.S.M.	November, 1922.
Paterson, A. V.	K.S.M.	November, 1924.

MINE SURVEYOR'S CERTIFICATES.

The following have gained certificates :—

Peat, J.	K.S.M.	November, 1909.
Adams, H.	K.S.M.	November, 1910.
Banks, R.	K.S.M.	November, 1911.
Gabel, J.	K.S.M.	November, 1911.
Pike, R. W.	K.S.M.	November, 1912.
Godden, F. R. W.	K.S.M.	November, 1915.
Mundle, E. B.	K.S.M.	November, 1915.
Leevers, J. C.	K.S.M.	November, 1916.
Crutchett, I. A.	K.S.M.	November, 1920.
Powell, T.	K.S.M.	November, 1921.
Agnew, R. J.	K.S.M.	November, 1922.
Crutchett, E. G.	K.S.M.	November, 1922.
Davies, I.	K.S.M.	November, 1922.
Eddy, J. T.	K.S.M.	November, 1922.
Rosenberg, J. M.	K.S.M.	November, 1923.
Gibbons, L. P. J.	K.S.M.	November, 1924.
Terrell, J. H.	K.S.M.	November, 1924.
Manners, J. E.	K.S.M.	November, 1926.

DRAUGHTSMAN'S CERTIFICATES.

The following have gained certificates :—

Galt, W.	K.S.M.	November, 1915.
Butement, J. C.	K.S.M.	November, 1915.
Edmondson, F. C.	K.S.M.	November, 1915.
Lang, J. H.	K.S.M.	November, 1915.
Davies, W.	K.S.M.	November, 1917.
Weselman, C.	K.S.M.	November, 1917.
Thompson, E. P.	K.S.M.	November, 1920.
Gill, L. J.	K.S.M.	November, 1921.
Macbeth, R. A.	K.S.M.	November, 1921.
Rosenberg, J. M.	K.S.M.	November, 1921.
Spalding, J.	K.S.M.	November, 1922.
Taylor, H.	K.S.M.	November, 1922.
Sinclair, R. J.	K.S.M.	November, 1925.
Thrupp, T. W.	K.S.M.	November, 1926.

ELECTRICIAN'S CERTIFICATES.

The following have gained certificates :—

Galt, W.	K.S.M.	November, 1915.
Butement, J. C.	K.S.M.	November, 1915
Edmondson, C. F.	K.S.M.	November, 1915.
Lang, J. H.	K.S.M.	November, 1915.
Davies, W.	K.S.M.	November, 1917.
Weselman, C.	K.S.M.	November, 1917.
Thompson, E. P.	K.S.M.	November, 1920.
Gill, L. J.	K.S.M.	November, 1921.
Macbeth, R. A.	K.S.M.	November, 1921.
Rosenberg, J. M.	K.S.M.	November, 1921.
Spalding, J.	K.S.M.	November, 1923.
Taylor, Harry	K.S.M.	November, 1923.
Meredyth, C. C.	K.S.M.	November, 1925.
Sinclair, R. J.	K.S.M.	November, 1925.
Thrupp, T. W.	K.S.M.	November, 1926.

GEOLOGIST'S CERTIFICATES.

Gabel, J.	K.S.M.	November, 1911.
Leevers, J. C.	K.S.M.	November, 1916.
Mundle, E. B.	K.S.M.	November, 1920.
Agnew, R. J.	K.S.M.	November, 1923.

DIPLOMAS.

The following students have gained Diplomas :—

Beech, S. J. (K.S.M.), Diploma in Metallurgy, November, 1906.
Adams, P. (P. and K.), Diploma in Metallurgy, November, 1907.
Adams, H. (P. and K.), Diploma in Metallurgy, November, 1908.
Banks, R. (C. and K.), Diploma in Metallurgy, November, 1910.
Burrows, M. F. (P. and K.), Diploma in Metallurgy, November, 1910
Compton, G. S. (P.T.S.), Diploma in Metallurgy, November, 1910.
Cook, H. J. (P.T.S.), Diploma in Metallurgy, November, 1910.
Gabel, J. (K.S.M.), Diploma in Metallurgy, November, 1910.
Gabel, J. (K.S.M.), Diploma in Mining, November, 1911.
Pike, R. W. (P. and K.), Diploma in Metallurgy, November, 1911.
Galt, W. (K.S.M.), Diploma in Mechanical and Electrical Engineering November, 1915.
Butement, J. C. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.
Edmondson, F. C. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.
Lang, J. H. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1915.
Grace, J. N. A. (P.T.S.), Diploma in Metallurgy, November, 1915.
Bradley, W. S. (K.S.M.), Diploma in Metallurgy, November, 1915.
Kurth, E. E. (K.S.M.), Diploma in Metallurgy, November, 1916.
Getty, A. (K.S.M.), Diploma in Metallurgy, November, 1916.
Le Mesurier, C. R. (K.S.M.), Diploma in Metallurgy, November, 1916.
Leevers, J. C. (K.S.M.), Diploma in Mining, November, 1916.
Davies, Watcyn (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1917.
Weselman, Carl (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1917.
Nairn, T. W. (K.S.M.), Diploma in Metallurgy, November, 1919.
Mundle, E. B. (K.S.M.), Diploma in Mining, November, 1920.
Thompson, E. P. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1920.
Gill, L. J. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1921.
Macbeth, R. A. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1921.
Rosenberg, J. M. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1921.
Rowledge, H. P. (P. and K.), Diploma in Metallurgy, November, 1922.
Taylor, Harry (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1923.
Spalding, J. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1924.
Sinclair, R. J. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1925.
Cecil, Clyde (K.S.M.), Diploma in Metallurgy, November, 1926.
Thrupp, Thos. W. (K.S.M.), Diploma in Mechanical and Electrical Engineering, November, 1926.

ENGINE-DRIVERS' CERTIFICATES.

The following students of the School of Mines have passed the examinations held by the Chief Inspector of Machinery during 1926 for various Engine-drivers' Certificates :—

Name.	Certificate.
Beames, H. M.	First Class Competency.
Wadeisha, J.	Third Class Competency.
Moore, H. L.	Internal Combustion Engine Competency.
Stack, E. J.	do. do. do.
Baker, C. E.	Boiler Attendants, Competency.
Craib, W.	do. do. do.
Maguire, D. E.	Locomotive Engine Competency.

SCHOLARSHIP EXAMINATIONS, 1926.

JUNIOR SCHOLARSHIP.

Candidate.	District.
Pinkus, Cliff A.	Kalgoorlie.
Woodroffe, Edward J.	Kalgoorlie.
Kelly, Charles J.	Kalgoorlie.
Hogarth, Keith	Kalgoorlie.

C. A. Pinkus gains the Junior Scholarship.

SENIOR SCHOLARSHIP.

Candidate	District.
Warman, Charles H.	Kalgoorlie.
Bell, Charles H.	Kalgoorlie.
Crocos, August J.	Kalgoorlie.

C. H. Warman gains the Senior Scholarship.

BURSARY IN THIRD YEAR SUBJECTS.

Candidates.	District.
Glendinning, Angus R.	Kalgoorlie.

CHAMBER OF MINES SCHOLARSHIP IN MINING.

Candidate.	District.
Bell, William R.	Kalgoorlie.

W. R. Bell has been recommended for this Scholarship.

CHAMBER OF MINES SCHOLARSHIP IN MECHANICAL DRAWING.

Candidate	District.
Crocos, August J.	Kalgoorlie.

A. J. Crocos has been recommended for this Scholarship.

THE CRITCHLEY PARKER PRIZE.

The following have been recommended for the prizes offered by Critchley Parker, Esq., Melbourne :—

Bell, C. H.—The Industrial Australian and Mining Standard.
Meredyth, C. C.—Mining Standard Publication.

MECHANICS' INSTITUTE (KALGOORLIE) FREE MEMBERSHIP PRIZES.

The following have been recommended :—

Baker, Stanley ; Cray, T. ; Hill, H. J. ; Koetsveld, W. A. ; McInerney, B. ; Lynch, T. ; Oakley, P. R.

SOUTH KALGURLI ORE.

REPORT ON GRINDING AND SIZING TESTS.

For the purpose of obtaining information about the distribution of the gold in this ore, a series of grinding and sizing tests has been carried out. This series gives the results of grading analyses on samples crushed to definite degrees of fineness, the fineness increasing with each succeeding test of the series.

For each test the whole of the sample has been ground to pass a fixed screen and then graded and the various sizes assayed.

These tests show clearly that when coarse crushing is adopted, the greater portion of the gold is present in the product coarser than 100-mesh, and that with increasing fineness of crushing, the percentage of gold in the minus 100-mesh product continuously increases.

These results indicate that the gold values are so uniformly distributed and the gold-bearing minerals are so finely crystalline that grinding to minus 100-mesh, at least, is necessary to separate the valuable minerals from the gangue.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 25th March, 1925.

SOUTH KALGURLI ORE.

GRINDING AND SIZING TESTS.

Sample No. 3.—Assay Value—23·2 dwt. Au. per ton.

GRADING ANALYSES.

Test No. 1.—Weight of Ore—1,000 grammes.

I.M.M. Screen.	Weight gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus, 8 plus 10	84·5	16·8	7·50
plus 20	259·0	17·2	23·90
plus 40	260·7	17·6	24·50
plus 60	90·2	18·0	5·90
plus 80	56·6	20·0	6·00
plus 100... ...	25·3	14·4	1·90
plus 150... ...	70·4	23·2	8·60
plus 200... ...	55·2	16·8	5·00
minus 200 ...	93·0	32·8	16·60
	994·9	19·8 (calcd.)	99·90

Test No. 2.—Weight of Ore—1,000 grammes.

I.M.M. Screen.	Weight gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus 16, plus 20	97·50	16·0	7·5
plus 40	359·90	17·2	29·9
plus 60	115·70	22·0	12·3
plus 80	80·50	21·6	8·4
plus 100... ...	14·50	23·2	1·6
plus 150... ...	83·00	25·6	10·2
plus 200... ...	25·90	17·6	2·2
minus 200 ...	214·70	26·8	27·7
	991·70	20·9 (calcd.)	99·8

Test No. 3.—Weight of Ore—1,000 grammes.

I.M.M. Screen	Weight gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus 30, plus 40	107·7	28·8	13·7
plus 60	208·3	20·8	19·2
plus 80	157·0	20·4	14·2
plus 100... ...	34·0	21·6	3·3
plus 150... ...	107·0	22·4	10·6
plus 200... ...	28·0	20·0	2·5
minus 200 ...	353·0	23·2	36·4
	995·0	22·6 (calcd.)	99·9

A. S. WINTER.
B. H. MOORE.

25th March, 1925.

SOUTH KALGURLI ORE.

GRADING AND SIZING TESTS.

Sample No. 4.—Assay Value—16·8 dwt. Au. per ton.

GRADING ANALYSES.

Test No. 4.—Weight of Ore—500 grammes.

I.M.M. Screen.	Weight gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus 50, plus 60	24·5	30·0	8·7
plus 80	74·7	12·0	10·5
plus 100... ...	27·4	13·6	4·4
plus 150... ...	76·9	17·6	15·9
plus 200... ...	16·0	16·8	3·1
minus 200 ...	276·2	17·6	57·3
	495·7	17·1 (calcd.)	99·9

Test No. 5.—Weight of Ore—500 grammes.

I.M.M. Screen.	Weight gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus 70, plus 80	26·4	10·4	2·8
plus 100... ...	26·9	18·8	5·3
plus 150... ...	80·5	19·2	16·1
plus 200... ...	24·2	12·0	3·1
minus 200 ...	334·0	20·8	72·6
	492·0	19·4 (calcd.)	99·9

Test No. 6.—Weight of Ore—250 grammes.

I.M.M. Screen.	Weight gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus 90, plus 100... ...	6·5	18·0	2·2
plus 150... ...	39·3	14·8	11·1
plus 200... ...	15·0	18·4	5·3
minus 200 ...	189·2	22·4	81·3
	250·0	20·8 (calcd.)	99·9

Test No. 7.—Weight of Ore—100 grammes.

I.M.M. Screen.	Weight. gram.	Assay, dwt. Au. per ton.	Percentage of total gold.
Minus 100, plus 150 ...	29·7	17·6	26·8
plus 200 ...	6·4	18·0	5·9
minus 200 ...	62·7	20·8	67·2
	98·8	19·6 (calcd.)	99·9

A. S. WINTER.
B. H. MOORE.

25th March, 1925.

PYRITIC GOLD ORE FROM SOUTH KALGURLI GOLD MINE.

REPORT ON FLOTATION TESTS.

In the series of flotation tests on ore from the South Kalgurli Gold Mine carried out in 1923 it was found that a clean float free from slimed gangue could not be obtained without the addition of excessive amounts of sulphuric acid. On reaching a stage where an endeavour was being made to overcome this difficulty it became necessary to lay aside this investigation in order to take up other work. This investigation has now been resumed, and the tests so far carried out have all been made with two main objects in view, viz., (1) devising a satisfactory and economical method of obtaining a clean pyritic float; and (2) obtaining residues of sufficiently low grade to be discarded without further treatment.

Samples of ore for this investigation have been kindly supplied by Mr. F. G. Brinsden, General Manager, South Kalgurli Consolidated Limited, who has taken a keen interest in this investigation since its inception.

All the samples used in this present investigation have shown the same tendency as No. 2 Sample (1923 Tests) to yield a mixed float consisting of sulphides and slimed gangue, which has been so bulky and so large in quantity as to render flotation of this ore under ordinary conditions economically impossible. Tests using acid to overcome this difficulty have shown that addition of this re-agent will give satisfactory results, but at the expense of so high a consumption of acid as to make the cost of treatment in this way prohibitive.

In choosing a re-agent to prevent the floating of slimed gangue it was recognised that such a re-agent must be inexpensive and must not be acted on chemically by the constituents of the ore, *i.e.*, its action must be physical rather than chemical.

In this connection sodium chloride was considered to offer possibilities, and its effect has been determined from a number of tests carried out on pulps containing varying percentages of salt. These tests have shown that when a two per cent. solution of sodium chloride was used in making up the pulp for flotation, there was practically no tendency for a mixed float to be produced, and the float was evidently clean pyrite. Solutions of higher concentration gave the same result, but weaker solutions again gave mixed floats, indicating that the minimum effective percentage of salt is approximately two per cent. On this basis the salt used would be 240 pounds per ton of ore, which, at first glance, seems very high. The results obtained by the use of salt solution in making up the pulp have been so good that it has not been considered necessary to investigate the effect of other addition re-agents, especially as the cost of salt per ton of ore in actual treatment would be small, and also as mine water, which in Kalgoorlie contains often two per cent. or more of sodium chloride, could be used, in which case the only charge against treatment would be for the pumping of the water from underground to the treatment plant. As this pumping is a necessity in the conduct of mining operations, its cost should be a charge against mining and not against treatment, and in this case the cost of salt for treatment would be nil.

As indicating the mineral composition of the mine water, an early analysis (supplied by Mr. Brinsden) of water from the Kalgurli Mine is given herewith:—

CaO	..	..	0.157 per cent.
MgO	..	..	0.285 „ „
Na_2O	..	..	2.380 „ „
SO_3	..	..	0.615 „ „
Cl_2	..	..	2.550 „ „
			5.987 „ „

It must be borne in mind that the salt acts physically and therefore the solution, after separation from the residues, is capable of being used again and consequently would be continuously in circuit in treatment on a large scale.

Even if mine salt water were not available for treatment, the principal cost for salt would be in initially making the solution up to two per cent. concentration, and thereafter further additions would only be necessary to make up for unavoidable losses by leakage and in the discarded residues, and these additions would be comparatively small, so that the actual cost per ton of ore would be very slight.

In these tests, as pointed out above, the main object has been to produce clean float and low-grade tails, and therefore no effort has yet been made to determine the minimum quantity of oil to be used, nor the best oil for the purpose.

The use of kerosene for oiling purposes was adopted primarily because it was considered that a thin oil might assist in preventing the flotation of slimed gangue with the sulphides, but it was found to have no appreciable effect in this direction. At the same time it was found that kerosene was exceedingly effective in oiling the sulphides, so that on addition of a heavier oil to act as a collector rapid flotation of the sulphides took place. For this reason kerosene has been used in most of the tests as an oiler in conjunction with other oils and mixtures acting as collectors and frothers. Oiling has in all cases been carried out during grinding in the pebble mill as this method had previously been found to be the most efficient, and further additions of oil have been made in the flotation cell, where, however, it acts less efficiently. Consequently, the consumption of oil has been somewhat excessive, but it is considered that by adding the whole of the oils during grinding the amount of oil necessary for successful flotation can be very much diminished. Further investigation is now proposed to determine the most suitable oils and the economic minimum necessary to give rapid and clean flotation and low-grade residues.

In some tests the pulp density has been varied with equally good results, and it has been found that up to a ratio of solids to liquid of one to four no difficulties have been met with in the flotation of the sulphides.

The results of this series of tests have been exceedingly satisfactory and encouraging, recoveries of gold in the concentrates varying from 72.6 to 93.9 per cent., while at the same time high grade concentrates and residues of values down to 1 dwt Au per ton have been obtained.

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25th March, 1925.

FLOTATION TESTS ON SOUTH KALGURLI ORE.

Sample No. 3—Assay Value—16·8 dwt. Au. per ton.

Test No.	Ore Wt. gram.	Water gram.	Oil. Description.	Oil. Wt. gram.	Oil. Wt. lb. per ton.	Reagents. Description.	Reagents. Wt. gram.	Reagents. Wt. lb. per ton.	Time of grinding hours.	Float. Wt. gram.	Float. Au. dwt. per ton.	Tails. Wt. gram.	Tails. Au. dwt. per ton.	Recovery in conc. per cent.	Remarks.
1	500	3,000	a. Euc. ...	0·48	1·92	...	...	...	2·0	91·8	...	350·7	...	...	
			b. Euc. grease	0·64	2·56	H_2SO_4 ...	25	100	...	31·8	...	...	...	...	The products from Tests 1 to 5 on being assayed, gave evidence of having been tampered with while being dried. Further examination disclosed the presence in the tails and floats of free gold which could not be detected in the original ore.
2	500	3,000	a. B.B. dist. and kero.	...	...	NaCl ...	240	960	2·5	36·0	...	432·8	...	...	
			b. Euc. ...	0·80	3·2	...	...	...	...	33·4	...	...	...	...	
3	500	3,000	Kero., Euc. and B.B. dist.	...	...	a. *Nil* ...	...	...	2·0	48·2	...	353·8	...	...	
				0·32	1·28	b. NaCl ...	150	600	...	...	...	...	...	...	
				...	...	H_2SO_4 ...	22	88	...	66·2	...	...	...	...	
4	500	3,000	Euc., Euc.-grease, Euc. pyrid.-tar	0·96	3·84	NaCl ...	150	600	2·0	60·2	...	442·2	...	...	
				0·3	1·2	...	...	...	...	...	...	...	...	...	
				2·0	8·0	...	...	...	...	...	...	...	...	...	
5	500	3,000	Kero. Euc.-pyridine, coal tar	1·0	4·0	NaCl ...	90	360	2·25	63·5	...	441·9	...	...	
				1·95	7·8	Na_2S ...	2	8	...	...	...	...	...	...	
6	500	3,000	Kerosene ...	0·75	3·0	NaCl ...	90	360	2·0	67·0	140	428·5	...	...	
			Euc.-pyr-tar ...	1·8	7·2	...	...	...	...	...	...	...	4·6	72·6	
7	500	3,000	Kerosene	0·75	4·8										
			Kero.-tar	1·2	4·8	NaCl ...	90	360	2·0	64·9	104	435·0	3·0	82·1	
			Euc.-pyr-tar	1·2	4·8										
8	500	3,000	Kerosene	1·75	7·0										
						NaCl ...	60	240	2·33	85·0	88·0	414·0	1·4	91·6	
			Euc.-pyr-tar	2·1	8·4										
9	500	3,000	Kerosene	1·12	4·5	NaCl ...	45	...	...	26·7	172	...	...	...	
			Euc.-pyr-tar...	2·1	8·4	...	...	180	2·0	58·6	20·0	413·5	3·0	82·1	
Sample No. 4.—Assay Value—16·2 dwt. Au. per ton.															
10	500	3,000	Turps-tar ...	1·2	4·8	...	...	...	...	24·4	204	...	...	...	
			Euc.-tar ...	1·2	4·8	NaCl ...	30	120	2·0	83·1	24·0	394	2·0	87·6	
11	500	3,000	Turps-tar ...	0·9	3·6	...	...	...	...	23·2	214	...	...	...	
			Kero. ...	0·25	1·0	...	...	...	2·0	195·7	16·0	278·0	1·8	88·8	
			Euc.-tar ...	0·9	3·6	...	...	...	...	...	...	...	...	...	
12	500	3,000	Euc.-pyr-tar ...	1·6	6·4	...	...	...	...	...	...	...	...	...	
			Kerosene ...	0·75	3·0	NaCl ...	15	60	2·0	150·2	52·0	346·5	2·2	86·4	
13	500	3,000	Kerosene ...	1·75	7·0	NaCl ...	37·5	150	2·0	125·5	60·0	376·0	1·6	90·1	
			Euc.-pyr-tar ...	1·6	6·4	...	...	...	...	...	...	...	...	...	
14	500	3,000	Kerosene ...	1·75	7·0	NaCl ...	45	180	...	...	...	...	...	...	
			Euc.-pyr-tar ...	1·28	5·12	Na_2S ...	2	8	2·0	123·0	60·0	372·5	1·0	93·8	
15	500	3,000	Kerosene ...	2·37	9·5	...	...	...	...	...	...	...	...	...	
			Euc.-pyr-tar ...	1·12	4·48	NaCl ...	60	240	2·0	73·0	100	407·0	2·0	87·6	
Sample No. 5.—Assay Value—16·4 dwt. Au. per ton.															
16	300	3,000	Kerosene ...	2·25	15	NaCl ...	50	333	...	...	...	...	...	...	
			Euc.-pyr-tar ...	1·05	7	Na_2S ...	1	7·3	2·0	109·2	42·0	193·0	1·8	89·0	
17	300	3,000	Kerosene ...	1·75	11·7	NaCl ...	60	400	...	...	...	...	...	...	
			Euc.-tar ...	...	...	Na_2S ...	2	14·6	2·0	...	...	...	...	...	
			Euc.-pyr-tar ...	1·5	10·0	...	...	...	...	51·5	98·0	245·0	2·0	87·8	
18	600	3,000	Kerosene ...	2·5	8·33	NaCl ...	60	200	...	...	...	...	...	...	
			Euc.-pyr-tar ...	1·35	4·5	...	...	...	2·0	99·5	92·0	499·0	1·0	93·9	
19	750	3,000	Kerosene ...	3·0	8·0	NaCl ...	60	160	...	...	...	...	...	...	
			Euc.-pyr-tar ...	1·2	3·2	...	...	...	3·0	152·5	74·0	597·0	1·0	93·9	
20	500	3,000	Kerosene ...	2·0	8·0	NaCl ...	60	240	...	...	...	...	...	...	
			Euc.-pyr-tar ...	1·35	5·4	Na_2S ...	2	8	2·0	65·0	112	430·5	1·0	93·9	

School of Mines, Kalgoorlie, 25th March, 1925.

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SOUTH KALGURLI ORE.

Flotation Concentrates.

CYANIDATION TESTS.

(Without Roasting).

Float from Test No. 14.—*Assay Value*—60 *dwt. Au. per ton.*

Weight of charge	100 gram.
Volume of solution	200 c.c.
Strength of solution	0·4 per cent. KCN.
Treatment	Agitation in pebble mill, 6 hours; further contact, 15 hours.
Assay value of residues	36·8 dwt. Au. per ton.
Strength of solution after treatment	0·238 per cent. KCN.
Cyanide consumption	6·48lb. KCN. per ton.
Extraction	38·7 per cent.

Float from Test No. 15.—*Assay Value*—100 *dwt. Au. per ton.*

Weight of charge	50 gram.
Volume of solution	100 c.c.
Strength of solution	0·4 per cent. KCN.
Treatment	Agitation in pebble mill, 6 hours; further contact, 15 hours
Assay value of residues	80 dwt. Au. per ton.
Strength of solution after treatment	0·238 per cent. KCN.
Cyanide consumption	6·48lb. KCN. per ton.
Extraction	20·0 per cent.

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School of Mines, Kalgoorlie, 25th March, 1925.

REPORT ON FLOTATION TESTS ON KALGOORLIE ORES.

Consequent on the successful results obtained by the use of sodium chloride solution or mine water containing dissolved chlorides as a medium in which to carry out flotation, the series of tests tabulated in the accompanying folios has been carried out under similar conditions in order to determine most efficient and economical working conditions. For this purpose the tests carried out have been so arranged as to furnish information on the following points, viz., the utility of salt water or water containing sodium chloride and other electrolytes in solution, the efficacy of various mixtures of oils in varying quantities, reduction of the time required for fine grinding, type of flotation cell, method and time of flotation, and approximate cost of flotation.

Use of Salt Solution.—In all tests flotation has been carried out in a pulp made up from sodium chloride solution, salt water from the North Kalgurli mine, or return solutions from previous tests. The conclusions arrived at as a result of the preliminary tests carried out under these conditions have satisfactorily proved the efficiency of these solutions in procuring a clean pyritic float free from slimed gangue. In no case where these solutions have been used has any trouble been experienced from the production of a float contaminated with slimed gangue, as has invariably been the case when dealing with these ores in a pulp made up with the comparatively pure water of the Goldfields Water Supply or with rain water. Hence, there appears to be no doubt but that sodium chloride and other dissolved salts materially assist flotation by deflocculating colloidal slime and thus assisting in the production of a clean pyritic concentrate, reasonably small in quantity, and low-grade tails. This difficulty, the flotation of considerable quantities of colloidal slime particles before the flotation of the pyrite, has been met with in dealing with all samples but one from the South Kalgurli mine, until the use of sodium chloride solution or mine water in making up the pulp for flotation. Further testing of ores from other mines on the field is necessary to determine whether the use of salt water is necessary in all cases, but, from the results obtained by its use, it is reasonable to assume that the use of such solutions, which are comparatively inexpensive, will always tend to the production of a clean concentrate.

That the salt solution can be used repeatedly without detriment to flotation has been clearly shown by those tests in which the liquor from previous tests has been used in making up the pulp. This line of investigation has not been followed sufficiently to enable it to be definitely decided whether the use of such return solutions presents added advantages in the shape of higher recovery with lower residues or diminished consumption of oil, although it is evident that these return solutions contain a certain amount of oil in solution. It has, however, been clearly shown that no harmful effect is produced by re-use of these liquors, and, therefore, in practice, the solution after separation from the residues could be used continuously, thus reducing the cost of this method of treatment.

Oil Mixtures.—The success attending the use of kerosene as an oiler for the sulphides has been so manifest that, except in a few isolated tests, this oil has always been used in conjunction with heavier oils and mixtures to act as collectors. In conjunction with the kerosene various oils and mixtures of oils with coal tar and Stockholm tar have been used for collecting the sulphides, and all have proved successful, although the best results have been obtained with mixtures of eucalyptus oil, pyridine and coal tar. Probably eucalyptus oil and pyridine, while acting as collectors, act also as solvents for the tar. Varying quantities of oils have been used for the purpose of ascertaining the minimum quantities that will give high recoveries together with the production of clean pyritic concentrates and low-grade tails. It has been found that the proportion of oils can be materially reduced without impairing the efficiency of the process. A series of tests using diminishing quantities of oil has shown that the proportion of oil can be reduced to 1.5 lb. per ton of ore, and at the same time a high extraction can be obtained. In the case of the kerosene-eucalyptus-pyridine-tar mixture used in the latest tests, the cost of this mixture is approximately one shilling per pound.

Method of Oiling.—Recognising that most efficient oiling of the sulphides could be obtained during fine grinding, the necessary quantities of oils have, where fine grinding was performed in the pebble mill, been added during that process. In those cases where no further grinding was adopted other than dry crushing, either to — 60 mesh or — 100 mesh, the oiling has been carried out by agitation of the pulp with the oils in the pebble mill used simply as an agitating device without the addition of pebbles. This method of oiling has proved efficient and is far preferable to oiling in the flotation cells.

The whole quantity of oil has been added at once in order to obtain the maximum oiling effect by thoroughly emulsifying the oils during the fine grinding period.

No oils have been added to the pulp after transfer to the flotation cell, as it has been found that such additions are wasteful of oil and inefficient.

Grinding of Ore.—After preliminary crushing, the ore has been ground dry to pass a 60-mesh I.M.M. screen. A grading analysis of the — 60 mesh ore is attached on a separate folio. Tests carried out on this product have given varying results and have indicated that for successful flotation further comminution of the ore is necessary. Consequently, the final grinding of the ore has been carried out in the pebble mill for varying periods of time. It has been found, however, that when the ore is crushed to pass 60 mesh in the preliminary dry crushing, the time required for the necessary fine grinding can be reduced to 30 minutes, with the production of a material of such a degree of fineness as to be eminently suitable for flotation, and that no material advantage is gained by continuing the pebble mill grinding for a longer period than 30 minutes. The grading analysis of the final product after 30 minutes fine grinding in the pebble mill, shown on a separate folio, shows clearly the effect of this period of fine grinding on the — 60 mesh ore and indicates that extension of the time of grinding will result in no benefit. A comparison of the grading analyses of the — 60 mesh ore and the pebble mill product shows the efficiency of this method of fine grinding.

In addition, more satisfactory results are to be expected from flotation if the final grinding is carried out wet than if all the crushing is done dry and the ore is then mixed with water. In practice, dry crushing could, no doubt, be dispensed with, and pulverising could, with advantage, be carried out in two stages employing coarse crushing machines to produce a product up to even one inch size, and tube mills for the fine grinding, operating in a closed circuit so that the product would be despatched to the flotation units as soon as it was sufficiently fine.

Experiments are now being carried out to determine whether coarser crushing than — 200 mesh will enable a satisfactory extraction to be made. In these tests the ore is coarsely crushed in the dry state and then ground in the pebble mill for varying periods. Dry crushing is carried out till the ore will pass 16 mesh screen, and this product is then ground wet to varying degrees of fineness. Should success be attained in this direction, one of the most serious items in the cost of flotation, viz., fine grinding, will be eliminated to a great extent.

Flotation.—Up to the present time flotation has, for the most part, been performed in a cell of the Minerals Separation type, which, though efficient, did not give a rapid float. It was considered that more violent agitation and aeration than could be obtained in the M.S. type of cell when used without sub-aeration were necessary for rapid flotation, and to determine whether more rapid flotation could be obtained, it was decided to make use of the Ruth flotation machine for the flotation. In this machine agitation is obtained by means of a hollow impeller or "spumer," which sucks air in through a hollow spindle and thus secures not only a violent agitation but also an efficient aeration. This machine, therefore, combines the two effects of mechanical agitation and sub-aeration. The M.S. type of cell can be adapted to make use of the principle of sub-aeration by the introduction of an air jet into the agitating compartment of the cell.

From the outset it was found that this machine provided the conditions necessary for rapid flotation, and all tests from No. 29 onwards have been carried out in this machine. It was found that flotation was extremely rapid under these conditions, and that the froth produced under the conditions of oiling adopted was an ideal froth for rapid flotation of the sulphides.

The formation of froth under these conditions has been extremely rapid and the froth has been heavily loaded, with the result that the time required for flotation has been gradually diminished until it can safely be said that flotation is complete in four minutes, or even less. This is a great advance on previous methods in use where the time required for flotation varied from twenty minutes to one hour. This rapidity of flotation, we consider, has been rendered possible by the oils used, the method of oiling, and the combination of mechanical agitation with sub-aeration in the flotation cell. Such results show that as regards flotation, the time factor need not be taken into account, provided the proper conditions for efficient flotation are determined and adopted.

Test No. 52 and following tests show conclusively that under the conditions determined by us flotation is exceedingly rapid and efficient.

In the Ruth machine the end point of flotation is sharp and distinct, and can generally be detected in from three to four minutes after the commencement of flotation. Beyond that period, no advantage is apparently gained by continuing the operation.

Roasting and Cyanidation of Concentrates.—Experiments are now being carried out on the flotation concentrates to determine the conditions for roasting and the most suitable method of securing a satisfactory recovery of the gold by cyanidation of the roasted concentrates.

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FLOTATION TESTS ON SOUTH KALGURLI ORE.

Test No.	Ore Wt. gram.	Water Wt. gram.	Oil.			Reagents.			Time of grinding hours.	Float.		Tails.		Recovery in conct. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb./ton.	Description.	Wt. gram.	Wt. lb./ton.		Wt. gram.	Au. dwt./ton.	Wt. gram.	Au. dwt./ton.		
Sample No. 6.—Assay Value—12·9 dwt. Au. per ton (2,000lb.)															
21	600	3,700	Pyr-tar ... Kerosene ...	1·5 1·75	5·0 5·8	NaCl	74 ...	246 ...	2·25 ...	12·8 65·0	219·6 73·2	... 484	... 1·4	... 89·1	
22	600	3,700	Kerosene ... Pyr-tar ...	1·25 0·9	4·16 3·00	Liquor from No. 21	...	...	2·25	96·5	75·0	506	0·71	94·5	
23	600	3,700	Kerosene ... Pyr-tar ...	2·0 0·9	6·6 3·00	Liquor from No. 22	...	...	2·25	122·0	55·3	472	1·25	90·3	Oiled in Pebble Mill only. The object of Tests 24, 25, 26, was to ascertain the effect of varying quantities of oil when the oiling was done only in the Pebble Mill.
24	600	3,700	Kerosene ... Pyr-tar ...	0·875 1·05	2·9 3·5	NaCl ...	74	246	2·00	56·5	107·1	541	1·6	87·6	
25	600	3,700	Kerosene ... Pyr-tar ...	1·0 0·75	3·3 2·5	Liquor from No. 24	...	...	2·00	42·5	152·8	558	1·6	87·6	
26	600	3,700	Kerosene ... Pyr-tar ...	1·25 1·2	4·16 4·00	NaCl ...	74	246	2·00	57·5	114·3	493	0·89	93·1	
27	500	3,000	Kerosene ... Pyr-tar ...	0·75 0·90	3·00 3·60	NaCl ...	60	240	2·00	58·7	96·4	431	0·71	94·5	Ruth cell used for flotation.
28	1,000	6,000	Kerosene ... Pyr-tar ...	1·25 0·9	2·5 1·8	NaCl ...	60	240	2·0	72·5	120	869	2·73	78·8	Callow pneumatic machine used for flotation.
Sample No. 7.—Assay Value—13·6 dwt. Au. per ton (2,000lb.)															
29	500	3,000	Pyr-tar-euc. ... Kerosene ...	0·9 0·75	3·6 3·0	... ...	... ...	... ...	2·0 ...	67·5 ...	86·4 ...	432 ...	0·4 ...	97·0 ...	Water from North Kalgurli Mine used instead of salt water. Test 29 and all succeeding tests floated in Ruth machine.
30	500	3,000	Pyr-tar-euc. ...	1·35	5·4	NaCl ...	60	240	2·0	52·8	97·6	439·5	1·4	89·7	
Sample No. 8.—Assay Value—12·8 dwt. Au. per ton (2,000lb.)															
31	500	3,000	Kerosene ...	1·25	5·0	...	...	...	2·0	...	...	...	...	...	Water from N. Kalgurli Mine used. Kerosene only used for oiling—no float, test negative.
32	500	3,000	BB tar, BB dist	1·35	5·4	...	...	...	2·0	43·0	97·6	458	1·3	89·8	Water from N. Kalgurli Mine.
33	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·9	3·0 3·6	...	...	...	...	52·5	96·0	437·5	0·8	93·7	Water from N. Kalgurli Mine. Ore crushed dry to –60 mesh.
34	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·9	3·0 3·6	...	...	...	0·5	63·5	81·6	428	0·5	96·0	Water from N. Kalgurli Mine.
35	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·9	3·0 3·6	NaCl ...	60	240	1·0	82·0	64·0	415·5	1·4	89·0	
Sample No. 9—Assay Value—10·6 dwt. Au. per ton (2,000lb.)															
36	500	3,000	Stockholm tar-turps	1·5	6·0	NaCl ...	60	240	...	95·5	44·8	398	1·0	90·6	Ore crushed dry to –100 mesh.
37	500	3,000	Kerosene St. tar-turps	0·75 1·5	3·0 6·0	...	...	...	1·0	88·2	45·6	415	1·0	90·6	Water from N. Kalgurli Mine.
38	500	3,000	Kerosene St. tar-turps	0·875 0·75	3·5 3·0	NaCl ...	60	240	2·0	85·5	44·8	420·5	1·4	86·7	
39	500	3,000	Kerosene St. tar-turps	0·75 0·60	3·0 2·4	Liquor from Test No. 37			2·00 ...	70·5 ...	54·4 ...	426· ...	1·6 ...	84·9 ...	
Sample No. 10—Assay Value—14·4 dwt. Au. per ton (2,000lb.)															
40	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·90	3·0 3·6	...	...	...	...	72·0	80·0	432	2·0	86·0	Water from N. Kalgurli Mine Ore crushed dry to –60 mesh.
41	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·90	3·0 3·6	...	...	...	0·5	72·7	88·0	426·2	1·2	91·6	Water from N. Kalgurli Mine.
42	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·90	3·0 3·6	Liquor from Test No. 40			...	70·7	83·2	433·7	1·6	88·8	Duplicate of Test No. 40.
43	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·9	3·0 3·6	Liquor from Test No. 41			0·5	92·5	73·6	417·5	1·0	93·0	Duplicate of Test No. 41.
44	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·9	3·0 3·6	Liquor from Test No. 42			...	74·0	88·0	427·7	3·2	77·7	Triplicate of Test 40.
Sample No. 11.—Assay Value—12·4 dwt. Au. per ton (2,000lb.)															
45	500	3,000	Kerosene ... Euc.-tar ...	0·75 0·90	3·0 3·6	Liquor from Test No. 44			0·5	88·0	65·6	415·7	1·2	90·3	Triplicate of Test No. 41.
46	600	3,000	Kerosene ... Eec.-tar ...	0·75 0·90	2·5 3·6	Liquor from Test No. 45			...	96·2	65·6	500·3	2·0	83·8	Weight of ore increased. Ore crushed dry to –60 mesh.
47	600	3,000	Kerosene ... Euc.-tar ...	0·75 0·90	2·5 3·0	Liquor from Test No. 46			0·5	133·3	56·0	466·8	1·2	90·3	
48	600	3,000	Kerosene ... Euc.-tar ...	0·75 0·90	2·5 3·0	Liquor from Test 47			0·5	147·0	48·0	436·2	0·6	95·1	
49	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·75 0·90	3·0 3·6	NaCl ...	60	240	0·5	94·5	57·6	407·0	0·5	95·9	
50	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·75 0·90	3·0 3·6	...	...	...	0·5	76·0	72·8	424·5	0·8	93·5	Water from N. Kalgurl Mine used.
51	500	3,000	Kerosene ... Euc.-pyr-tar	0·75 0·90	3·0 3·6	NaCl ...	60	240	0·5	73·3	73·6	426·0	0·4	96·7	
52	500	3,000	Kerosene ... Euc.-pyr-tar	0·5 0·6	2·0 2·4	NaCl ...	60	240	0·5	79·9	70·4	418·5	0·5	95·9	Time of flotation, 8 minutes.
53	500	3,000	Kerosene ... Euc.-pyr-tar	0·5 0·6	2·0 2·4	NaCl ...	60	240	0·5	75·9	72·0	425·0	0·8	93·5	Time of flotation, 8 minutes; most of float off in 4 mins.
54	500	3,000	Kerosene ... Euc.-pyr-tar	0·3 0·48	1·3 1·92	NaCl ...	60	240	0·5	60·7	91·0	436·5	0·8	93·5	Time of flotation, 8 minutes; most of float off in 4 mins.
55	500	3,000	Kerosene ... Euc.-pyr-tar	0·3 0·48	1·3 1·92	NaCl ...	60	240	0·5	69·0	82·0	429·5	0·9	92·7	Time of flotation, 8 minutes; most of float off in 4 mins.
56	500	3,000	Kerosene ... Euc.-pyr tar	0·25 0·36	1·0 1·44	NaCl ...	60	240	0·5	57·0	98·0	442·3	0·7	94·3	Time of flotation, 8 minutes; most of float off in 4 mins.

FLOTATION TESTS ON SOUTH KALGURLI ORE—*continued.*

Test No.	Ore Wt. gram.	Water Wt. gram.	Oil.			Reagents.			Time of grinding hours.	Float.		Tails.		Recovery in conct. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb./ton.	Description.	Wt. gram.	Wt. lb./ton.		Wt. gram.	Au. dwt/ton.	Wt. gram.	Au. dwt/. ton.		
	Sample No. 12.—Assay Value—10·8 dwt. Au. per ton (2,000lb.)														
57	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·25 0·36	1·0 1·44	...	...	...	0·5	72·2	64·0	423·2	0·6	94·6	Water from N. Kalgurli Mine used. Time of flotation, 6 minutes.
58	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·375 0·6	1·5 2·4	...	...	...	0·5	86·0	44·8	408·0	0·8	92·6	Water from N. Kalgurli Mine used. Time of flotation, 3·5 minutes. Demonstration test for Messrs. Kingsley Thomas, Howe, Phoenix, McAulay, Brinsden and Paton.
59	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·36 0·25	1·44 1·00	NaCl ...	60	240	0·5	64·5	69·0	431·0	1·0	90·75	Increased proportion of tar in oil mixture. Time of flotation, 6 minutes.
60	500	3,000	Kerosene ... Euc.-pyr.-tar ...	0·36 0·25	1·44 1·00	NaCl ...	60	240	0·5	26·8	166·0	462·0	1·7	84·2	Excessive proportion of tar in oil mixture. Time of flotation, 10 minutes.
61	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·375 0·60	1·5 2·4	...	...	...	0·5	85·0	54·0	416·5	0·7	93·5	N. Kalg. mine water used. Euc-pyr-tar mixture in equal proportions used in this and succeeding tests. Time of flotation, 3·5 minutes. Demonstration test.
62	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·36 0·25	1·44 1·00	...	...	...	0·5	81·5	60·0	415·5	0·6	94·4	N. Kalg. mine water used. Time of flotation, 4 minutes.
	Sample No. 13.—Assay Value—10·4 dwt. Au. per ton (2,000lb.)														
63	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·20 0·30	0·80 1·20	NaCl ...	60	240	0·5	61·0	79·0	434·5	0·6	94·1	Time of flotation, 4 minutes.
64	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·175 0·27	0·71 1·08	NaCl ...	60	240	0·5	62·2	75·0	435·2	0·6	94·1	Time of flotation, 4 minutes.
65	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·15 0·24	0·60 0·96	NaCl ...	60	240	0·5	57·7	83·0	440·9	0·9	91·3	Time of flotation, 4 minutes.
66	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·15 0·21	0·60 0·84	NaCl ...	60	240	0·5	63·5	80·0	431·0	0·8	92·3	Time of flotation, 4 minutes.
67	500	3,000	Kerosene ... Euc.-pyr-tar ...	0·125 0·21	0·5 0·84	NaCl ...	60	240	0·5	43·5	112·0	455·5	1·4	86·5	Time of flotation, 4 minutes.

FLOTATION TESTS ON SOUTH KALGURLI ORE.

Grading Analyses, showing the effect of thirty minutes grinding in Pebble Mill on minus 60 mesh ore.
Minus 60 *mesh ore,* crushed dry, used in Flotation Tests 33, 36, 40, 42, 44, 46.

I.M.M. Screen.	Percentage.
Plus 80	9·86
Plus 100	4·42
Plus 150	17·54
Plus 200	4·40
Minus 200	63·78
	100·00

Product from thirty minutes' grinding in Pebble Mill of minus 60 mesh ore.

I.M.M. Screen.	Percentage.
Plus 80	0·11
Plus 100	0·00
Plus 150	2·89
Plus 200	1·54
Minus 200	95·46
	100·00

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SUMMARY OF FLOTATION TESTS.

(Carried out under varying conditions).

TABLE A.—*Two per cent. salt (NaCl) solution.*

Test No.	Assay Value of ore., dwt. Au. ton.	Float.			Tails.		Recovery in conct. per cent.	Time of flotation, minutes.	Ore.
		Wt. gram.	Au. dwt. ton.	Percentage of ore.	Wt. gram.	Au. dwt. ton.			
27	12·9	58·7	96·4	11·7	431·0	0·71	94·5	40	South Kalgurli.
49	12·4	94·5	57·6	18·9	407·0	0·5	95·9	30	South Kalgurli.
51	12·4	73·3	73·6	14·7	426·0	0·4	96·7	30	South Kalgurli.
52	12·4	79·9	70·4	15·9	418·5	0·5	95·9	8	South Kalgurli.
53	12·4	75·9	72·0	15·2	425·0	0·8	93·5	8	South Kalgurli.
54	12·4	60·7	91·0	12·1	436·5	0·8	93·5	8	South Kalgurli.
55	12·4	69·0	82·0	13·8	429·5	0·9	92·7	8	South Kalgurli.
56	12·4	57·0	98·0	11·4	442·0	0·7	94·3	8	South Kalgurli.
2	8·0	89·4	42·0	17·9	404·0	0·3	96·25	8	Associated.
Average ...		73·1	75·9	14·6	424·4	0·62	94·8	...	

TABLE B.—*North Kalgurli Mine water used instead of salt solution.*

Test No.	Ore, dwt. Au. ton.	Float.			Tails.		Recovery in conct. per cent.	Time of flotation, minutes.	Ore.
		Wt. gram.	Au. dwt. ton.	Percentage of ore.	Wt. gram.	Au. dwt. ton.			
29	13·6	67·5	86·4	13·5	432·0	0·4	97·0	20	South Kalgurli.
33	12·8	52·5	96·0	10·5	437·5	0·8	93·7	30	South Kalgurli.
34	12·8	63·5	81·6	12·7	428·0	0·5	96·0	30	South Kalgurli.
50	12·4	76·0	72·8	15·2	424·5	0·8	93·5	30	South Kalgurli.
57	10·8	72·2	64·0	14·4	423·2	0·6	94·6	6	South Kalgurli.
58	10·8	86·0	44·8	17·2	408·0	0·8	92·8	3·5	South Kalgurli.
1	8·0	111·5	33·6	22·3	383·2	0·4	95·0	8	Associated.
3	8·0	93·0	46·0	18·6	407·0	0·4	95·0	5	Associated.
Average ...		77·7	65·6	15·5	417·9	0·58	94·7	...	

TABLE C.—*Re-use of solution from previous tests (instead of fresh salt solution or mine water).*

Test No.	Ore.		Float.			Tails.		Recovery in conct. per cent.	Time of flotation, minutes.
	Wt. gram.	Au. dwt. ton.	Wt. gram.	Au. dwt. ton.	Percentage of ore.	Wt. gram.	Au. dwt. ton.		
22	600	12·9	96·5	75·0	16·1	506·0	0·71	94·5	40
48	600	12·4	147·0	48·0	24·5	436·2	0·6	95·1	45
Average ...		...	121·7	61·5	20·3	471·1	0·65	94·8	...
43	500	14·4	92·5	73·6	18·5	417·5	1·0	93·0	30
45	500	12·4	88·0	65·6	17·6	415·7	1·2	90·3	45
Average ...		...	90·2	69·6	18·0	416·6	1·1	91·6	...

TABLE D.—*Kinds of Oil.*

Test No.	Ore.		Float.			Tails		Recovery in conct. per cent.	Kind of Oil.	Time of flotation, minutes.
	Wt. gram.	Au. dwt. / ton.	Wt. gram.	Au. dwt. / ton.	Percentage of ore.	Wt. gram.	Au. dwt / ton.			
				SOUTH KALGURLI ORE.						
22	600	12·9	96·5	75·0	16·1	506·0	0·71	94·5	K.P.T.	40
26	600	12·9	57·5	114·3	9·6	493·0	0·89	93·1	K.P.T.	45
	Average		77·0	94·6	12·8	499·5	0·80	93·8	...	...
27	500	12·9	58·7	96·4	11·7	431·0	0·71	94·5	K.P.T.	40
33	500	12·8	52·5	96·0	10·5	437·5	0·8	93·7	K.E.T.	30
34	500	12·8	63·5	81·6	12·7	428·0	0·5	96·0	K.E.T.	30
	Average		58·0	88·8	11·6	432·7	0·65	94·8	...	...
48	600	12·4	147·0	48·0	24·5	436·2	0·6	95·1	K.E.T.	30
29	500	13·6	67·5	86·4	13·5	432·0	0·4	97·0	K.E.P.T.	20
49	500	12·4	94·5	57·6	18·9	407·0	0·5	95·9	K.E.P.T.	30
50	500	12·4	76·0	72·8	15·2	424·5	0·8	93·5	K.E.P.T.	30
51	500	12·4	73·3	73·6	14·7	426·0	0·4	96·7	K.E.P.T.	30
52	500	12·4	79·9	70·4	15·9	418·5	0·5	95·9	K.E.P.T.	8
53	500	12·4	75·9	72·0	15·2	425·0	0·8	93·5	K.E.P.T.	8
54	500	12·4	60·7	91·0	12·1	436·5	0·8	93·5	K.E.P.T.	8
55	500	12·4	69·0	82·0	13·8	429·5	0·9	92·7	K.E.P.T.	8
56	500	12·4	57·0	98·0	11·4	442·3	0·7	94·3	K.E.P.T.	8
57	500	10·8	72·2	64·0	14·4	423·2	0·6	94·6	K.E.P.T.	6
58	500	10·8	86·0	44·8	17·2	408·0	0·8	92·8	K.E.P.T.	3·5
				ASSOCIATED ORE.						
1	500	8·0	111·5	33·6	22·3	383·2	0·4	95·0	K.E.P.T.	8
2	500	8·0	89·4	42·0	17·9	404·0	0·3	96·25	K.E.P.T.	8
3	500	8·0	93·0	46·0	18·6	407·0	0·4	95·0	K.E.P.T.	5
	Average		79·0	66·7	15·8	419·0	0·59	94·8	...	...
36	500	10·6	95·5	44·8	19·1	398·0	1·0	90·6	ST.T.	20
37	500	10·6	88·2	45·6	17·6	415·0	1·0	90·6	ST.T.K.	20
38	500	10·6	85·5	44·8	17·1	420·5	1·4	86·7	ST.T.K.	20
39	500	10·6	70·5	54·4	14·1	426·0	1·6	84·9	ST.T.K.	25
	Average		84·9	47·4	16·9	414·9	1·25	88·2	...	...

K. = Kerosene; P. = Pyridine; T. = Coal tar; E. Eucalyptus oil; ST. = Stockholm tar.

TABLE E.—*Ore dry crushed.*

Test No.	Ore.			Float.			Tails.		Recovery in conct. per cent.	Time of flotation, minutes.
	Wt. gram.	Au. dwt./ ton.	I.M.M. Screen.	Wt. gram	Au. dwt./ ton.	Percentage of ore.	Wt., gram.	Au. dwt./ ton.		
				SOUTH KALGURLI ORE.						
33	500	12·8	–60	52·5	96·0	10·5	437·5	0·8	93·7	30
40	500	14·4	–60	72·0	80·0	14·4	432·0	2·0	86·0	45
42	500	14·4	–60	70·7	83·2	14·1	433·7	1·6	88·8	40
44	500	14·4	–60	74·0	88·0	14·8	427·7	3·2	77·7	45
	Average ...	...	...	67·3	86·8	13·45	432·7	1·9	86·5	...
46	600	12·4	–60	96·2	65·6	19·2	500·3	2·0	83·8	45
36	500	10·6	–100	95·5	44·8	19·1	398·0	1·0	90·6	40

TABLE F.—*Quantity of Oil.*

Test No.	Ore.		Oil.			Float.			Tails.		Recovery in conct. per cent.
	Wt., gram.	Au., dwt. ton.	Description.	Wt. gram.	Wt., lb. ton.	Wt., gram.	Au. dwt. ton.	Percentage of ore.	Wt., gram.	Au., dwt. ton.	
				SOUTH KALGURLI ORE.							
56	500	12·4	K.E.P.T.	0·61	2·44	57·0	98·0	11·4	442·3	0·7	94·3
57	500	10·2	K.E.P.T.	0·61	2·44	72·2	64·0	14·4	423·2	0·6	94·4
62	500	10·8	K.E.P.T.	0·61	2·44	81·5	60·0	16·3	415·5	0·6	94·4
63	500	10·4	K.E.P.T.	0·50	2·00	61·0	79·0	12·2	434·5	0·6	94·1
64	500	10·4	K.E.P.T.	0·445	1·78	62·2	75·0	12·4	435·2	0·6	94·1
65	500	10·4	K.E.P.T.	0·39	1·56	57·7	83·0	11·5	440·9	0·9	91·3
66	500	10·4	K.E.P.T.	0·36	1·44	63·5	80·0	12·7	431·0	0·8	92·3

K.E.P.T. = Kerosene, Eucalyptus, Pyridine, Coal tar mixture.

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School of Mines Kalgoorlie, 28th April, 1925.

REPORT ON THE FLOTATION OF KALGOORLIE ORES AND THE ROASTING AND CYANIDATION OF FLOTATION CONCENTRATES.

South Kalgurli Ore.—As indicated in our report of 28th April on the flotation of South Kalgurli ores, a series of tests has now been completed, the object of which was to determine whether flotation could be successfully performed on ore of much coarser grade than had hitherto been considered possible of successful flotation. In this series of tests, all factors were kept constant except the time of grinding in the pebble mill. The ore was crushed dry to pass a 16 mesh I.M.M. screen, and then ground in the pebble mill for different periods of time, viz., 40, 30, and 20 minutes. The results of these tests indicate clearly that with this particular ore, extremely fine grinding prior to flotation is not necessary, for the results of tests in which pebble mill grinding was carried out for twenty minutes have given equally as good, and in some cases better, results than those in which grinding was carried out for thirty and forty minutes. The average recovery in the concentrates from these seventeen tests has been 94 per cent., while the value of the tails has averaged 0.62 dwt., the head value being 10.6 dwt. Au per ton (2,000 lb.). The concentrates, constituting on the average 12.7 per cent. of the ore, had an average assay value of 74.6 dwt. Au per ton. The recoveries in these tests have been remarkably consistent, varying from a minimum of 92.4 per cent. to a maximum of 95.2 per cent.

To illustrate the degree of fineness to which crushing has been carried in these tests, grading analyses are attached which show the comparatively coarse nature of the product of 20 minutes' grinding, and also the efficiency of the pebble mills as fine grinding appliances. The successful flotation of such comparatively coarse ore indicates that extremely fine grinding, *i.e.,* all to minus 200 mesh, is not necessary for this particular ore, and therefore the cost of preliminary fine grinding would be materially diminished in practice.

From the results of tests Nos. 87 and 88, however, it appears that greater coarseness than that obtained by 20 minutes' grinding of minus 16 mesh product materially diminishes the recovery, probably owing to the sulphides not being unlocked from the containing gangue. These two tests, in conjunction with the previous series, also show that the percentage recovery increases with increased fineness of grinding up to a maximum obtained on a 63 per cent. minus 150 mesh product, and that further comminution of the ore results in no benefit.

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FLOTATION TESTS ON SOUTH KALGURLI ORE, INDICATING THE EFFECT OF COARSE GRINDING.

Sample No. 14.—Assay Value: 10·6 dwt. Au per ton (2,000lb).

Test No.	Ore Wt. gram.	Water Wt. gram.	Oil.			Reagents.			Time of grinding hours.	Float.		Tails.		Recovery in conc. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au dwt. per ton.	Wt. gram.	Au dwt. per ton.		
75	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·66	62·9	74·0	432·3	0·60	94·3	In all these tests the ore was crushed dry to minus 16 mesh; then wet in Pebble Mill. For fineness under varying times of wet grinding, *see* grading analyses. All tests floated four minutes.
68	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·5	53·7	77·0	439·0	0·80	92·4	
69	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·5	59·7	82·0	435·5	0·60	94·3	
70	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·5	67·9	75·0	427·1	0·60	94·3	
74	500	3,000	Kerosene ... Euc-pyr-tar	0·175 0·27	0·7 1·08	NaCl	60	240	0·5	57·4	80·0	442·2	0·60	94·3	
71	500	3,000	Kerosene Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	50·7	100·0	442·8	0·80	92·4	
72	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	59·8	83·0	441·0	0·50	95·2	
73	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	59·9	75·0	437·1	0·50	95·2	
76	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	66·0	68·0	429·7	0·65	93·8	
77	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	66·8	71·0	425·3	0·70	93·3	
78	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	69·4	68·0	426·3	0·55	94·8	
79	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	73·0	68·0	418·3	0·60	94·3	
80	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	62·8	79·0	433·5	0·60	94·3	
81	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	68·2	68·0	423·5	0·65	93·8	
82	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	69·3	69·0	420·2	0·80	92·4	
83	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	67·2	68·0	428·7	0·60	94·3	
84	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	68·1	74·0	427·0	0·55	94·8	
						Average ...	...	...	...	63·7	74·6	431·1	0·62	94·0	

FLOTATION TESTS ON SOUTH KALGURLI ORE.

Grading Analyses.

Showing the effect of fine grinding in the Pebble Mill.

I.M.M. Screen.	–16 mesh product crushed dry.		–16 mesh product ground for 20 minutes in Pebble Mill.		–16 mesh product ground for 30 minutes in Pebble Mill.		–16 mesh product ground for 40 minutes in Pebble Mill.	
	Per cent.	Per cent. cumulative.	Per cent.	Per cent. cumulative.	Per cent.	Per cent. cumulative.	Per cent.	Per cent. cumulative.
Plus 20	0·91	...	...	...	...	...	...	...
Plus 40	40·40	41·31	...	...	...	...	...	...
Plus 60	16·30	57·61	...	...	...	...	...	...
Plus 80	10·00	67·61	11·56	...	2·43	...	...	...
Plus 100	0·81	68·42	3·44	15·00	1·01	3·44	...	...
Plus 150	6·45	74·87	22·11	37·11	16·92	20·36	6·98	...
Plus 200	1·10	75·97	3·14	40·25	4·78	25·14	4·96	11·94
Minus 200	23·93	99·90	59·73	99·98	74·87	100·01	88·06	100·00

FLOTATION TESTS ON SOUTH KALGURLI ORE.

Sample No. 14. Assay value, 10·6 dwt. Au per ton (2,000lb.)

Test No.	Ore Wt. gram.	Water Wt. gram.	Oil.			Reagents.			Time of grinding hours.	Float.		Tails.		Recovery in conc. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au dwt. per ton.	Wt. gram.	Au dwt. per ton.		
85	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	64·1	72·0	431·2	0·6	94·3	Demonstration test.
86	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·33	63·9	70·0	427·5	0·65	93·8	Demonstration test.
87	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·166	39·6	114·0	456·0	1·5	85·8	To show effect of coarse grinding.
88	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	0·25	45·0	96·0	445·5	1·2	88·7	To show effect of coarse grinding.

ASSOCIATED ORE.

A series of tests on this ore has been carried out, the results of which are shown on the attached folio. For these tests all conditions, except the total quantities and relative proportions of oils, have been kept constant, and the recoveries have been fairly satisfactory, varying from a minimum of 87.5 per cent. to a maximum of 96.25 per cent. We do not consider that finality has been reached as regards this ore, for further investigation would no doubt lead to results comparable with those obtained on South Kalgurli ore. The investigation of this ore has been discontinued for the present in order to investigate Croesus Proprietary ore, of the same class as that now being treated by Oroya Links, Limited, in their minerals separation pilot plant on the Brown Hill mine.

FLOTATION TESTS ON ASSOCIATED ORE.

Sample No 1—Assay Value: 8·0 dwt. Au. per ton (2,000lb.)

Test No.	Ore Wt. grm.	Water Wt. gram.	Oil.			Reagents.			Time of grinding. Hours.	Float.		Tails.		Recovery in conct. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au. dwt. per ton.	Wt. gram.	Au. dwt. per ton.		
1	500	3,000	Kerosene ... Euc-pyr-tar ...	0·6 0·75	2·4 3·0	...	...	...	0·5	111·5	33·6	383·2	0·4	95·0	Water from N. Kalgoorlie Mine. Time of flotation, 8 mins.
2	500	3,000	Kerosene ... Euc-pyr-tar ...	0·6 0·75	2·4 3·0	NaCl ...	60	240	0·5	89·4	42·0	404·0	0·3	96·25	Time of flotation 8 mins.
3	500	3,000	Kerosene ... Euc-pyr-tar ...	0·375 0·6	1·5 2·4	...	...	...	0·5	93·0	40·0	407·0	0·4	95·0	Water from N. Kalgoorlie Mine. Time of flotation, 5 mins. Demonstration test for Messrs. Kingsley Thomas, Howe, Phoenix, McAulay, Brinsden and Paton.
4	500	3,000	Kerosene ... Euc-pyr-tar ...	0·25 0·36	1·0 1·44	NaCl ...	60	240	0·5	53·5	60·0	441·0	0·8	90·0	Excessive tar in oil mixture. Time of flotation, 8 mins.
5	500	3,000	Kerosene ... Euc-pyr-tar ...	0·25 0·36	1·00 1·44	NaCl ...	60	240	0·5	19·5	168	475·5	1·7	78·75	Excessive tar in oil mixture. Time of flotation, 10 mins.
6	500	3,000	Kerosene ... Euc-pyr-tar ...	0·375 0·6	1·5 2·4	...	...	...	0·5	94·0	34·0	409·5	1·0	87·5	Water from N. Kalgoorlie Mine. Time of flotation, 4 mins. Euc-pyr-tar in equal proportions.
7	500	3,000	Kerosene ... Euc-pyr-tar ...	0·25 0·36	1·0 1·44	...	...	...	0·5	71·0	46·0	427·5	0·8	90·0	Water from N. Kalgoorlie Mine. Time of flotation, 4 mins. Euc-par-tar in equal proportions.

Sample No 2.—Assay Value: 12·0 dwt. Au. per ton (2,000lb).

8	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	...	69·6	74·0	427·5	1·0	91·7	Time of grinding 20 mins.
9	500	3,000	Kerosene ... Euc-pyr-tar ...	0·175 0·27	0·7 1·08	NaCl ...	60	240	...	74·7	72·0	417·5	1·0	91·7	do. do.
10	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·36	0·9 1·44	NaCl ...	60	240	...	72·8	66·0	416·1	0·9	92·5	do. do.
11	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·36	0·9 1·44	NaCl ...	60	240	...	73·6	68·0	420·3	0·9	92·5	do. do.
12	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·33	0·9 1·32	NaCl ...	60	240	...	80·8	60·0	412·0	1·0	91·7	do. do.
13	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·33	0·9 1·32	NaCl ...	60	240	...	83·2	66·0	413·0	1·0	91·7	do. do.
14	500	3,000	Kerosene ... Euc-pyr-tar ...	0·20 0·83	0·8 1·32	NaCl ...	60	240	...	83·5	66·0	407·0	1·1	90·8	do. do.
15	500	3,000	Kerosene ... Euc-pyr-tar ...	0·20 0·33	0·8 1·32	NaCl ...	60	240	...	79·5	73·0	414·2	1·0	91·7	do. do.

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B. H. MOORE,
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School of Mines, Kalgoorlie,
28th April, 1925.

CROESUS PROPRIETARY ORE, OROYA LINKS, LIMITED.

Preliminary tests on this ore along the lines found satisfactory for other Kalgoorlie ores gave encouraging results, indicating the possibility of obtaining efficient flotation when the conditions applicable to ores previously tested were slightly modified to compensate for the different character of the ore.

This ore contains more pyrite than the ores previously tested, as shown by the comparison below:—

———	S. Kalgurli.	Associated.	Croesus Propy.
Sulphur, per cent.	2·54	3·82	4·76
Pyrite, per cent.	4·76	7·16	8·92

hence the necessity for somewhat finer grinding and increased quantities of oils.

The result of Test No. 9 is interesting, as pointing to the necessity for flotation of this ore in salt water, as this is the lowest recovery obtained in the series of tests on this ore.

The results of the preliminary tests under varying conditions as regards fineness of grinding, density of pulp, quantity of oils, and time of flotation have shown that this ore requires longer grinding in the pebble mill to reduce it to a sufficient degree of fineness, also that a slight increase in the pulp density is of advantage, that a slightly increased quantity of oils is necessary, and that ten minutes' flotation is necessary.

Tests Nos. 12 and 19, which have been carried out under exactly identical conditions, have given the best results, and these tests indicate that the conditions laid down are likely to be effective. It is proposed, therefore, to carry out a series of tests under these same conditions to ascertain whether consistently high recoveries can be obtained by this method.

FLOTATION TESTS ON OROYA LINKS ORE.

Test No.	Ore Wt., gram.	Water Wt., gram.	Oil. Description.	Oil. Wt., gram.	Oil. Wt. lb./ton.	Reagents. Description.	Reagents. Wt., gram.	Reagents. Wt. lb./ton.	Time of grinding, hours.	Float. Wt., gram.	Float. Au., dwt./ton.	Tails. Wt., gram.	Tails. Au. dwt./ton.	Recovery in conct. per cent.	Time of flotation, min.	Remarks.
"Croesus Proprietary"—Sample No. 1—Assay Value: 6·6 dwt. Au. per ton (2,000lb.).																
1	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·36	0·9 1·44	NaCl ...	60	240	0·33	92·0	32·0	397·5	0·8	87·8	...	
2	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·36	0·9 1·44	NaCl ...	60	240	0·33	96·0	31·0	395·5	0·75	88·6	...	
3	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·36	0·9 1·44	NaCl ...	60	240	0·33	89·6	32·0	398·6	0·8	87·8	...	
4	500	3,000	Kerosene ... Euc-pyr-tar ...	0·225 0·36	0·9 1·44	NaCl ...	60	240	0·33	84·7	35·0	394·5	0·85	87·1	...	
5	500	3,000	Kerosene ... Euc-pyr-tar ...	0·275 0·33	1·1 1·32	NaCl ... Na_2S ...	60 0·5	240 2·0	0·33	101·2	33·0	390·0	0·8	87·8	...	
6	500	3,000	Kerosene ... Euc-pyr-tar ...	0·275 0·33	1·1 1·32	NaCl ...	60	240	0·66	94·9	34·0	395·0	0·7	89·4	...	
7	500	3,000	Kerosene ... Euc-pyr-tar ...	0·275 0·33	1·1 1·32	NaCl ... Na_2S ...	60 0·5	240 2·0	0·66	110·0	28·0	380·0	0·75	88·6	...	
8	500	3,000	Kerosene ... Euc-pyr-tar ...	0·275 0·33	1·1 1·32	NaCl ...	90	360	0·66	98·0	30·0	392·0	0·7	89·4	...	
9	500	3,000	Kerosene ... Euc-pyr-tar ...	0·275 0·33	1·1 1·32	...	...	...	0·66	105·1	25·0	385·0	1·1	83·3	...	
"Croesus Proprietary"—Sample No. 2—Assay Value: 7·2 dwt. Au. per ton (2,000lb).																
10	600	3,000	Kerosene ... Euc-pyr-tar ...	0·30 0·42	1·0 1·4	NaCl ...	60	200	0·66	154·2	26·0	436·0	1·0	86·1	10	In all these tests the ore was crushed dry in a ball mill on the mine, then wet in a pebble mill at the School of Mines. For grading analyses, *see* page 17.
11	600	3,000	Kerosene ... Euc-pyr-tar ...	0·30 0·42	1·0 1·4	NaCl ...	60	200	1·00	136·5	28·0	453·0	0·6	91·7	10	
12	600	3,000	Kerosene ... Euc-pyr-tar ...	0·30 0·42	1·0 1·4	NaCl ...	90	300	1·00	153·0	25·0	437·0	0·45	93·75	10	
13	600	3,000	Kerosene ... Euc-pyr-tar ...	0·30 0·42	1·0 1·4	NaCl ...	60	200	0·66	126·4	27·0	463·0	0·75	89·6	8	
14	600	3,000	Kerosene ... Euc-pyr-tar ...	0·30 0·42	1·0 1·4	NaCl ...	60	200	0·66	a101·2 b22·3	34·0 8·0	456·0	0·6	91·7	6 6	
15	600	3,000	Kerosene ... Euc-pyr-tar ...	0·30 0·42	1·0 1·4	NaCl ...	60	200	1·00	130·8	29·0	460·0	0·55	92·4	8	
16	500	3,000	Kerosene ... Euc-pyr-tar ...	0·25 0·36	1·0 1·44	NaCl ...	60	240	1·00	112·4	27·0	378·0	0·8	88·9	8	
17	500	3,000	Kerosene ... Euc-pyr-tar ...	0·25 0·36	1·0 1·44	NaCl ...	60	240	1·00	115·9	27·0	376·0	0·7	90·3	10	

GRADING ANALYSES.

"Croesus Proprietary" Ore, Sample No. 2.

I.M.M. Screen.	Ball mill product as received from Oroya Links G.M.		Ball mill product crushed wet in pebble mill, 40 minutes.		Ball mill product crushed wet in pebble mill, 60 minutes.	
	per cent.	per cent. cumulative.	per cent.	per cent. cumulative.	per cent.	per cent. cumulative.
Plue 8	8·5	...	...	...	...	...
Plus 16	21·2	29·7	...	...	...	...
Plus 20	5·5	35·2	...	...	...	...
Plue 40	17·4	52·6	0·8	...	...	...
Plus 60	7·8	60·4	0·8	1·6	...	...
Plus 80	5·7	66·1	4·0	5·6	0·7	...
Plus 100	0·1	66·2	1·0	6·6	0·1	0·8
Plus 150	6·5	72·7	16·0	22·6	6·5	7·3
Plus 200	1·0	73·7	6·9	29·5	5·6	12·9
Minus 200	25·7	99·4	69·0	98·5	85·9	98·8

School of Mines, Kalgoorlie,

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"Croesus Proprietary"—Sample No. 3—Assay Value: 7·8 dwt. Au. per ton (2,000lb.).

Test No.	Ore Wt., gram.	Water Wt., gram.	Oil. Description.	Oil. Wt., gram.	Oil. Wt. lb./ton.	Reagents. Description.	Reagents. Wt., gram.	Reagents. Wt. lb./ton.	Time of grinding hours.	Float. Wt., gram.	Float. Au. dwt./ton.	Tails. Wt., gram.	Tails. Au. dwt./ton.	Recovery in conct. per cent.	Time of flotation. min.	Remarks.
18	500	3,000	Kerosene ...	0·25	1·00	NaCl ...	90	360	1·0	79·2	36·0	...	...	...	5	The greater portion of the gold content is removed in the first float, while the second float, averaging five per cent. of the ore, would be returned to the circuit for re-treatment.
			Euc-pyr-tar ...	0·36	1·44	...	...	...	...	27·6	10·0	383·0	0·7	91·0	5	
19	600	3,000	Kerosene ...	0·30	1·00	...	...	...	...	105·1	30·0	...	...	...	5	
			Euc-pyr-tar ...	0·42	1·40	NaCl ...	90	300	1·0	32·3	10·0	451·6	0·5	93·6	5	
20	750	3,000	Kerosene ...	·375	1·00	...	...	...	...	107·5	36·0	...	...	...	5	
			Euc-pyr-tar ...	0·54	1·44	NaCl ...	90	240	1·0	37·7	6·0	594·8	0·85	89·1	5	
21	500	3,000	Kerosene ...	·375	1·50	...	...	...	...	75·4	32·0	...	...	...	5	
			Euc-pyr-tar ...	0·18	0·72	NaCl ...	90	360	1·0	21·2	6·0	393·6	0·65	91·5	5	
22	600	3,000	Kerosene ...	0·45	1·50	...	...	...	...	94·5	35·0	...	...	...	f	
			Euc-pyr-far ...	0·21	0·70	NaCl ...	90	300	1·0	33·6	6·0	462·1	0·8	89·7	5	
23	750	3,000	Kerosene ...	0·55	1·50	...	...	...	...	132·0	32·0	...	...	...	5	
			Euc-pyr-tar ...	0·27	0·70	NaCl ...	90	240	1·0	24·8	8·0	583·0	0·6	92·3	5	
24	500	3 000	Kerosene ...	·375	1·50	...	...	...	...	70·0	39·0	...	...	...	5	
			Euc-pyr-tar ...	0·18	0·72	NaCl ...	60	240	1·0	21·8	7·0	399·0	0·8	89·7	5	
25	600	3,000	Kerosene ...	0·45	1·50	...	...	...	...	96·4	34·0	...	...	...	5	
			Euc-pyr-tar ...	0·21	0·70	NaCl ...	60	200	1·0	27·6	7·0	466·2	1·0	87·2	5	
26	750	3,000	Kerosene ...	0·55	1·50	...	...	...	...	125·5	33·0	...	...	...	5	
			Euc-pyr-tar ...	0·27	0·70	NaCl ...	60	160	1·0	24·3	6·0	590·0	0·8	89·7	5	

School of Mines, Kalgoorlie,
11th June, 1925.

A. S. WINTER,
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B. H. MOORE,
Lecturer in Metallurgy.

REPORT ON INVESTIGATION WORK CARRIED OUT IN THE METALLURGICAL LABORATORY FROM JUNE 12th TO JULY 9th, 1925.

Croesus Proprietary, Oroya Links, Ltd.

9th July, 1925.

As indicated in our report of the 11th June on the flotation of Croesus Proprietary ore, a series of tests has now been completed, the object of which was to see if the results obtained previously in tests Nos. 12 and 19 could be repeated. In this series 10 tests were carried out under exactly similar conditions, and the results show a consistently high recovery and a low residue. The amount of concentrate is high compared to that obtained in the tests on South Kalgurli ore, due partly to the higher percentage of pyrite, the sulphur content being in each case:—

South Kalgurli	2.54 per cent.
Croesus Proprietary	4.75 per cent.

Work on this ore has been stopped temporarily to enable us to carry out some other tests, and to do some investigation work as outlined by the State Mining Engineer. As soon as this work is complete further research should be undertaken to endeavour to reduce the amount of flotation concentrate and at the same time produce a clean residue.

Amount of Salt used in tests:—

The amount of salt shown in the tabulations is the weight of salt in the five or six tons of water used with each ton of ore, but the amount of salt in solution in the five or six tons of water used per ton of ore, is only three per cent. in this case and two in other cases, and the water is returned for re-use. The only loss is that due to the moisture going away in the residues. The only mine water tested and used in the flotation tests carried enough chlorides for the purpose.

REPORT ON FLOTATION TESTS ON OROYA LINKS ORE.

"Croesus Proprietary"—Sample No. 4—Assay Value: 7·2 dwt. Au. per ton (2,000lb.).

Test No.	Ore Wt., gram.	Water Wt., gram.	Oil.			Reagents.			Time of grinding, hours.	Float.		Tails.		Recovery in conct. per cent.	Time of flotation, min.	Remarks.
			Description.	Wt., gram.	Wt. lb./ton.	Description.	Wt., gram.	Wt. lb./ton.		Wt., gram.	Au., dwt./ton.	Wt., gram.	Au. dwt./ton.			
27	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	119·5	27·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	29·0	5·6	442·0	0·60	91·66	5	
28	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	115·0	28·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	40·0	3·6	435·0	0·50	93·00	5	
29	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	126·5	26·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl	90	300	1·0	36·0	3·6	428·0	0·50	93·00	5	
30	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	125·0	28·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	29·6	3·2	436·0	0·40	94·44	5	
31	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	110·0	28·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	42·0	3·2	438·0	0·50	93·00	5	
32	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	128·0	26·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	29·5	3·2	438·0	0·40	94·44	5	
33	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	119·0	26·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	37·6	4·0	434·0	0·40	94·44	5	
34	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	120·0	28·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	38·0	3·2	432·0	0·60	91·66	5	
35	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	110·6	34·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	44·5	4·8	435·0	0·40	94·44	5	
36	600	3,000	Euc-pyr-tar ...	0·42	1·4	...	...	...	...	122·2	31·0	...	...	...	5	
			Kerosene ...	0·30	1·0	NaCl ...	90	300	1·0	42·0	3·6	426·0	0·55	92·36	5	

School of Mines, Kalgoorlie,
18th June, 1925.

A. S. WINTER,
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B. H. MOORE,
Lecturer in Metallurgy.

REPORT ON INVESTIGATION WORK CARRIED OUT IN THE METALLURGICAL LABORATORY ON CROESUS PROPRIETARY ORE FROM OROYA LINKS, LTD.

Since my last report of the 9th inst., some further research has been conducted on the Croesus Proprietary ore, the object of this work being to endeavour to produce, by the flotation process, a minimum amount of concentrate with a clean residue, and from the results obtained the tests have certainly been very successful.

As shown in the tabulation, the average of 15 tests is as follows:—

Ore = 6.6 dwts.
Flotation conc. = 44.5 dwts. = 13.5 per cent. by weight.
Tails = 0.46 dwts. = 84.7 per cent. by weight.
Recovery—93.0 per cent.

The ore (6.6 dwts.) is low grade, and the recovery, 93.0 per cent., from that grade of ore is very high. The concentrate was clean, and the amount produced is only 13.5 per cent. of the original ore.

To arrive at the best conditions various changes were made in the method of treatment, viz.:—

(1) Coarse grinding.
(2) No salt in solution.
(3) Salt solution.
(4) Density of pulp.
(5) Oils—
(a) Kero. only.
(b) Pine oil only.
(c) Eu. Py. Tar in excess plus Kero.
(d) Eu. Py. Tar plus Kero. in excess.

The best results were obtained by fine grinding, using a salt solution, and Potassium Xanthate with Pine Oil or Kero. Eucalyptus Pyridene Tar in the amounts as shown in the tabulations.

School of Mines,
Kalgoorlie, 22nd July, 1925.

A. S. WINTER,
Research Metallurgist.

FLOTATION TESTS ON OROYA LINKS ORE.

Test No.	Ore Wt., gram.	Water Wt., gram.	Oil. Description.	Oil. Wt., gram.	Oil. Wt., lb. ton.	Reagents. Description.	Reagents. Wt., gram.	Reagents. Wt., lb. ton.	Time of grinding.	Float. Wt., gram.	Float. Au., dwt. ton.	Tails. Wt., gram.	Tails. Au. dwt. per ton.	Recovery per cent.	Remarks.
"Croesus Proprietary."—Sample No. 5.—Assay Value: 6·8 dwt. Au. per ton (2,000lbs.).															
37	600	3,000	Pine	·6	2·0	Pot. Xanthate	0·1	·33	mins. 45	98·4	38·0	492·0	·55	91·9	
38	600	3,000	Pine	·6	2·0	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	45	80·0	44·0	510·0	·45	93·3	
39	600	3,000	Kerosene ... Eu-py-tar ...	·225 ·42	·75 1·40	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	45	102·5	38·0	488·0	·6	91·2	
40	600	3,000	Pine	·6	2·0	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	30	74·5	46·0	516·0	·9	86·7	These tests prove that 30 minutes grinding is not sufficient on this class of ore.
41	600	3,000	Kerosene ...	·55	1·83	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	30	55·0	52·0	535·0	2·5	63·2	
42	600	3,000	Kerosene ... Eu-py-tar ...	·25 ·30	·83 1·00	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	30	93·7	35·0	497·0	1·7	75·0	
43	600	3,000	Pine	·66	2·2	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	60	76·7	46·4	514·0	·55	91·9	
44	600	3,000	Kerosene ... Eu-py-tar ...	·40 ·21	1·33 ·70	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	60	81·3	42·0	509·0	·45	93·3	
45	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 ·6	Pot. Xanthate NaCl ...	0·1 3%	·33 soln.	60	77·0	45·0	513·0	·40	94·1	
46	600	3,000	Pine	·60	2·0	Pot. Xanthate NaCl ...	0·1 2%	·33 soln.	60	80·5	43·0	510·0	·35	94·8	
47	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 ·6	Pot. Xanthate NaCl ...	0·1 2%	·33 soln.	60	71·7	55·0	519·0	·40	94·1	
48	500	3,000	Kerosene ... Eu-py-tar ...	·35 ·15	1·4 ·6	Pot. Xanthate NaCl ...	0·1 2%	·40 soln.	60	49·9	54·0	440·0	·80	88·2	
"Croesus Proprietary"—Sample No. 6—Assay value 6·5 dwt. Au. per ton (2,000lb.).															
49	600	3,000	Pine	·66	2·2	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	mins. 60	85·8	45·0	504·0	0·5	92·3	
50	600	3,000	Pine	·66	2·2	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	80·0	44·0	510·0	0·4	93·8	
51	600	3,000	Pine	·66	2·2	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	83·2	42·0	506·0	0·5	92·3	
52	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	91·9	37·0	498·0	0·45	93·0	
53	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	94·7	38·0	495·0	0·45	93·0	
54	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	82·7	43·0	507·0	0·45	93·0	
55	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	75·9	48·0	514·0	0·5	92·3	
56	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	79·4	45·0	510·0	0·5	92·3	
57	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	77·4	50·0	512·0	0·5	92·3	
58	600	3,000	Kerosene ... Eu-py-tar ...	·45 ·18	1·5 0·6	Pot. Xanthate NaCl ...	0·1 3%	0·33 soln.	60	79·0	45·0	510·0	0·5	92·3	

REPORT.

INVESTIGATION WORK CARRIED OUT IN THE METALLURGICAL LABORATORY ON LAKE VIEW AND STAR ORE.

The sample on which these tests have been carried out was received in lump form, together with a fair percentage of finer material. It was prepared for testing by first dry crushing through the rock breaker and the rolls; this material was then crushed wet in the pebble mill. (For fineness see grading analysis on separate sheet).

The ore is apparently very similar to the other ores on the belt, which have already been satisfactorily tested by flotation: in this case the grade is somewhat lower (4.8 to 5.0 dwt. per ton), and the pyrite present is slightly higher (5.2 per cent. S. = 9.7 per cent. FeS_2). The flotation concentrate produced was exceptionally clean, the average weight being 15.7 per cent. of the ore taken. The slight increase is due to the higher percentage of pyrite in the ore.

Altogether 17 tests were carried out, and certain set conditions were followed with variations in the quantity of potassium xanthate, amounts ranging from .066 to .33 lb. per ton were used, and very good results were obtained with the smaller amount. In one test potassium xanthate was tried without oil, and a clean float was obtained by this means, but the tails were high.

A. S. WINTER,
Research Metallurgist.

School of Mines,
Kalgoorlie, 4th August, 1925.

FLOTATION TESTS ON LAKE VIEW AND STAR ORE.

Sample No. 1—Assay Value: 4·8 dwts. Au. per ton (2,000lb).

Test No.	Ore Wt. gram.	Water Wt. gram.	Oil. Description.	Oil. Wt. gram.	Oil. Wt. lb. ton.	Reagents. Description.	Reagents. Wt. gram.	Reagents. Wt. lb. ton.	Time of grinding.	Float. Wt. gram.	Float. Au. dwt. ton.	Tails. Wt. gram.	Tails. Au. dwt. ton.	Recovery	Remarks.
1	600	3,000	Pine	·66	2·2	NaCl ...	2 % soln.	...	60 min.	49·1	31·0	540·0	2·3	52·08	In all these tests the ore was crushed dry through the rolls; then wet in Pebble Mill. For fineness under varying times of wet grinding, *see* grading analysis on page 21.
2	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	NaCl ...	2 % soln.	...	60 min.	88·0	30·0	502·0	0·5	90·0	
3	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	Pot. Xan. ... NaCl ...	·1 2 % soln.	·33 ...	60 min.	94·4	29·0	495·0	0·35	92·7	
4	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	Pot. Xan. ... NaCl ...	·1 2 % soln.	·33 ...	60 min.	105·0	26·0	485·0	0·35	92·7	
5	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	Pot. Xan. ... NaCl ...	·1 2 % soln.	·33 ...	60 min.	95·0	28·0	495·0	0·35	92·7	
6	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	Pot. Xan. ... NaCl ...	·1 2% soln.	·33 ...	60 min.	90·9	29·0	499·0	0·35	92·7	
7	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	NaCl ...	3 % soln.	...	60 min.	96·6	27·0	493·0	0·5	90·0	
8	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	NaCl ...	3 % soln.	...	60 min.	91·0	28·0	500·0	0·5	90·0	
9	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	NaCl ...	3 % soln.	...	60 min.	88·0	30·0	502·0	0·5	90·0	
10	600	3,000	Kero. ... ... Eu. Py. tar ...	·45 ·18	1·5 ·6	Pot. Xan. ... NaCl ...	·1 2 % soln.	·33 ...	30 min.	75·7	34·0	514·0	0·5	90·0	
11	600	3,000	Pine	·66	2·2	Pot. Xan. ... NaCl ...	·1 2 % soln.	·33 ...	45 min.	99·5	28·0	490·0	0·35	92·7	

Sample No. 2.—Assay Value: 5·0 dwts. Au. per ton (2,000lb.)

Test No.	Ore Wt. gram.	Water Wt. gram.	Oil. Description.	Oil. Wt. gram.	Oil. Wt. lb. ton.	Reagents. Description.	Reagents. Wt. gram.	Reagents. Wt. lb. ton.	Time of grinding.	Float. Wt. gram.	Float. Au. dwt. ton.	Tails. Wt. gram.	Tails. Au. dwt. ton.	Recovery
12	600	3,000	...	...	...	Pot. Xan. ... NaCl ...	·1 2 % soln.	·33 ...	45 min.	76·2	32·0	514·0	0·9	82·0
13	600	3,000	Pine	·66	2·2	Pot. Xan. ... NaCl ...	·05 2 % soln.	·165 ...	45 min.	95·2	29·0	495·0	0·35	93·0
14	600	3,000	Pine	·66	2·2	Pot. Xan. ... NaCl ...	·02 2 % soln.	·066 ...	45 min.	95·1	29·0	495·0	0·3	94·0
15	600	3,000	Pine	·66	2·2	Pot. Xan. ... NaCl ...	·02 2 % soln.	·066 ...	45 min.	89·0	31·0	501·0	0·4	92·0
16	600	3,000	Pine	·66	2·2	Pot. Xan. ... NaCl ...	·02 2 % soln.	·066 ...	45 min.	89·9	30·5	500·0	0·35	93·0
17	600	3,000	Pine	·66	2·2	Pot. Xan ... NaCl ...	·02 2 % soln.	·066 ...	45 min.	88·0	32·0	502·0	0·3	94·0

FLOTATION TESTS ON LAKE VIEW AND STAR ORE.

GRADING ANALYSIS.

Showing the effect of fine grinding in the Pebble Mill.

I.M.M. Screen.	Sample crushed dry through rolls.	Product from rolls ground 30 minutes in Pebble Mill.	Product from rolls ground 45 minutes in Pebble Mill.	Product from rolls ground 60 minutes in Pebble Mill.
Plus 5	0·40 %	...	...	...
Plus 8	2·02 %	...	...	...
Plus 20	29·02 %	...	...	...
Plus 40	26·40 %	...	...	...
Plus 60	8·90 %	...	...	...
Plus 80	4·99 %	4·3 %	...	...
Plus 100	0·80 %	1·7 %	0·8 %	...
Plus 150	8·40 %	18·4 %	8·6 %	5·7 %
Plus 200	4·20 %	4·6 %	5·0 %	2·1 %
Minus 200	13·20 %	70·0 %	84·7 %	91·7 %

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES ON THE FLOTATION OF PYRITIC GOLD ORE FROM THE IVANHOE GOLD MINE.

This sample of ore was received during 1925, but the investigation was delayed on account of urgent departmental investigations and by the work on the Oroya Links Pilot Plant.

In all, 34 tests have been carried out, and the results of these tests indicate that on this ore similar results can be obtained to those previously obtained on ores from other mines of the Golden Mile investigated up to this time.

On account of the success recently obtained in America on the flotation of base metal ores by the use of lime and potassium xanthate, some tests were carried out on these lines, but the results tended to show that the use of lime was detrimental, and especially so where salt water was not used, particularly as regards the percentage and grade of concentrate. (*Vide* Tests 13, 14, 15). It has been our experience that the use of fresh instead of salt water has always had a detrimental effect on the percentage and grade of concentrate, and this effect seems to be much increased when an alkaline pulp is used. (*Vide* Test 15.) No benefit was derived by increasing the salinity of the water from two to five per cent. NaCl, this increase being made in order to conform as nearly as possible to the salinity of the mine water.

The main conclusions arrived at as a result of these tests are—

1. The ore is amenable to flotation, and satisfactory recoveries can be made in a high grade concentrate constituting a small percentage of the ore treated.
2. A mixture of crude eucalyptus, coal tar, and kerosene gave, as hitherto, very satisfactory results.
3. Good results were obtained by the use of oil mixture in quantity equivalent to 1.6 pounds per ton, but somewhat better results were obtained when using 2 pounds of oil mixture per ton.
4. Salt water gives uniformly better results than fresh water.
5. The use of potassium xanthate as a conditioning agent in the proportion of 0.185 pound per ton of ore apparently is beneficial.
6. Fine grinding is essential.
7. The use of lime in conjunction with potassium xanthate appears to offer no advantages, and in a fresh water pulp is a decided disadvantage, as it seriously affects the percentage recovery, and percentage and grade of concentrate.
8. Other conditions being equal, reduction of time of flotation from ten to seven minutes does not appear materially to affect the result.

All results have been calculated on the basis of the long ton in order to conform with current practice on the mines.

Grading analyses of the minus 16 mesh dry-crushed ore, and the pebble mill products resulting from different periods of grinding are as follows:—

I.M.M. Screen	-16 mesh dry-crushed.	Pebble Mill Products.		
		30 min.	45 min.	60 min.
	%	%	%	%
Plus 150	72·4	29·7	10·7	1·9
Plus 200	2·1	4·1	5·8	3·0
Minus 200	25·5	66·2	83·5	95·1

A. S. WINTER,
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B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 29th March, 1926.

FLOTATION TESTS ON IVANHOE ORE.

Assay Value, No. 1 Sample: 10·0 dwts. Au. per ton (2,240lbs).

Test No.	Ore Wt., gram.	Water Wt., gram.	Oil.			Reagents.			Time of grinding, min.	Float.			Tails.		Recovery, per cent.	Time of flotation, min.	Remarks.
			Description.	Wt., gram.	Wt. lb./ton.	Description.	Wt., gram.	Wt. lb./ton.		Wt., gram.	Wt. per cent.	Au., dwt. per ton.	Wt., gram.	Au. dwt. per ton.			
1	600	3,000	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl ... Pot X'te. ...	2% 0·05	Soln. ·185	60	68·5	11·4	84·0	523	0·65	93·5	10	2 per cent. salt used with Pot. Xanth.
2 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl ... Pot X'te. ...	2% 0·05	Soln. ·185	60	63·6	10·6	86·0	527	0·6	94·0	10	do. do.
3 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl ... Pot. X'te. ...	2% 0·05	Soln. ·185	60	64·7	10·8	82·0	525	0·6	94·0	10	do. do.
4 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero ...	0·30 0·25	1·12 0·93	NaCl ... Pot X'te. ...	5% 0·05	Soln ·185	60	67·0	11·2	80·0	523	0·65	93·5	10	Salt increased to 5 per cent.
5 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl ... Pot X'te. ...	5% 0·05	Soln. ·185	60	74·8	12·4	74·0	515	0·9	91·0	10	do. do.
6 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl ... Pot X'te. ...	5% 0·05	Soln. ·185	60	69·0	11·5	78·0	512	0·7	93·0	10	do. do.
7 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	... NaCl ...	5% ...	Soln. ...	60	66·1	11·0	82·0	524	0·9	91·0	10	No Xanthate.
8 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl	5% ...	Soln. ...	60	65·1	10·8	82·0	525	0·9	91·0	10	do. do.
9 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	NaCl	5% ...	Soln. ...	60	69·1	11·5	80·0	520	0·85	91·5	10	do. do.
10 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	... ...	... ...	... ..	60	100·4	16·7	53·0	490	0·9	91·0	10	No salt, no X'thate.
11 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·30 0·25	1·12 0·93	Pot X'te.	0·05 ...	·185 ...	60	101·3	16·9	54·0	489	0·8	92·0	10	No salt.
12 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot X'te. ...	5% 0·05	Soln. ·185	60	66·8	11·1	82·0	523	0·65	93·5	10	Salt and Xanthate added. Amount of oil decreased.
13	600	3,000	Eu.-Tar 1:6 Kero.	0·24 0·20 ...	0·89 0·74 ...	NaCl ... CaO ... Pot X'te. ...	5% 1·0 0·05	Soln. 3·7 ·185	60	94·0	15·7	56·0	496	0·9	91·0	10	Lime used with salt and Pot. Xan.
14	600	3,000	Eu.-Tar 1:6 Kero.	0·24 0·20 ...	0·89 0·74 ...	NaCl ... CaO ... Pot X'te. ...	2% 1·0 0·05	Soln. 3·7 ·185	60	90·0	15·0	58·0	500	1·6	84·0	10	Lime used. Amount of salt decreased.
15 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	CaO ... Pot X'te. ...	1·0 0·05	3·7 ·185	60	203·0	33·8	26·0	387	1·8	82·0	10	Lime used. No salt.
16 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0 89 0·74	NaCl ... Pot X'te. ...	5% 0·05	Soln. ·185	60	66·0	11·0	80·0	524	0·8	92·0	7	Time of flotation reduced.
17 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot X'te. ...	5% 0·05	Soln. ·185	60	66·2	11·0	80·0	524	0·7	93·0	7	do. do.
18 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot X'te. ...	5% 0·05	Soln. ·185	60	73·0 ...	12·2	72·0	517	0·7	93·0	7	do. do.

FLOTATION TESTS ON IVANHOE ORE—*continued*.

Assay Value, No. 1 Sample: 10·0 dwts. Au. per ton (2,240lbs.)—*continued*.

Test No.	Ore Wt., gram.	Water Wt., gram.	Oil.			Reagents.			Time of grinding, min.	Float.			Tails.		Recovery per cent.	Time of flotation. min.	Remarks.
			Description.	Wt., gram.	Wt., lb./ton.	Description.	Wt., gram.	Wt., lb./ton.		Wt., gram.	Wt. per cent.	Au., dwt. per ton.	Wt., gram.	Au. dwt. per ton.			
19 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5 % 0·05	Soln. ·185	60	74·2	12·4	72·0	516	0·85	91·5	7	Time of flotation reduced.
20 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5 % 0·05	Soln. ·185	45	69·0	11·5	74·0	521	... 1·1	89·0	7	Time of grinding reduced.
21 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5 % 0·05	Soln. ·185	30	75·2	12·5	66·0	515	1·2	88·0	7	Time of grinding further reduced.
22 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5 % 0·05	Soln. ·185	30	63·5	10·6	82·0	526	1·3	87·0	7	do. do.
23 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl	5 % ...	Soln. ...	60	83·0	13·8	60·0	507	1·1	89·0	10	Tests 23 to 28 inclusive were carried out without the use of Pot. Xanthate.
24 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl	5 % ...	Soln. ...	60	88·3	14·7	58·0	502	1·2	88·0	10	
25 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl	5 % ...	Soln. ...	60	75·2	12·5	68·0	515	1·0	90·0	10	
26 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl	5 % ...	Soln. ...	60	85·7	14·3	58·0	504	1·3	87·0	10	
27 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl	5 % ...	Soln. ...	60	78·7	13·1	64·0	511	1·0	90·0	10	
28 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl	5 % ...	Soln. ...	60	77·0	12·8	68·0	513	1·6	84·0	10	
29 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot X'te. ...	5 % 0·05	Soln. ·185	60	80·7	13·4	64·0	510	0·8	92·0	10	Tests 29 to 34 inclusive, Pot. Xanthate has been added; other conditions remaining the same as in Tests 23 to 28.
30 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot X'te. ...	5 % 0·05	Soln. ·185	60	86·2	14·4	64·0	504	0·9	91·0	10	
31 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5 % 0·05	Soln. ·185	60	82·0	13·7	64·0	508	1·0	90·0	10	
32 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot X'te. ...	5 % 0·05	Soln. ·185	60	88·2	14·7	60·0	502	0·9	91·0	10	
33 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5 % 0·05	Soln. ·185	60	86·0	14·3	64·0	504	0·8	92·0	10	
34 ...	600 ...	3,000 ...	Eu.-Tar 1:6 Kero. ...	0·24 0·20	0·89 0·74	NaCl ... Pot. X'te. ...	5% 0·05	Soln. ·185	60	92·0	15·3	58·0	498	0·8	92·0	10	

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES, KALGOORLIE, ON THE FLOTATION OF PYRITIC GOLD ORE FROM THE BOULDER PERSEVERANCE GOLD MINE.

Ore Samples.

The first sample submitted for investigation consisted of ball mill product, which was found to be quite unsuitable for flotation on account of the fine state of division to which it had been reduced by dry grinding. The following is a grading analysis of this sample as received:—

I.M.M.	per cent.
plus 40	23.8
plus 60	15.8
plus 80	10.0
plus 100	0.8
plus 150	13.3
plus 200	1.3
minus 200	35.0
	100.0

It is a recognised fact that the fine grinding necessary for flotation must be carried out wet in tube or similar mills, and that fine grinding in the dry state, as in dry ball mills, tends to render the mineral content not amenable to flotation, because the mineral and gangue particles are to a large extent ground into one another. Hence, although some flotation tests were carried out on this ore after a further wet grinding, it was found impossible to secure satisfactory results, which had been expected when the nature of the method of crushing of the material had been ascertained.

The management of the company, on being apprised of this fact, courteously supplied a second sample, which was found to assay over 5oz. Au. per ton, and on careful examination, was found to contain coarse free gold. Nevertheless, some tests were carried out on this ore by combined amalgamation and flotation, which gave excellent results, the residues being reduced to 2dwt. Au. per ton. Amalgamation was found to be essential, either before or after flotation, since most of the free gold was too coarse to be floated, even after fine grinding of the ore in the pebble mill, which resulted mainly in the flattening out of the particles of gold. As, however, this sample could not be considered as representative of the general-run-of-mine ore, the management were asked to supply a sample more nearly representative of the usual mill feed. This sample contained a small quantity of free gold, which, however, is characteristic of Perseverance ore, and the grade of the sample more closely approximated to that of the normal mill feed.

Testing.

This sample was tested under varying conditions of direct flotation and combined amalgamation and flotation, with the very satisfactory results shown in the accompanying tables and summary of tests. Salt water was used in making up the plup for flotation, the salt solution being of 2 per cent. and 5 per cent. concentration. Salt water was used, because a trial test carried out with fresh water showed that it was impossible to produce a clean concentrate under those conditions, and because it had been found that the use of salt water enabled clean concentrates to be obtained in the flotation of all Kalgoorlie ores tested up to the present. The salt acts as a deflocculator of the colloids of the ore and so prevents their flotation with the pyrite. Thus it has been possible to obtain a high grade, clean concentrate constituting a small percentage of the original ore, which is a vital point in large scale treatment.

Oiling was carried out as usual during grinding in the pebble mill, the ore being first crushed dry to pass 8-mesh I.M.M. screen, and finally ground in the pebble mill for one hour. Grading analyses of these products are attached. For oiling, euco-tar mixture in the proportion of 1 to 6, and kerosene were used throughout in constant quantity, all of which was added to the pebble mill. In all but three tests potassium xanthate was also added to the pebble mill in quantity equivalent to 0.187 lbs. per ton of ore.

The accompanying summary of tests grouped according to conditions of treatment shows that the best results were obtained in the tests in which potassium xanthate was used.

(a) in 5 per cent. salt solution without amalgamation;

(b) in 2 per cent. salt solution with amalgamation before flotation.

The percentage weight of concentrates obtained in these tests varies from a minimum of ten to a maximum of 15.7, but the average in the two groups of tests mentioned above is approximately 12.5. In the testing, the whole of the float is included in the concentrate, no middle product being made, the principle object being to secure a clean, low grade residue, whereas in practice the lower grade portion of the float would be returned to the head of the flotation machine.

The results of these tests indicate that under the conditions stated, very satisfactory recoveries can be obtained in the form of a high grade concentrate, averaging 12.5 per cent. by weight of the ore, and that in order to obviate the loss of coarse gold, which at times occurs in the mill feed, amalgamation before flotation should be practised.

Mine water containing NaCl and other ionised salts in solution can be used for making up the flotation pulp, with equally satisfactory results to those obtained by the use of a plain solution of NaCl.

It will be noticed that the total quantity of oils used is under 2lbs. per ton of ore, the cost of which would be approximately five pence per ton of ore, while the cost of potassium xanthate in the proportion used would not exceed three pence per ton of ore, making a total cost for flotation oils and reagents of eight pence per ton of ore, a figure which would probably be reduced in practice where a proportion of the oils and reagents would remain in the circuit. At the same time, no work has been done to ascertain the minimum quantity of potassium xanthate that could be used consistent with satisfactory results.

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School of Mines,
Kalgoorlie, 26th April, 1926.

BOULDER PERSEVERANCE ORE.

Grading Analyses.

Ore crushed dry to pass 8 mesh I.M.M. screen.

I.M.M. Screen.		%
Plus	16	15·05
,,	20	22·75
,,	40	18·25
,,	60	6·80
,,	80	4·55
,,	100	0·90
,,	120	3·75
,,	150	3·30
Plus	200	3·90
Minus	200	20·75
		100·00

After grinding wet in pebble mill for 60 minutes.

I.M.M. Screen.		%
Plus	150	4·1
Minus	150	95·9
		100·0

FLOTATION TESTS ON BOULDER PERSEVERANCE ORE.

Sample A. Assay Value, 16·6dwt. Au. per ton (2,240lb.).

Test No.	Ore wt. gram.	Water wt. gram.	Oil. Description.	Oil. Wt. gram.	Oil. Wt. lb./ton.	Reagents. Description.	Reagents. Wt. gram.	Reagents. Wt. lb./ton.	Time of grinding, min.	Float. Wt., gram.	Float. Per cent.	Float. Au. dwt./ton.	Residue. Wt., gram.	Residue. Au. dwt. per ton.	Time of flotation, min.	Recovery per cent.	Remarks.
1	600	3,000	Euco-tar (1:6) Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	60·0	10·0	154·0	530·0	0·9	10	94·6	Tests 1–3, 2% salt soln. and pot. xanth.
2	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	2% 0·05	soln. 0 187	60	60·5	10·1	168·0	530·0	1·2	10	92·8	
3	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 1·56	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	65·5	10·9	164·0	525·0	1·2	10	92·8	
4	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	77·5	12·9	114·0	513·0	0·7	10	95·8	Tests 4–6, 5% salt, soln. with pot. xanth.
5	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	73·5	12·25	122·0	517·0	0·8	10	95·2	
6	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	72·0	12·0	128·0	518·0	0·8	10	95·2	
7	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	69·0	11·5	118·0	521·0	0·7	10	95·8	Tests 7–9, 2% salt soln. with pot. xanth. Amalgamn. before flotation.
8	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	73·0	12·2	103·0	517·0	0·6	10	96·4	
9	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	81·0	13·5	104·0	509·0	0·7	10	95·8	
10	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ...	2%	soln.	60	73·0	12·2	101·0	517·0	1·1	10	93·4	Tests 10–12, 2% salt soln., no pot. xanth., amalgamn. before flotation.
11	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ...	2%	soln.	60	70·0	11·7	113·0	520·0	1·8	10	89·2	
12	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ...	2%	soln.	60	76·5	12·75	111·0	514·0	1·1	10	93·4	
13	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	79·0	13·2	125·0	511·0	1·4	10	91·6	Tests 13–21 carried out in 5% salt solution, with pot. xanthate. No amalgamation.
14	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% ·05	soln. 0·187	60	81·5	13·6	110·0	509·0	1·4	10	91·6	
15	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 1·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	82·5	13·7	111·0	510·0	0·8	10	95·2	
16	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	94·0	15·7	91·0	496·0	1·05	10	93·7	
17	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	80·0	13·3	102·0	510·0	1·4	10	91·6	
18	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	83·5	13·9	115·0	507·0	0·8	10	95·2	
19	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	79·5	13·2	104·0	511·0	0·8	10	95·2	
20	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	85·0	14·2	96·0	505·0	0·9	10	94·6	
21	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	84·0	14·0	104·0	506·0	1·0	10	94·0	
22	600	3,000	Euco-tar Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	75·0	12·5	92·0	515·0	0·8	10	94·4	Tests 22–24, new head sample, 14·4dwt per ton. Amalgamation before flotation.
23	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	74·5	12·4	100·0	516·0	0·87	10	93·9	
24	600	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	77·0	12·8	94·0	513·0	0·8	10	94·4	

School of Mines, Kalgoorlie, 26th April, 1926.

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AVERAGES OF FLOTATION TESTS UNDER DIFFERENT CONDITIONS OF TREATMENT.

Salt solution, 5 per cent ; Potassium Xanthate ; No amalgamation (12 tests).

Float—	
Percentage weight	13·5
Average value	110·2 dwt. per ton.
Residue—	
Average value	1·02 dwt. per ton.
Recovery	94·075 per cent.

Salt solution, 2 per cent ; Potassium Xanthate ; No amalgamation (3 tests).

Float—	
Percentage weight	10·3
Average value	162·0 dwt. per ton.
Residue—	
Average value	1·1 dwt. per ton.
Recovery	93·4 per cent.

Salt solution, 2 per cent ; No Potassium Xanthate ; With amalgamation (3 tests).

Float—	
Percentage weight	12·22
Average value	111·66 dwt. per ton.
Residue—	
Average value	1·33 dwt. per ton.
Recovery	92·0 per cent.

Salt solution, 2 per cent. ; Potassium Xanthate ; With amalgamation (3 tests).

Float—	
Percentage weight	12·4
Average value	108·3 dwt. per ton.
Residue—	
Average value	0·7 dwt. per ton.
Recovery	96·0 per cent.

Salt solution, 5 per cent. ; Potassium Xanthate ; With amalgamation (3 tests).

Float—	
Percentage weight	12·6
Average value	95·3 dwt. per ton.
Residue—	
Average value	0·82 dwt. per ton.
Recovery	94·23 per cent.

REPORT OF INVESTIGATIONS CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES, KALGOORLIE, ON BOULDER PERSEVERANCE ORE.

At the request of Dr. K. B. Edwards, a Director of Boulder Perseverance, Ltd., who is visiting the mine, to make a technical investigation of operating conditions, and with the approval of the Hon. Minister for Mines, tests on Boulder Perseverance ore have been carried out along lines suggested by him.

Magnetic Concentration.

We had noticed that the flotation residues from the treatment of Boulder Perseverance ore contained appreciable quantities of a black mineral, which investigation proved to be magnetite. It was considered that this mineral might contain an appreciable amount of gold and that its presence might, therefore, account for the inability of flotation to reduce the grade of the residues below 0.6dwt. or 0.7dwt. Au per ton. Therefore, a test was carried out to determine this point, by concentrating the mineral magnetically and determining its gold content. The percentage of magnetite in the flotation residues was found to be very small, 0.083 per cent., and, although the clean magnetite concentrate carrying no free gold discernible under the microscope assayed 30dwt. Au per ton, the percentage of magnetite present in the flotation residues was so small, that it could not account for an appreciable amount of the gold that could not be extracted by flotation.

On treating the mill residues, which had been roasted and cyanided, by a similar method of concentration, it was found that the percentage of magnetite was much greater in this case, being 0.38 per cent., but its gold content had apparently been much reduced during the treatment, the concentrate assaying 6dwt. Au per ton. Here, again, the gold contained in this material was not of appreciable account, as an explanation of the mode of occurrence of the gold in the mill residues.

There is a marked difference in the percentages of magnetite found in the flotation and mill residues which is accounted for on the assumption that much of the magnetite originally present in the ore is recovered in the flotation concentrate, an assumption which examination of the flotation concentrate has proved to be correct.

Hence some other cause must be looked for to account for the unextractable gold in the flotation and mill residues.

The results of these tests are shown on the accompanying sheet.

Unaltered Pyrite in Mill Residues.

In order to investigate the mode of occurrence of the gold in the mill residues, a series of flotation tests was carried out on the mill residues resulting from the fine grinding, roasting and cyaniding of the ore. Dr. Edwards holds the opinion that the method of roasting is inefficient, because the pyrite particles are to a considerable extent blanketed by the very fine particles of gangue during roasting, and so some of the pyrite is prevented from oxidising. A visit to the mine and an inspection of the roasting operation led us to believe that this was correct, and in order to determine whether roasting was incomplete, a series of flotation tests was carried out on the mill residues. These tests showed conclusively that even after roasting, an appreciable quantity of unaltered pyrite could be recovered by flotation, and the grade of the residues could be considerably reduced by this treatment. This shows conclusively that roasting is far from complete, for, if the particles of pyrite were coated even with a film of oxide, they would not be amenable to flotation. Hence, it follows that more efficient roasting would result in increased extraction and that an appreciable proportion of the gold in the mill residues is present in association with unaltered pyrite, and, therefore, that the blanketing action by the fine ore particles does under present conditions take place and materially affects the recovery of gold. The average proportion of pyrite in the ore can be taken as 6 per cent. by weight, which, after the grinding operation, is intimately mixed with 94 per cent. by weight of inert, very finely divided gangue, which acts as a blanket and surrounds the particles of pyrite, thus exercising a tendency to prevent exposure of the pyrite to oxidising conditions. Assuming the specific gravity of pyrite and gangue to be 5 and 2.8 respectively, the relative volumes are 3.45 and 96.55, or approximately 1 to 28. As the relative volumes are the important factors in deciding whether this blanketing action takes place, it is evidently extremely improbable that efficient roasting of the pyrite can be accomplished under present conditions, and, therefore, the gold content of the unaltered pyrite is not recoverable by ordinary methods of cyanidation. Therefore, a high recovery of gold under existing conditions of all-roasting depends entirely on the completeness of the oxidation of the pyrite during roasting, and this in turn depends to a considerable extent on the prevention of the blanketing action of the very fine gangue and on the exposure of every particle of pyrite to the oxidising action of the air during roasting.

The attached table of results shows the extent to which the grade of the mill residues has been reduced by flotation.

Granular Grinding.

This investigation was carried out to determine whether by suitable modification of the method of charge grinding in the pebble mill in the laboratory, a granular product could be produced similar to that obtained by wet crushing in tube or similar mills on a large scale, where the product is removed from the mill as soon as it reaches the desired fineness, and is, therefore, not subjected to unnecessary grinding which tends to produce a true slime. The object was also to ascertain whether by such modification a maximum of material of the required fineness could be produced without producing a large quantity of material very much finer than that aimed at. The nature of the products from these tests is indicated in the accompanying grading analyses.

In the case of dry grinding in a ball mill, the production of a granular product is not possible, but in the case of wet grinding in tube mills or wet ball mills, it is possible to do so by removing the pulverised material from the mill as soon as it reaches the desired fineness, so that it is not subjected to further unnecessary grinding action, which would produce a flour.

In charge grinding in a pebble mill, removal of the granular fines as fast as the material is reduced to the desired fineness is not possible, but an approximation can be obtained by grinding for definite short periods of time, decanting off the fines through a screen of the desired fineness, and returning the oversize for further crushing, and continuing this treatment until the whole of the ore will pass the chosen screen.

In the tests carried out to determine the effect of such a method of grinding, the ore was first crushed dry to pass an 8 mesh I.M.M. screen. Tests were carried out on —40, —60, —80, —90, —120, and —150 mesh material, the object being to produce in the wet grinding process a granular product just fine enough to pass the screen, and a minimum of material much finer than the screen size set out for each test. In the first five cases, the dry-crushed ore was screened through the particular screen, the undersize being rejected, while the oversize was ground in the pebble mill, according to the stated method of short periods of grinding, followed by decantation and screening, until the whole of the ore passed the screen. In the case of the —150 mesh test, the —150 mesh product was removed from the dry-crushed ore, the oversize being then ground to pass the screen and the two portions were then combined for the test.

The nature of this method of grinding precluded oiling in the pebble mill during grinding, because of the continual dilution during decantation, and it was also not possible to oil the products subsequently in the pebble mill under efficient conditions, *i.e.*, with a pebble charge, because further grinding was inadmissible on account of the necessity of performing grading analyses of the products in each case. Hence recourse had to be had to oiling in the pebble mill by simple agitation or in the flotation machine by reversal of the direction of rotation of the impeller, neither of which methods could be considered to be as efficient as oiling during grinding. Hence, it was not expected that the recovery by flotation would, under the circumstances, be as high as when oiling was performed during the grinding operation. This opinion was borne out by the results, although the results on —90, —120 and —150 mesh products were satisfactory and showed a slight increase with increasing fineness. On the coarser grade materials, —40, —60, and —80 mesh, the results showed a very appreciable falling off, indicating that an increase in fineness of grinding was accompanied by an increased extraction.

Grading analyses of the flotation feed are shown, but, unfortunately, it was not possible to determine the percentages of material of finer grade than —200 mesh.

The question of the limiting fineness of grinding necessary to secure a high flotation recovery, is of importance on account of the rapid increase in the cost of finer grinding, owing to the increased power consumption required to carry out the operation, and it, therefore, becomes necessary to determine the economic crushing limit.

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School of Mines,
Kalgoorlie, 28th April, 1926.

FLOTATION TESTS ON BOULDER PERSEVERANCE MILL RESIDUES.

Test No.	Residues.		Water Wt., gram.	Oil.			Reagents.			Float.			Residue.		Time of flotation.	Recovery per cent.	Remarks.
	Dry Wt. gram.	Au. dwt. per ton.		Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.	Wt. gram.	Wt. per cent.	Au. dwt. per ton.	Wt. gram.	Au. dwt. per ton.	min.		
1	600	1·4	3,000	Euco-kero. ...	0·22	0·815	NaCl ... Pot. Xanth.	5% 0·05	soln 0·185	16·0	2·6	20·0	574	0·6	10	57·1	Residues first given one wash with water, then floated direct in machine without further grinding. Oiled in machine.
2	600	1·4	3,000	Euco-kero. ...	0·138	0·515	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·185	38·0	6·3	8·0	542	0·5	10	64·3	Residues not washed. Agitated in pebble mill with oils and reagents 15 min. Slight re grinding took place.
3	600	1·4	3,000	Kerosene ...	0·15	0·56	NaCl .. Pot. Xanth.	5% 0·05	soln. 0·185	17·3	2·9	6·0	573	0·5	10	64·3	Same treatment as Test 2.
4	600	1·4	3,000	Euco ... Kerosene ...	0·12 0·125	0·45 0·47	Pot Xanth.	0·05	0·185	18·3	3·05	10·0	572	0·4	10	71·4	Residues washed before treatment. No. salt.
5	600	1·4	3,000	Euco. ... Kerosene ..	0·12 0·125	0·45 0·47	CuSO4 ... Pot. Xanth.	2·0 0·05	7·5 0·185	25·0	4·2	12·0	565	0·4	10	71·4	Residues washed before treatment.

Note.—Salt water is not necessary for flotation on account of these residues having been roasted.

School of Mines, Kalgoorlie, 26th April, 1926.

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BOULDER PERSEVERANCE ORE.

Magnetite Concentrates.

1. Concentrate panned off from Flotation Residues and Magnetite extracted by magnetic concentration.

Weight of Residues taken	... 7,600 gram.
Weight of Magnetite ...	... 6·3 gram.
Percentage of Magnetite	... 0·083
Assay Value, dwt. per ton	**... 30·0**

2. Concentrate panned off from Mill Residues and Magnetite extracted by magnetic concentration.

Weight of Residues taken	1,620 gram. (dry wt.)
Weight of Magnetite ...	... 6·97 gram.
Percentage of Magnetite	... 0·38
Assay value, dwt. per ton	... 6·0

Magnetic concentrates when examined microscopically showed no free gold.

FLOTATION TESTS ON BOULDER PERSEVERANCE ORE TO DETERMINE THE EFFECT OF GRANULAR GRINDING.

Test No.	Ore. Wt. gram.	Ore. dwt. per ton.	Water Wt. gram.	Oil. Description.	Oil. Wt. gram.	Oil. Wt. lb./ton	Reagents. Description.	Reagents. Wt. gram.	Reagents. Wt. lb./ton.	Float. Wt. gram.	Float. Per cent.	Float. Au. dwt./ton.	Residues. Wt. gram.	Residues. Au. dwt./ton.	Time of flotation. min.	Recovery. per cent.
1	600	12·0	3,000	Euco-tar (1 : 6) Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth. ...	5% 0·05	soln. 0·185	68·0	11·3	92·0	522·0	0·9	10	92·5
2	600	12·8	3,000	Euco-tar (1 : 6) Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... ... Pot. Xanth. ...	5% 0·05	soln. 0·185	85·0	14·2	73·0	505·0	0·85	10	93·3
3	600	14·4	3,000	Euco-tar (1 : 6) Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... ... Pot. Xanth. ...	5% 0·05	soln. 0·185	91·0	15·2	77·0	499·0	0·8	10	94·4

METHOD OF TREATMENT.

TEST 1.—The sample was first crushed dry through 8 mesh I.M.M., then screened dry through 90 mesh I.M.M., the minus 90 mesh product being rejected. 600 gram of plus 90 mesh product were slimed in pebble mill by grinding and screening through 90 mesh every ten miuntes. The minus 90 mesh pulp was dewatered and made up to usual bulk and floated after adding reagents and oils in machine. Oiling was performed by reversing the direction of rotation of the impeller for two minutes.

TEST 2.—The sample was first crushed dry through 8 mesh I.M.M., then screened dry through 120 mesh I.M.M., the minus 120 mesh product being rejected. 600 gram of minus 120 mesh product were slimed in the pebble mill by grinding and screening through 120 mesh every ten minutes. The minus 120 mesh pulp was agitated with a few pebbles in the pebble mill with the reagents and oils for three minutes to endeavour to obtain more efficient oiling. Flotation was carried out as usual.

TEST 3.—The sample was first crushed dry through 8 mesh I.M.M., 600 grams were taken for the test and minus 150 mesh material removed before wet grinding. The plus 150 mesh product was slimed in the pebble mill by grinding and screening through 150 mesh every 10 minutes. The whole of the minus 150 mesh product was combined and subsequently treated as in Test 2.

In all three tests the residues were amalgamated after flotation.

GRADING ANALYSES OF PRODUCTS.

Test 1. Screen.	Test 1. Per cent.	Test 2. Screen.	Test 2. Per cent.	Test 3. Screen.	Test 3. Per cent.
+100 I.M.M.	0·8	+100 I.M.M.	0·0	+100 I.M.M.	0·0
+120 I.M.M.	0·4	+120 I.M.M.	0·0	+120 I.M.M.	0·0
+150 I.M.M.	4·3	+150 I.M.M.	1·7	+150 I.M.M.	0·0
+200	2·3	+200	1·0	+200	0·85
- 200	92·2	- 200	97·3	- 200	99·15
	100·0		100·0		100·0

N.B.—Above 200 mesh screen is not I.M.M.

FLOTATION TESTS ON BOULDER PERSEVERANCE ORE TO DETERMINE THE EFFECT OF GRANULAR GRINDING.

Test No.	Ore. Wt. gram.	Ore. Au, dwt. per ton.	Water Wt., gram.	Oil. Description.	Oil. Wt., gram.	Oil. Wt. lb. per ton.	Reagent. Description.	Reagent. Wt. gram.	Reagent. Wt. lb. per ton.	Float. Wt. gram.	Float. Wt. per cent.	Float. Au dwt. per ton.	Residue. Wt. gram.	Residue. Au dwt. per ton.	Time of flotation.	Recovery per cent.	Remarks.
4	600	12·8	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·185	55	9·2	140·0	535	1·25	min. 10	90·2	-80 product.
5	600	12·8	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·185	75	12·5	62·0	515	1·4	10	89·1	-60 product.
6	600	15·2	3,000	Euco-tar ... Kerosene ...	0·36 0·15	1·34 0·56	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·185	63	10·5	72·0	527	2·0	10	86·8	-40 product.

REMARKS—

Test 4.—Sample first crushed dry through 8 mesh I.M.M., then screened dry through 80 mesh I.M.M., the -80 product being rejected. 600 gram of plus 80 product were slimed in pebble mill by grinding and screening through 80 mesh I.M.M. every 7 minutes. The -80 mesh product was dewatered and made up to usual bulk with 5% salt solution and floated after amalgamation. Oiling was done in flotation machine.

Test 5.—The -60 mesh product was treated similarly to Test 4, using 60 mesh I.M.M. screen.

Test 6.—The -40 mesh product was treated similarly to Test 4, using 40 mesh I.M.M. screen.

A. S. WINTER,
Research Metallurgist.

R. H. MOORE,
Lecturer in Metallurgy.

School of Mines, Kalgoorlie, 28th April, 1926.

FLOTATION TESTS ON BOULDER PERSEVERANCE ORE TO DETERMINE THE EFFECT OF GRANULAR GRINDING.

Grading Analyses of Products.

Test. 4 Screen.	Test. 4 Per cent.	Test 5. Screen.	Test 5. Per cent.	Test 6. Screen.	Test 6. Per cent.
+60	...	+60	...	+60	0·5
+80	...	+80	1·30	+80	7·0
+100	0·15	+100	1·45	+100	5·7
+120	2·40	+120	10·73	+120	12·2
+150	5·90	+150	13·25	+150	10·2
+200	0·04	+200	1·17	+200	0·2
—200	91·51	—200	72·10	—200	64·2
	100·00		100·00		100·00

N.B.—Above 200 mesh screen is not I.M.M.

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES, KALGOORLIE, ON A SAMPLE OF ACCUMULATED AGITATOR CONCENTRATE FROM BOULDER PERSEVERANCE GOLD MINE.

It is found in the mill of the Boulder Perseverance that in the agitators supplying the pulp to the filter presses, a heavy concentrate of high grade accumulates.

Dr. Edwards furnished us with a sample of this concentrate, that we might determine its nature and the mode of occurrence of the gold. Preliminary investigation showed that the magnetite which occurs in small quantity in Boulder Perseverance ore had concentrated in this material to a considerable extent.

In order to determine the percentage of magnetite and its value, a magnetic concentration test was performed on a concentrate obtained by gravity concentration, from which magnetite equivalent to 10.3 per cent. of the original agitator concentrate was recovered. The residual portion of the gravity concentrate, on careful examination microscopically, was found to contain free gold, unaltered pyrite, superficially oxidised pyrite, and gangue particles containing included pyrite.

The presence of amalgam in the agitator concentrate is indicated by the result of Test A, in which the sample was agitated with clean silver foil.

Flotation tests on the agitator concentrate, with and without amalgamation, showed that substantial reductions in the grade of the material could be made in this way, with the production of a very high grade concentrate. In these tests, a limited amount of regrinding was adopted before flotation, and the concentrates consisted largely of unaltered pyrite, free gold and amalgam.

Details of these tests are shown on the accompanying sheet.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 30th April, 1926.

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES, KALGOORLIE, ON A SAMPLE OF ACCUMULATED AGITATOR CONCENTRATE FROM BOULDER PERSEVERANCE GOLD MINE.

Accumulated Agitator Concentrate.

Assay Value	55·2 dwt. Au. per ton (2,240 lb.).

Magnetic Concentration.

Weight of concentrate, per cent ...	10·3
Assay value, dwt. Au per ton	64·0
Per cent. of total Au recovered	11·94

Recovery of Amalgam and Free Gold.

Test A.—Agitation with clean Silver.

Assay value of concentrate, dwt. per ton ...	55·2
Assay value of residue, dwt. per ton ...	45·6
Per cent. of total Au recovered ...	17·39

Test B.—Agitation with Amalgamated Silver.

Assay value of concentrate, dwt. per ton ...	55·2
Assay value of residue, dwt. per ton ...	47·6
Per cent. of total Au recovered	13·77

Flotation Tests.

Test 1:—

Head Assay value, dwt. per ton	55·2
Concentrate—	
Percentage weight	2·8
Assay value, dwt. per ton	1520·0
Residue—	
Assay value, dwt. per ton	15·0
Per cent. of total Au recovered ...	72·8

Remarks.—Charge re-ground in pebble mill for 30 minutes with Euco-tar equivalent to 0·9 lb. per ton, kerosene, equivalent to 0·75 lb. per ton and potassium xanthate equivalent to 0·187 lb. per ton. This test was carried out without amalgamation.

Test 2:—

Head Assay value, dwt. per ton ...	55·2
Concentrate—	
Percentage weight	3·3
Assay value, dwt. per ton	834·0
Residue—	
Assay value, dwt. per ton	12·6
Per cent. of total Au recovered ...	77·2

Remarks.—Treatment as in Test 1, but with amalgamation.

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES, KALGOORLIE, ON THE FLOTATION OF PYRITIC GOLD ORE FROM THE GREAT BOULDER PROPRIETARY GOLD MINE.

A careful examination of this ore disclosed the presence of free gold, and, as preliminary flotation tests indicated, by the presence of free coarse gold in the residue, that some of the free gold after grinding of the ore was not amenable to flotation, it was necessary that amalgamation should be practised, either before or after flotation. Amalgamation before flotation removes a considerable proportion of the gold content of the ore, as is shown by a comparison of the grade of the concentrates produced in the two cases, but amalgamation after flotation gives slightly lower final residues, and has also the advantage that most of the gold present in the ore is collected in the form of a flotation concentrate which is of very much higher grade than when amalgamation takes place before flotation.

The tests are divided into four groups for the sake of comparison of results:—

(a) Flotation in five per cent. salt (NaC1) solution with addition of potassium xanthate, and amalgamation before flotation.

(b) Flotation in five per cent. salt (NaC1) solution with addition of potassium xanthate, and amalgamation after flotation.

(c) Flotation in five per cent. salt (NaC1) solution without addition of potassium xanthate, and amalgamation after flotation.

(d) Flotation in fresh water with addition of potassium xanthate, and amalgamation after flotation.

The results of these tests under conditions which have been found to yield similar results on other Kalgoorlie ores show clearly—

1. That the use of potassium xanthate is beneficial in that it enables a better collection of the pyrite to be made. This is due to the action of the potassium xanthate, which is a collector but not a frother.

2. Amalgamation after flotation gives slightly higher recoveries than amalgamation before flotation.

3. That whereas flotation in salt water yields a concentrate varying from 10.3 to 13.3 per cent. of the weight of the ore, flotation in fresh water yields a concentrate varying from 21.8 to 22.9 per cent. of the weight of the ore. The cost of subsequent treatment of the concentrate from fresh water flotation would therefore be practically double that of the concentrate from salt water flotation.

4. A high percentage recovery of the gold can be made by combined flotation and amalgamation.

5. That the use of potassium xanthate enables lower grade residues to be produced than without its use.

6. That a high grade concentrate can be made by flotation in salt water with the use of potassium xanthate, but that when fresh water is used with potassium xanthate, the grade of the concentrate is very much reduced.

7. That under the conditions of these tests the pyrite in this ore floats readily and rapidly.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 15th May, 1926.

FLOTATION TESTS ON GREAT BOULDER PROPRIETARY ORE.

Sample No. 1. Assay Value, 15·2 dwt. Au. per ton (2,240 lbs.).

Test No.	Ore wt., gram.	Water wt., gram.	Oil. Description.	Oil. Wt. gram.	Oil. Wt. lb./ton.	Reagents. Description.	Reagents. Wt. gram.	Reagents. Wt. lb./ton.	Time of grinding, min.	Float. Wt., gram.	Float. Wt. per cent.	Float. Au. dwt./ton.	Residue. Wt., gram.	Residue. Au. dwt./ton.	Time of flotation. min.	Recovery per cent.	Remarks.
1	600	3,000	Euco-tar ... Kerosene	0·30 0·20	1·12 0·75	NaC1 ... Pot. Xanth.	5% 0·05	soln. 0·187	min. 60	78·0	13·0	58·0	512·0	0·80	10	94·7	Amalgamated before flotation.
2	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ... Pot. Xanth.	5% 0·05	soln. 0·187	60	74·0	12·3	58·0	516·0	0·85	10	94·4	
3	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ... Pot. Xanth.	5% 0·05	soln. 0·187	60	80·0	13·3	56·0	510·0	0·75	10	95·06	
4	600	3,000	Euco:tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ... Pot. Xanth.	5% 0·05	soln. 0·187	60	74·0	12·3	108·0	516·0	0·70	10	95·4	Amalgamated after flotation.
5	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ... Pot. Xanth.	5% 0·05	soln. 0·187	60	74·5	12·4	117·0	515·0	0·70	10	95·4	
6	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ... Pot. Xanth.	5% 0·05	soln. 0·187	60	78·0	13·0	111·0	512·0	0·65	10	95·7	
7	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ...	5%	soln.	60	64·0	10·7	108·0	526·0	1·15	10	92·4	No pot. xanthate. Amalgamated after flotation.
8	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ...	5%	soln.	60	65·0	10·8	106·0	525·0	1·10	10	92·8	
9	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	NaC1 ...	5%	soln.	60	62·0	10·3	112·0	528·0	1·15	10	92·4	
10	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	Pot. Xanth.	0·05	0·187	60	136·5	22·7	60·0	453·5	0·75	10	95·06	No NaC1, Potassium xanthate added, amalgated after flotation.
11	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	Pot. Xanth.	0·05	0·187	60	131·0	21·8	72·0	459·0	0·75	10	95·06	
12	600	3,000	Euco-tar ... Kerosene ...	0·30 0·20	1·12 0·75	Pot. Xanth.	0·05	0·187	60	137·5	22·9	65·0	452·5	0·65	10	95·7	

Euco-tar mixture = 1 part eucalyptus: 6 parts coal tar, by weight.

School of Mines, Kalgoorlie, 15th May, 1926.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES ON THE FLOTATION OF PYRITIC GOLD ORE FROM GOLDEN HORSESHOE MINE.

In order that the series of tests on ores from the mines of the Golden Mile might be made complete, the Management of the Golden Horseshoe Estates was requested to furnish the School with a sample of ore for investigation by flotation, this being the only producing mine whose ore had not been tested. Two samples of ore were supplied shortly after the mine closed down, on one of which, assaying 10.8 dwt. Au. per ton, a series of tests has been carried out along lines found satisfactory in the case of other ores of the belt.

This ore contained appreciably more calcite than the usual run of Kalgoorlie ores, occurring in large crystalline pieces. This, in conjunction with the proportion of oils used, appeared to be responsible for the somewhat higher percentage weight of concentrate than is usual, as shown in Tests 1-7, and it was found advisable to modify the proportions of oils by increasing the quantity of kerosene and diminishing the quantities of the heavier collecting oils, eucalyptus oil and coal tar. This modification of conditions reduced the percentage weight of concentrate to the normal figure and materially increased the grade of concentrate.

Apart from this slight modification, flotation conditions were as usual, and the ore presents no difficulty so far as flotation of the pyrite is concerned.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 15th July, 1926.

FLOTATION TESTS ON GOLDEN HORSESHOE ORE.

No. 1 Sample, Assay value—10·8 dwt. Au. per ton (2,240lb.).

Test No.	Ore, Wt., gram.	Water, Wt., gram.	Oil.			Re-agents.			Time of grinding, min.	Float.			Residue.		Time of flotation, min.	Recovery, per cent.
			Description.	Wt. gram.	Wt. lb./ton.	Description.	Wt., gram.	Wt., lb./ton.		Wt., gram.	Wt., per cent.	Au, dwt./ton.	Wt., gram.	Au, dwt./ton.		
1	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	107·5	17·9	56·0	482	1·05	7	90·3
2	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	105·2	17·5	57·0	485	0·9	7	91·7
3	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth.	5% 0·05	soln. 0·187	60	96·8	16·1	63·5	493	0·75	7	93·0
4	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth	2% 0·05	soln. 0·187	60	107·3	17·9	56·5	483	0·65	7	94·0
5	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	95·6	15·9	60·0	494	0·8	7	92·6
6	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	100·1	16·7	59·0	490	1·0	7	90·7
7	600	3,000	Euco-tar ... Kerosene ...	0·3 0·2	1·12 0·75	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	88·4	14·7	68·0	502	0·85	7	92·1
8	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	69·3	11·5	84·5	521	1·0	7	90·7
9	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	70·7	11·8	76·0	519	0·9	7	91·7
10	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	69·0	11·5	80·0	521	0·9	7	91·7
11	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	63·9	10·6	86·0	526	1·0	7	90·7
12	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	70·0	11·7	80·0	520	0·95	7	91·2
13	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	74·5	12·4	74·0	515	0·85	7	92·1
14	600	3,000	Euco-tar ... Kerosene ...	0·24 0·3	0·90 1·12	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	60	71·7	11·9	82·0	518	0·9	7	91·7

Euco-tar = 1 part eucalyptus oil: 6 parts coal tar, by weight.

School of Mines, Kalgoorlie, 15th July, 1926.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE.
Lecturer in Metallurgy

REPORT ON INVESTIGATION WORK CARRIED OUT IN THE METALLURGICAL LABORATORY ON ORE FROM WILUNA SENT IN BY H. E. VAIL, ESQ.

The Sample—

The sample on which the investigation was conducted was received at the School of Mines in the crushed state, having been crushed dry to pass an eight-mesh screen.

The grading analysis of the sample as received is as follows:—

Plus	8 mesh	..	5.2	per cent.
„	16 „	..	20.6	„
„	20 „	..	4.8	„
„	40 „	..	20.2	„
„	60 „	..	9.3	„
„	80 „	..	6.8	„
„	100 „	..	1.6	„
„	150 „	..	8.4	„
„	200 „	..	2.4	„
Minus	200 „	..	20.6	„
			99.9	„

Flotation Tests—

Thirty-eight flotation tests were carried out, and varying conditions of treatment were tried, viz.:—

(a) Different oil mixture.
(b) Use of potassium xanthate.
(c) Reduced quantities of potassium xanthate.
(d) Without potassium xanthate.
(e) Two per cent. salt solution.
(f) Three per cent. salt solution.
(g) Without salt in solution.
(h) Wiluna salt water.
(i) Use of return salt liquor from previous tests.

Most of the oil mixture used gave good results, but the best results were obtained from a salt solution with the addition of potassium xanthate. It has been found that this reagent can be used in very small amounts with equally good results, the smallest amount used being equal to ½ oz. per ton of ore.

The concentrate produced from the tests by flotation was very clean, and weighed approximately 12.5 per cent. of the total ore.

Treatment of Flotation Concentrate by Roasting and Cyanidation—

The roasting of the flotation concentrate was carried out in a wood fired muffle furnace, by placing a small muffle inside a larger one. The temperature of the inside muffle at the commencement of roasting was kept very low; the muffle was not allowed to show any signs of redness. At that temperature the roasting started, and continued until all the sulphur had burnt out. The concentrate is an ideal product to roast; there was not the slightest sign of sinter, and as there is sufficient sulphur present to act as a fuel, the roasting should not be costly.

The concentrate contains 24.7 per cent. of sulphur, and it loses on roasting 22 per cent. by weight.

Two cyanidation tests were conducted on the roasted material under varying conditions, as shown in the tabulation. The residues from these tests are high, but I consider that they can be greatly improved upon by a slight modification in the treatment. The roasted product being very high grade may require longer agitation, or perhaps a stronger cyanide solution.

Presence of Salt in Concentrate—

As the flotation of the concentrate is carried out in a salt solution, it is very essential that this salt must be removed before the concentrate is roasted, otherwise a heavy loss of gold by volatilization will occur. Salt being very soluble it is easily removed by washing, and this presents no great difficulty on a large scale.

I have assayed the concentrate under the two different conditions, with the following results:—

Washed concentrate (after roasting)—Gold lost, nil.

Unwashed concentrate, containing salt (after roasting)—Gold lost, 37.7 per cent.

A. S. WINTER,
Research Metallurgist.

2nd October, 1925.

FLOTATION TESTS ON WILUNA ORE.

Test No.	Ore.		Water Wt. gram.	Oil.			Reagents.			Float.			Tails.		Recovery per cent.	Remarks.
	Wt. grms.	Gold dwt. ton.		Description.	Wt. gram.	Wt. lb. ton.	Description.	Wt. gram.	Wt. lb. ton.	Wt. grm.	Percentage Weight.	Gold dwt. ton.	Wt. gram.	Gold dwt. ton.		
1	600	10·4	3,000	Pine ...	·66	2·2	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	72·3	12·05	76·0	518	0·95	90·9	45 mins. grinding in Pebble Mill.
2	600	10·4	3,000	Kero. ... Eu. Py. tar...	·4 ·24	1·33 ·8	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	72·0	12·0	80·0	518	0·8	92·3	45 mins. grinding in Pebble Mill.
3	600	10·4	3,000	Kero. ... Eu. Py. tar	·4 ·24	1·33 ·8	NaCl ... Pot. Xan. ...	3 % soln. ·05	·16	78·0	13·0	74·0	512	0·85	91·8	45 mins. grinding in Pebble Mill.
4	600	10·4	3,000	Kero. ... Eu. Py. tar	·4 ·24	1·33 0·8	NaCl ...	3 % soln.	...	64·9	10·8	83·0	525	1·25	88·0	45 mins. grinding in Pebble Mill. No Pot. Xan. in this test.
5	600	10·4	3,000	Kero. ... Eu. Py. tar	·45 ·24	1·5 ·8	NaCl ... Pot. Xan. ...	3 % soln. ·05	·16	65·2	10·9	82·0	525	0·9	91·3	45 mins. grinding in Pebble Mill.
6	600	10·4	3,000	Kero. ... Eu. Py. tar	·45 ·24	1·5 ·8	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	76·5	12·7	75·0	514	1·3	87·5	30 mins. grinding in Pebble Mill.
7	600	10·4	3,000	Kero. ... Eu. Py. tar	·45 ·24	1·5 ·8	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	70·7	11·8	79·0	519	1·1	89·4	40 mins. grinding in Pebble Mill.
8	600	10·4	3,000	Kero. ... Eu. Py. tar	·45 ·24	1·5 ·8	Pot. Xan. ...	·05	·16	68·5	11·4	79·0	522	1·2	88·4	45 mins. grinding in Pebble Mill. No salt in this test.
9	600	10·4	3,000	Pine ...	·66	2·2	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	74·5	12·4	74·0	515	0·95	90·9	60 mins. grinding in Pebble Mill.
10	600	10·4	3,000	Kero. ... Eu. Py. tar	·45 ·21	1·5 ·7	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	72·3	12·05	74·0	518	0·9	91·3	60 mins. grinding in Pebble Mill.
11	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·3	1·0 1·0	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	76·0	12·6	76·0	514	0·9	91·3	60 mins. grinding in Pebble Mill.
12	600	10·4	3,000	Kero. Eu. ...	·6	2·0	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	85·5	14·2	69·0	504	0·8	92·3	60 mins. grinding in Pebble Mill.
13	600	10·4	3,000	Kero ... Eu. Py. tar	·3 ·36	1·0 1·2	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	80·3	13·4	70·0	510	0·8	92·3	60 mins. grinding in Pebble Mill.
14	600	10·4	3,000	Kero. ... Eu. Py. tar	·35 ·3	1·17 1·0	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	71·8	11·9	74·0	518	0·85	91·8	60 mins. grinding in Pebble Mill.
15	600	10·4	3,000	Coal tar ... Creosote ...	·66	2·2	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	76·7	12·8	70·0	514	1·0	90·4	
16	600	10·4	3,000	Yarmor ... Pine ...	·66	2·2	NaCl ... Pot. Xan. ...	2 % soln. ·05	·16	79·5	13·2	69·0	510	0·85	91·8	
17	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·36	1·0 1·2	Pot. Xan. ...	·05	·16	79·0	13·2	71·0	511	1·00	90·4	Wiluna salt water used.
18	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·36	1·0 1·2	Pot. Xan. ...	·05	·16	84·7	14·1	66·0	505	·95	90·9	Wiluna salt water used.
19	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·36	1·0 1·2	Pot. Xan. ...	·05	·16	82·5	13·7	67·0	507	·90	91·3	Wiluna salt water used.
20	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·36	1·0 1·2	Pot. Xan. ...	·05	·16	93·7	15·6	59·0	497	·65	93·8	Liquor from above tests used. This float taken off over 20 mins. Usual time of floating 5 minutes.
21	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·36	1·0 1·2	Pot. Xan. ...	·05	·16	74·0	12·3	77·0	516	·90	91·3	Liquor from above test used.
22	600	10·4	3,000	Kero. ... Eu. Py. tar	·3 ·36	1·0 1·2	Pot. Xan. ...	·05	·16	77·3	12·9	72·0	513	·80	92·3	Liquor from above test used.
23	600	10·4	3,000	Kero. Eu.	·6	2·0	Pot. Xan. ...	·05	·16	88·3	14·7	62·0	502	·90	91·3	Wiluna salt water used.
24	600	10·4	3,000	Kero. Eu. ...	·6	2·0	Pot. Xan. ...	·05	·16	78·0	13·0	72·0	512	·90	91·3	Wiluna salt water used.
25	600	10·4	3,000	Kero. Eu. ...	·6	2·0	Pot. Xan. ...	·05	·16	87·0	14·5	66·0	503	·75	92·8	Wiluna salt water used This float taken off over 15 mins.
26	600	10·4	3,000	Kero. Eu. ...	·6	2·0	Pot. Xan. ...	·05	·16	80·0	13·3	68·0	510	·80	92·3	Liquor from above tests used.
27	600	10·4	3,000	Kero. Eu. ...	·6	2·0	Pot. Xan. ...	·05	·16	74·5	12·4	74·0	515	·80	92·3	Liqour from above tests used.
28	600	10·4	3,000	Kero. Eu. ...	·6	2·0	Pot. Xan. ...	·05	·16	74·2	12·4	77·0	516	·80	92·3	Liquor from above tests used.
29	600	10·4	3,000	Kero. Eu. ...	·6	2·0	Pot. Xan. ...	·05	·16	70·3	11·7	75·0	520	1·0	90·4	Liquor from above tests used.

FLOTATION TESTS ON WILUNA ORE—*continued.*

Test No.	Ore.		Water Wt. gram.	Oil.			Reagents.			Float.			Tails.		Recovery per cent.	Remarks.
	Wt. grms.	Gold dwt. ton.		Description.	Wt. gram.	Wt. lb. ton.	Description.	Wt. gram.	Wt. lb. ton.	Wt. gram.	Percentage Weight.	Gold dwt. ton.	Wt. gram.	Gold dwt. ton.		
30	600	10·4	3,000	Kero. + Eu. Eu. Py. tar	·6 ·18	2·0 ·6	... ...	... ...	... ...	79·4	13·2	72·0	510	1·1	89·4	Tests :—30, 31 and 32 carried out with Pot. Xan., using Euc. and Kero. mixture as oil, float very poor, added Eu. Py. tar mix in machine.
31	600	10·4	3,000	Kero. + Eu. Eu. Py. tar	·6 ·18	2·0 ·6	... ...	... ...	... ...	73·0	12·2	74·0	517	1·2	88·4	Liquor used from previous tests.
32	600	10·4	3,000	Kero. + Eu. Eu. Py. tar	·6 ·18	2·0 ·6	... ...	... ...	... ...	73·3	12·2	74·0	516	1·2	88·4	
33	600	10·4	3,000	Kero. ... Eu. Py. tar	·25 ·30	·81 1·0	Pot. ... Xan. ...	·05	·16	86·0	14·3	67·0	504	·95	90·9	Fresh sample of ore used in tests 33 and 34. Crushed dry down to 8 mesh, then wet crushed. Wiluna salt water used in No. 33 test—floated 7 mins.
34	600	10·4	3,000	Kero. ... Eu. Py. tar	·25 ·30	·81 1·0	Pot. ... Xan. ...	·05	·16	76·7	12·8	73·0	513	1·2	88·4	Liquor used in 34 test floated 4 mins.
35	600	10·4	3,000	Kero. ... Eu. Py. tar	·25 ·30	·81 1·0	Pot. ... Xan. ...	·025	·08	74·2	12·4	74·0	515	·9	91·3	
36	600	10·4	3,000	Kero. ... Eu. Py. tar	·25 ·30	·81 1·0	Pot. ... Xan. ...	·015	·048	68·3	11·4	82·0	521	·85	91·8	Reduced Pot. Xan.
37	600	10·4	3,000	Kero. ... Eu. Py. tar	·25 ·30	·81 1·0	Pot. ... Xan. ...	·10	·032	77·3	12·9	73·0	512	·85	91·8	Used liquor from previous tests.
38	600	10·4	3,000	Kero. ... Eu. Py. tar	·25 ·30	·81 1·0	Pot. ... Xan. ...	·10	·032	77·0	12·8	74·0	513	1·0	90·4	Wiluna salt water, and Wiluna fresh water used in this test 1 : 1.

WILUNA ORE GRADING ANALYSES.

Showing the effect of fine grinding in the Pebble Mill.

Sample as received (crushed dry minus 8 mesh).

	Plus 150 I.M.M.
After 45 minutes grinding in the Pebble Mill ...	21·1%
After 60 minutes grinding in the Pebble Mill ...	10·3%

CYANIDATION TESTS ON WILUNA FLOTATION CONCENTRATE.

No. 1.

Roasted Concentrate ... ... 200 gram.
KCN Solution ... ... 1,000 c.c. ·2% KCN.

Treatment :—
Ground in Pebble Mill with cyanide solution for 6 hours, left in contact 34 hours (over Sunday) in closed jar. Then air agitated in glass Pachuca for 6 hours with addition of further ·1% KCN.

Assays of Products :—
Raw Concentrate ... ... 68 dwts.
Roast Concentrate ... ... 82 dwts.
Residues (calculated on Roast Concentrates) ... ... 4·8 dwts.

Extraction :—
Gold ... ... 94·2%

No. 2.

Roasted Concentrate ... ... 200 gram.
KCN Solution ... ... 1,000 c.c. ·2 KCN.

Treatment :—
Ground Roasted Concentrate in Pebble Mill with ·6 gram. lime and 1,000cc. water for 3 hours, then transferred to glass Pachuca and air agitated for 2 hours. Filter-pressed and washed ; afterwards air agitated with 1,000 c.cs. ·2% KCN Solution for 12 hours.

Assay of Products
Raw Concentrate ... ... 68 dwts.
Roast Concentrate ... ... 86·5 dwts.
Residues (calculated on Roast Concentrates) ... ... 5·8 dwts.

Extraction :—
Gold ... ... 93·3%

REPORT OF AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY OF THE SCHOOL OF MINES ON THE FLOTATION OF PYRITIC GOLD ORE FROM CELEBRATION MINE.

The sample of ore was received from the manager of the mine in September, 1925, but its investigation has been delayed by the necessity of carrying out other more pressing tests. The sample was received in a comparatively fine state, which, in conjunction with the interval of time that elapsed between its receipt and its treatment, possibly had a harmful effect on the flotation treatment.

In all, 27 tests were carried out, with the results shown in the accompanying tables. As far as possible, the conditions under which these tests were carried out were similar to those adopted for previously described tests on Kalgoorlie pyritic gold ores. These tests fall into two series according to the time occupied in flotation. In the first series, consisting of the first ten tests, the time of flotation was 3.5 minutes, while in the second series, consisting of the last 17 tests, 10-minute flotation was adopted. The density of pulp was kept constant throughout, while variations were made in all other operating factors.

The results of these tests showed that—

1. This ore is amenable to flotation, and that satisfactory recoveries can be made in the concentrates.

2. While a mixture of kerosene and eucalyptus (1.1) gave slightly better results than a mixture of kerosene, eucalyptus, and coal tar (6 : 1 : 6), the increased cost due to the larger proportion of eucalyptus used in the former case is a decided disadvantage, and the small extra recovery does not compensate for the additional cost.

3. Results were not improved when pyridine was used in conjunction with the other oils, and for that reason and on account of the difficulty of procuring this reagent its use was discontinued.

4. The use of salt water may not be necessary with this class of ore on account of the absence of colloids; but its use was adopted (5 per cent. solution) because conditions existing at the mine would entail the use of mine water for treatment. The presence of salt in solution in the treatment water has been shown to be always beneficial.

5. The use of potassium xanthate as a conditioning agent in amounts varying from 0.09 to 0.74 pounds per ton resulted in no material benefit.

6. Extremely fine grinding of this particular sample was essential. (The ore was crushed dry to pass 16 mesh I.M.M., and then ground wet in the Pebble mill for 30-minute, 45-minute, and 60-minute periods, the last-named giving best results. Grading analyses of the three products are attached.)

The results of these tests are calculated on the basis of the long ton of 2,240lbs., which makes the grade of the residues apparently compare somewhat unfavourably with the grade of residues obtained on ores previously tested, in which cases, however, the short ton of 2,000lbs. constituted the basis for calculation. This also makes the proportions of oils used appear greater than in previous tests.

GRADING ANALYSES.

Mesh I.M.M.	30 minutes' grinding wet per cent.	45 minutes' grinding wet per cent.	60 minutes' grinding wet per cent.
Plus 150	12·8	7·9	2·4
Plus 200	2·8	1·9	1·0
Minus 200	84·4	90·2	96·6
	100·0	100·0	100·0

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School of Mines,
Kalgoorlie, 10th March, 1926.

FLOTATION TESTS ON CELEBRATION ORE.

Assay Value 7·5 dwts. Au. per ton (2,240lbs).

Test No.	Ore wt. gms.	Water wt. gms.	Oil. Description.	Oil. Wt. gms.	Oil. Wt. lb. ton.	Reagents. Description.	Reagents. Wt. gms.	Reagents. Wt. lb. ton.	Time of grinding, mins.	Float. Wt. grms.	Float. % wt.	Float. Au. dwt. ton.	Tails. Wt. grms.	Tails. Au. dwt. ton.	Recovery	Time of floating. mins.	Remarks.
1 ...	600 ...	3,000 ...	Eu. Tar (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	2 % ·1	Soln. ·37	30 ...	65·5 ...	10·9 ...	54 ...	524 ...	1·8 ...	76·0 ...	3½ ...	Insufficient grinding.
2 ...	600 ...	3,000 ...	Eu. Tar (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	2 % ·1	Soln. ·37	45 ...	82·5 ...	13·7 ...	44 ...	507 ...	1·45 ...	80·6 ...	3½ ...	Insufficient grinding
3 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	2 % ·1	Soln. ·37	60 ...	71·8 ...	11·9 ...	55 ...	517 ...	0·9 ...	88·0 ...	3½ ...	
4 ...	600 ...	3,000 ...	Eu. Tar (1·6) Kero. ...	·24 ·25	·89 ·93	NaCl	2 % ...	Soln. ...	45 ...	67·2 ...	11·2 ...	56 ...	522 ...	1·2 ...	84·0 ...	3½ ...	No Xanthate.
5 ...	600 ...	3,000 ...	Eu Tar. (1·6) Kero. ...	·24 ·25	·89 ·93	NaCl	2 % ...	Soln. ...	60 ...	64·8 ...	10·8 ...	61 ...	525 ...	1·15 ...	84·6 ...	3½ ...	No Xanthate.
6 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·24 ·25	·89 ·93	NaCl	2 % ...	Soln. ...	75 ...	64·0 ...	10·7 ...	56 ...	526 ...	0·9 ...	88·0 ...	3½ ...	No Xanthate.
7	600	3,000	Eu. Tar. (1·6) Kero. ...	·24 ·25	·89 ·93	... Pot. Xan. ...	·1 ...	·37 ...	60 ...	... ...	... ...	48 ...	... ...	1·1 ...	85·3 ...	3½ ...	No salt, most of float lost.
8 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·24 ·25	·89 ·93	... ...	... ...	... ...	60 ...	76·5 ...	12·7 ...	47 ...	514 ...	1·2 ...	84·0 ...	3½ ...	No salt, no Xanthate.
9 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·24 ·25	·89 ·93	NaCl ... Pot. Xan. ...	3 % ·1	Soln. ·37	60 ...	67·0 ...	11·2 ...	56 ...	523 ...	0·95 ...	87·3 ...	3½ ...	Salt increased to 3 per cent.
10 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·24 ·25	·89 ·93	... Pot. Xan. ...	... ·1	... ·37	... 60	... 90·6	... 15·1	... 42	... 500	... 1·15	... 84·6	... 3½	Repeat of test No. 7
11 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	90 ...	75·0 ...	12·5 ...	51·5 ...	515 ...	0·8 ...	89·3 ...	10 ...	Salt increased to approx. amount present in mine water.
12 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	90 ...	81·2 ...	13·5 ...	46· ...	509 ...	0·7 ...	90·6 ...	10 ...	do. do.
13	600	3,000	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 90	... 73·8	... 12·3	... 52	... 517	... 0·8	... 89·3	... 10	do. do.
14 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 85·3	... 14·2	... 43	... 505	... 0·85	... 88·6	... 10	do. do.
15 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 87·1	... 14·5	... 44·5	... 503	... 0·8	... 89·3	... 10	do. do.
16 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 82·0	... 13·7	... 44·0	... 508	... 0·7	... 90·6	... 10	do. do.
17 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·2	Soln. ·74	... 60	... 81·1	... 13·5	... 50·0	... 509	... 0·8	... 89·3	... 10	Pot. X'ate. increased.
18 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·2	Soln. ·74	... 60	... 72·0	... 12·0	... 52·0	... 518	... 0·7	... 90·6	... 10	do. do.
19 ...	600 ...	3,000 ...	Eu. Tar. (1·6) Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·2	Soln. ·74	... 60	... 83·5	... 13·9	... 45·0	... 507	... 0·75	... 90·0	... 10	do. do.
20 ...	600 ...	3,000 ...	Eu. Py. Tar Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	60 ...	87·0 ...	14·5 ...	45·0 ...	503 ...	0·75 ...	90·0 ...	10 ...	Pyridine added with oil mixture.
21 ...	600 ...	3,000 ...	Eu. Py. Tar Kero. ...	·30 25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 76·5	... 12·7	... 52·0	... 514	... 0·7	... 90·6	... 10	do. do.
22 ...	600 ...	3,000 ...	Eu. Py. Tar Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 80·2	... 13·3	... 48·0	... 510	... 0·7	... 90·6	... 10	do. do.
23 ...	600 ...	3,000 ...	Eu. Kero. ... (1·1)	... ·55	... 2·05	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 78·0	... 13·0	... 51·0	... 512	... 0·65	... 91·3	... 10	Eucalyptus and kero. only.
24 ...	600 ...	3,000 ...	Eu. Kero. ... (1·1)	... ·55	... 2·05	NaCl ... Pot. Xan. ...	5 % ·1	Soln. ·37	... 60	... 76·4	... 12·7	... 53·0	... 514	... 0·65	... 91·3	... 10	do. do.
25 ...	600 ...	3,000 ...	Eu. Tar ... Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·05	Soln. ·185	... 60	... 97·0	... 16·2	... 38·0	... 493	... 0·8	... 89·3	... 10	Amount Pot X'nte. decreased.
26 ...	600 ...	3,000 ...	Eu. Tar ... Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·025	Soln. ·092	... 60	... 90·0	... 15·0	... 41·0	... 500	... 0·9	... 88·0	... 10	Pot X'nte. further decreased.
27 ...	600 ...	3,000 ...	Eu. Tar ... Kero. ...	·30 ·25	1·12 ·93	NaCl ... Pot. Xan. ...	5 % ·025	Soln. ·092	60 ...	85·0 ...	14·2 ...	43·0 ...	505 ...	0·9 ...	88·0 ...	10 ...	do. do.

ROASTING AND CYANIDATION OF FLOTATION CONCENTRATES.

Samples for this purpose have been prepared by mixing the flotation concentrates from individual laboratory tests. Roasting of these composite samples has then been carefully carried out in a muffle furnace, keeping the temperature low during the initial stages, *i.e.*, during the oxidation of the first half of the sulphur of the pyrite. When this oxidation is complete, the temperature may be much increased without any risk of sintering, and the product of roasting is porous and much more voluminous than the raw concentrate. The efficiency of roasting under these conditions is shown by the following sulphur contents of raw and roasted concentrates:—

	Raw conct.	Roasted conct.
Sulphur as sulphide, per cent.	16.0	0.07
Sulphur as sulphate, per cent.	..	2.71

In all, ten cyanidation tests have been carried out, which have shown the possibility of obtaining high percentage recoveries of the gold content, although the actual gold values of the residues have been comparatively high. The consumption of cyanide has also been in some cases very high, although in tests Nos. 4 to 8, inclusive, this item has been fairly satisfactory.

CYANIDE TESTS ON ROASTED FLOTATION CONCENTRATES.

Test No.	Roasted Concentrates.		Solution.		Treatment.	Tails, dwt. Au per ton.	KCN Consumption lb. per ton.	Extraction of gold per cent.	Remarks.
	Wt. gram.	Dwt. Au. per ton.	Vol. c.c.	KCN per cent.					
1	30	82·0	300	0·1	Agitated 3 hr. ... ... Contact, 16 hr.	1·6	8·0	98·0	0·1 gram lead acetate added.
2	30	82·0	300	0·1	Agitated, 4 hr. ... ... Contact, 16 hr.	1·2	7·8	98·5	0·1 gram lead acetate added.
3	30	82·0	300	0·1	Agitated, 4 hr. ... ... Contact, 16 hr.	1·2	7·8	98·5	No lead acetate added.
4	50	88·0	300	0·061	Agitated, 2 hr. ... ... Contact, 4·5 hr. ...	3·8	1·56	95·6	0·2 gram sodium hydroxide added.
5	50	88·0	300	0·061	Agitated, 2 hr. ... ... Contact, 4·5 hr. ...	4·0	1·32	95·4	0·3 gram sodium hydroxide added.
6	50	88·0	300	0·061	Agitated, 2 hr. ... ... Contact, 4·5 hr. ...	3·6	1·2	95·9	0·4 gram sodium hydroxide added.
7	100	80·0	500	0·060	Agitated, 6 hr. ... ... Contact, 11 hr.	3·0	0·7	97·1	0·2 gram sodium hydroxide added.
8	200	80·0	1,000	0·060	Agitated, 6 hr. ... ... Contact, 11 hr.	4·0	0·8	95·0	0·2 gram sodium hydroxide added.
9	100	74·0	500	0·106	Agitated, 8·5 hr. ... Contact, 11·5 hr. ...	2·2	5·6	97·0	0·2 gram sodium hydroxide added.
10	100	74·0	500	0·125	Agitated, 8·5 hr. ... Contact, 11·5 hr. ...	2·0	6·5	97·3	0·2 gram sodium hydroxide added. Aero Brand Cyanide used.

These tests, which are really only preliminary tests, show that a high percentage recovery of the gold is possible by careful roasting and cyanidation, but they indicate the necessity for further investigation to determine the most economical conditions for cyanidation of the roasted concentrates.

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Kalgoorlie, 11th June, 1925.

FLOTATION TESTS ON IVES REWARD "RESIDUES."

Test No.	Ore.		Water Wt. gram.	Oil.			Reagents.			Time of grind-ing.	Float.		Tails.		Re-covery per cent.	Remarks.
	Wt. gram.	Assay value dwt. ton (2000lb.)		Description.	Wt. gram.	Wt. lb. ton.	Description.	Wt. gram.	Wt. lb. ton.		Wt. gram.	Au. dwt. ton.	Wt. gram.	Au. dwt. ton.		
1	500	1·25	3,000	Kerosene ... Eu-py-tar ...	·3 ·21	1·2 ·84	Pot. Xanthate NaCl ...	·05 2% soln.	·2 ...	mins. 15	37·2	14·0	453	0·2	84·0	100 mesh material as received.
2	580	1·0	3,000	Kerosene ... Eu-py-tar ...	·4 ·21	1·37 ·72	Pot. Xanthate NaCl ...	·05 2% soln.	·17 ...	30	28·1	15·0	540	0·2	80·0	Ordinary residues as received.
3	580	1·1	3,000	Kerosene ... Eu-py-tar ...	·4 ·21	1·37 ·72	Pot. Xanthate NaCl ...	·05 2% soln.	·17 ...	30	31·2	15·0	539	0·2	81·8	
4	580	1·0	3,000	Kerosene ... Eu-py-tar ...	·4 ·21	1·37 ·72	Pot. Xanthate NaCl ...	·05 2% soln.	·17 ...	30	23·0	18·0	547	0·2	80·0	
5	580	1·1	3,000	Pine	·66	2·2	Pot. Xanthate NaCl ...	·05 2% soln.	·17	30	31·7	17·0	538	0·2	81·8	

Four small samples of ordinary residues were brought in by the Manager of Ives Reward Gold Mine for testing, the object being to see if any further recoveries could be made on this low grade material by flotation.

Five tests have been carried out, one on each of the four different samples, and a duplicate on No. 3 sample ; in this test pine oil was used instead of the oil mixture.

LOGAN'S FIND.

Five flotation tests were made on a sample of ore brought in by a Mr. J. A. Nickel, from Logan's Find. The sample was only a small one, and some of it looked as if it had been broken some time. From the results obtained it certainly looks as if good recoveries could be expected from this class of ore, especially if the ore were freshly mined.

REPORT ON FLOTATION TESTS ON LOGAN'S FIND ORE.

(Per Mr. J. A. Nickel).

Assay Value : 15·6 dwt. Au. per ton (2,000lb).

Test No.	Ore Wt. gram.	Water wt., gram.	Oil.			Reagents.			Time of grind-ing hours.	Float.		Tails.		Re-covery in conct. per cent.	Remarks.
			Description.	Wt., gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au. dwt. per ton.	Wt., gram.	Au. dwt. per ton.		
1	500	3,000	Euc-pyr-tar ... Kerosene ...	0·36 0·25	1·44 1·00	...	...	...	1	...	...	...	...	...	Very poor float ; no froth.
2	500	3,000	Euc-pyr-tar ... Kerosene ...	0·36 0·25	1·44 1·00	NaCl ...	60	240	1	22·6	270·0	458·0	0·6	96·1	
3	500	3,000	Euc-pyr-tar ... Kerosene ...	0·45 ·125	1·80 0·50	NaCl ...	60	240	1	30·7	200·0	450·0	1·2	92·3	
4	500	3,000	Euc-pyr tar ... Kerosene ...	0·36 0·25	1·44 1·00	NaCl ...	60	240	1	31·1	198·0	449·0	1·8	88·4	
5	500	3,000	Euc-pyr-tar ... Kerosene ...	0·36 0·25	1·44 1·00	NaCl ...	60	240	1	34·4	188·0	446·0	1·6	89·7	

School of Mines Kalgoorlie, 18th June, 1925.

A. S. WINTER,
Research Metallurgist.
B. H. MOORE,
Lecturer in Metallurgy.

MOUNT ZION ORE.

Sample No. 2.

PROGRESS REPORT.

In accordance with the request of the State Mining Engineer, further testing has been carried out on this ore with the results shown on the accompanying sheets.

Cyanidation has not yet been attempted, as it was considered advisable in the limited time at our disposal to carry out further flotation tests.

Tests have been carried out along the following lines:—

(1) Flotation without acid and reflotation of the concentrate with addition of acid.

(2) Concentration on the Wilfley table, regrinding of the tails, and flotation of the reground tails.

The former method has not proved successful, and it appears that in the oxidised condition of this ore satisfactory results cannot be obtained by flotation unless either acid is used to remove the oxide film from the sulphides or a sulphidising reagent such as sodium sulphide is used to film the sulphides before flotation. In this connection we wish to state that the suggested test using calcium sulphide instead of sodium sulphide has not been tried owing to inability to obtain calcium sulphide, which is a chemical of comparative rarity, whereas sodium sulphide is easily procurable, and in the crude state (62 per cent.) is quoted at one to two pence per pound in America. On account of the oxidised condition of this ore it seems probable that a variation of the above method might possibly give better results, viz., flotation without acid followed by acid flotation of the residue.

The second method, involving gravity concentration, followed by regrinding and flotation of the Wilfley tails with addition of acid, has given the lowest tails yet obtained, and seems to offer the best method of recovering the values in a pyritic concentrate. Direct cyanidation of the ore under the conditions laid down in our previous report may, however, prove satisfactory, and this method will be investigated as soon as possible.

B. H. MOORE.
A. S. WINTER.

School of Mines,
Kalgoorlie, 4th December, 1924.

FLOTATION TEST.

Ore.		Water gram.	Oil.			Reagents.			Time of grinding, hours.	Float.		Tails.		Recovery in concentrates per cent.	Remarks.
Wt. gram.	Au. dwt.		Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au. dwt. per ton.	Wt. gram.	Au. dwt. per ton.		
1,000	12·8	3,000	*a*.Euc.	0·64	1·28	*Nil* ...	...	...	...	...	...	...	...	...	
...	...	...	Euc., tar, grease	2·08	4·16	...	...	...	...	...	...	831·2	5·6	...	Non-acid flotation.
...	...	...	*b* Euc. ...	0·64	1·28	H_2SO_4 ...	9·4	18·8	...	28·4	150·0	118·8	15·0	56·25	Acid flotation of float *a*.

CONCENTRATION AND FLOTATION TEST.

Ore.		Water gram.	Oil.			Reagents.			Time of grinding hours.	Concentrate.		Tails.		Recovery in concentrates per cent.	Remarks.
Wt. gram.	Au. dwt.		Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au. dwt. per ton.	Wt. gram.	Au. dwt. per ton		
600	12·8	...	*Nil*	...	...	*Nil* ...	...	...	...	112·8	26·0	...	...	...	Wilfley Concentration.
Tails from Wilfley		3,000	Euc.	1·66	6·2	H_2SO_4 ...	26·1	97·4	2	31·8	59·0	382·2	1·8	78·12	Flotation of reground tails.
...	...	...	Euc., tar, grease	0·3	1·12	...	...	...							

School of Mines, Kalgoorlie,
December 4th, 1924.

B. H. MOORE.
A. S. WINTER.

FLOTATION TESTS.

Test No.	Ore.		Water, wght. gram.	Oil.			Reagents.			Time of grinding, hrs.	Float.		Tails.		Recovery in concentrates per cent.	Remarks.
	Au., dwt. per ton.	Wt. gram.		Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.		Wt. gram.	Au., dwt. per ton.	W gram.	Au., dwt. per ton.		
1	12·8	500	3,000	Eucalyptus ...	0·64	2·9	(*a*) *Nil* ...	...	...	1·5	13·4	92·0	...	...	...	Float very slow until addition of acid.
...	...	...	...	...	...	...	(*b*) H_2SO_4 ...	22	101	...	20·8	110·0	432·7	4·7	63·28	
2	12·8	500	3,000	Eucalyptus, grease, Stockholm tar, pyridine	2·5	11·2	*Nil*	...	...	1·5	133·9	28·0	328·0	4·3	66·40	Float very slow and mixed with slime.
3	12·8	500	3,000	Eucalyptus and grease	1·28	5·7	NaOH ...	2	9	2·5	116·1	42·0	366·0	4·45	65·23	Float very frothy but mixed.
...	...	...	...	...	...	...	Na_2S	2	9							
4	12·8	500	3,000	Eucalyptus, blackboy tar and grease	Large excess not determined		(*a*) *Nil* ...	...	...	2·0	17·1	76·0	340·0	3·0	76·56	Floated at 50 deg. C.
							(*b*) H_2SO_4 ...	18	81		13·4	127·0				
							(*c*) H_2SO_4 ...	9	40·3		19·0	60·0				
5	12·8	500	3,000	Eucalyptus, grease and tar	1·66	7·4	*Nil*	...	...	1·5	119·9	44·0	354·0	3·2	75·00	Float very slow; 45 minutes floating.
6	12·8	500	3,000	Eucalyptus, grease and tar	1·54	6·9	*Nil*	...	...	3·0	99·6	41·0	396·4	4·85	62·11	0·48 gram oil added in pebble mill; 35 minutes floating.
7	12·8	500	3,000	Eucalpytus, grease and tar	1·54	6·9	*Nil*	...	...	3·0	68·0	62·0	427·7	4·80	62·50	As for Test 6.

10th October, 1924.

B. H. MOORE,
A. S. WINTER.

Partial Analysis—

Total sulphur—4.45 per cent.
Sulphate sulphur (SO_3)—2.65 per cent.
Sulphide sulphur—3.39 per cent.
Pyrite (FeS_2)—6.36 per cent.
Water-soluble material—2.24 per cent.
Gold, dwt. per ton (2,240lbs.)—12.80.

Of the total sulphur content 23.8 per cent. is present in the form of sulphates, indicating the extent to which oxidation has taken place, so that the sample is not really suitable for flotation in the condition in which it was received. Although it was evident on opening up the sample that considerable oxidation had taken place, which was confirmed by the above analyses, nevertheless, attempts have been made under varying conditions to obtain a satisfactory concentration of values by flotation.

Conditions of treatment were varied in the following directions, viz.:—

1. Without addition of acid.
2. With addition of acid.
3. With addition of sodium hydroxide and sulphide.
4. Cold pulp.
5. Hot pulp.
6. Various oils.
7. Varying periods of grinding.
8. Addition of oil in flotation cell.
9. Addition of oil in pebble mill.
10. Duration of flotation.

In cases where acid was added, the object was to endeavour to remove the oxide film from the sulphide particles and to make them amenable to flotation. The pulp after grinding was slightly acid on account of the presence in the ore of soluble sulphates, but this acidity was not sufficient to clean the sulphide particles. On account of the extent to which oxidation of the ore had taken place, it was found that large quantities of acid—far in excess of economic limits—had to be added to obtain a clean sulphide float in quantity. In Test No. 3 sodium hydroxide was added to neutralise the acidity of the ore and sodium sulphide to endeavour to convert the film of oxide coating the sulphides into a film of sulphide. Test No. 4, in which a large quantity of acid was used, gave the lowest tails and a small weight of high-grade float—under 10 per cent. of the weight of the ore—a condition which is necessary to attain in practice. The amount of acid, however, renders the cost of this method of treatment prohibitive. In this test flotation was carried out at 50 degrees Centigrade, and the froth produced without addition of acid —taken off as a first float—was similar in character to other floats taken off cold without addition of acid, *i.e.*, mixed.

The following oils and mixtures thereof were used, but none gave a clean pyritic float except when excessive acid was added, viz., eucalyptus, pyridine, Stockholm tar, blackboy tar, yellow machinery grease.

Grinding was carried out in the pebble mill in all cases for times varying from 1.5 to 3 hours, and in Tests 5, 6, and 7 oil was added to the charge in the pebble mill to ascertain whether better oiling of the sulphides could be obtained by this means.

From the results of these tests it appears that the ore, as received, is not suitable for flotation, but, if the ore were freshly mined and floated before oxidation had taken place, better results might be expected.

It may be noticed that in all cases the actual weights of the tails are less than the difference between the weights of the sample and the floats. This discrepancy is due to the following causes, viz., loss during transfer from pebble mill to flotation cell, and from the cell to the receiving dishes, in decantation of the settled products, and from solution of soluble material in the ore. There is also a slight loss of float owing to conditions of transfer.

We are of the opinion that fine grading and direct cyanidation of the ore, either when freshly mined or when weathered, might give satisfactory results. In the case of the weathered or partially oxidised ore a preliminary removal of the soluble cyanicides would be necessary either by means of a water or alkaline wash before cyaniding. We suggest, therefore, that tests be carried out in this direction.

B. H. MOORE.
A. S. WINTER.

10th October, 1926.

MOUNT ZION ORE.

SAMPLE No. 2.

***Statement of Recoveries of Pyrite in Tests* 6 *and* 7 *of Report of* 10*th October,* 1924.**

***Ore Sample*—Pyrite, FeS_2 ... ... 6·36 per cent.**

Test 6:

***Tails*—Sulphur ... ... 0·93 per cent.**
Pyrite, FeS_2 ... ... 1·74 per cent.

Units FeS_2 in ore ... ... 6·36 × 500 = 3180
„ „ tails ... ... 1·74 × 396·4 = 689·736
„ „ recovered ... ... 3,180 — 689·736 = 2,490·264
Percentage FeS_2 recovered = 78·31

Test 7:

***Tails*—Sulphur ... ... 1·41 per cent.**
Pyrite, FeS_2 ... ... 2·64 per cent.

Units FeS_2 in ore ... ... 6·36 × 500 = 3,180
„ „ tails ... ... 2·64 × 427·7 = 1,129·128
„ „ recovered ... ... 3,180 — 1,129·128 = 2,050·872
Percentage recovered ... ... = 64·81.

School of Mines, Kalgoorlie,
4th December, 1924.

B. H. MOORE.
A. S. WINTER.

REPORT ON CYANIDATION TESTS.

In accordance with the request of the State Mining Engineer of 21st October, 1924, tests have now been carried out on this ore to ascertain the results obtainable by—

(a) Direct cyanidation of the ore after rendering it alkaline;
(b) Flotation of the ore, followed by cyanidation of the concentrates and tails from this treatment.

The results of these tests, which are shown on the accompanying sheet, indicate that a satisfactory extraction of the gold content can be made in this way, although at the expense of a high cyanide consumption. This high consumption of cyanide is to be expected when treating this class of ore after it has been exposed to weathering influences for some time, although it is highly probable that an equally good extraction could be obtained on fresh unaltered ore with a very much diminished consumption of cyanide.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 24th February, 1925.

MOUNT ZION ORE.

SAMPLE No. 2

CYANIDATION TESTS.

Assay Value ... ... 6·4 dwt. Au. per ton.

Cyanidation Test:

Ore	500 grams, slimed two hours in pebble mill, then rendered alkaline with lime water.
Solution	1000 c.c.; 0·36 per cent. KCN.
Treatment	Agitation in pebble mill, 6 hours; further contact, 16 hours.
Residues	2·0 dwt. Au. per ton.
Extraction	68·75 per cent.
Consumption	14lb. KCN. per ton.

Flotation and Cyanidation Test:

Flotation	500 grams ore slimed in pebble mill, two hours; floated in M.S. Cell.
	Concentrate ...Weight, 31 grams; Assay value, 80 dwt. Au. per ton.
	Tails ... ... Weight, 417 grams; Assay Value, 2·2 dwt. Au. per ton.

CYANIDATION:

Flotation Concentrate —

Concentrates	20 grams.; assay value, 80 dwt. Au. per ton.
Solution	120 c.c.; 0·48 per cent. KCN.
Treatment	Pulp made alkaline with lime water; agitated in pebble mill, 6 hours; further contact, 16 hours.
Residues	28 dwt. Au. per ton.
Extraction	65 per cent.
Consumption	33·8lb. KCN. per ton.

Flotation Tails:

Tails	350 grams.; assay value, 2·2 dwt. Au. per ton.
Solution	700 c.c.; 0·27 per cent. KCN.
Treatment	Pulp made alkaline with lime water; agitated in pebble mill, 6 hours; further contact, 16 hours.
Residue	2·4 grains Au. per ton.
Extraction	95·4 per cent.
Consumption	8·2lb. KCN. per ton.

Total Extraction ... 81·13 per cent.
Total Consumption ... 9·8lb. KCN per ton of original ore.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines, Kalgoorlie, 24th February, 1925.

REPORT ON INVESTIGATION WORK CARRIED OUT IN THE METALLURGICAL LABORATORY ON MENZIES CONSOLIDATED "OLD CONCENTRATES."

Two bags of material, known as "Old Concentrates," have been received from the Menzies Consolidated Ltd., and Tests have been carried out on different lines, as shown in the tabulations. I understand that this material has at some time been treated by roasting and cyanidation, and that it has been exposed on the surface for a number of years; it is yellowish brown in colour, and certainly looked impossible as far as flotation was concerned. Some flotation tests, however, were carried out under varying conditions after grinding, but the results were not satisfactory. The best result was obtained by grinding the material for 30 minutes in the Pebble mill, treating the ground material by Wilfley Concentration, regrinding the Wilfley tails, and treatng them by flotation. By this means a high grade product, 76dwt. Au. per ton was produced from the Wilfley, being 11.7 per cent. the weight taken, and contained 49.6 per cent. of the total gold. Cyanidation of the Wilfley tails was tried, also direct cyanidation of the material as received, but the result in each case was negative.

From the preliminary tests, it looks as if the most economical method of treating this material would be an efficient roasting furnace and cyanidation of the roasted product.

A. S. WINTER,
Research Metallurgist.

School of Mines,
Kalgoorlie, 10/7/1925.

FLOTATION TESTS ON MENZIES CONSOLIDATED "OLD CONCENTRATES."

Sample No. 1—Assay Value 15·9 dwts. Au. per ton (2,000lbs.).

Test No.	Ore wt. gram.	Water wt. gram.	Oil.			Reagents.			Time of grinding.	Float.		Tails.		Recovery in conct. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb. ton.	Description.	Wt. gram.	Wt. lb. ton.		Wt. gram.	Au. dwt. ton.	Wt. gram.	Au. dwt. ton.		
									hours.						
1	600	3,000	Eu Py tar ... Kerosene ...	·42 ·25	1·4 ·83	Na2S ... NaCL ...	0·6 2%	... Soln.	... 1·0	144·0A 20·7B	52·0 18·0	420·0	3·9	75·4	The sample was very much oxidised, on account of exposure for a number of years. These tests were run to see if the values could be obtained in the flotation concentrate after regrinding the particles.
2	600	3,000	Eu Py tar ... Kerosene ...	·42 ·25	1·4 ·83	NaCL ...	2%	Soln.	1·0	150·0	50·0	430·0	4·0	74·8	
3	600	3,000	Eu Py tar ... Kerosene ...	·42 ·25	1·4 ·83	...	...	...	1·0	150·0	49·0	430·0	3·8	76·1	
4	600	3,000	Eu	·66	2·2	NaCL ...	2%	Soln.	1·0	157·5	50·0	420·0	4·0	74·8	
5	500	3,000	Eu Py tar ... Kerosene ...	·24 ·30	0·96 1·20	NaCL ...	2%	Soln.	1·0	135·2	48·0	350·0	3·9	75·4	
6	600	3,000	Eu Py tar ... Kerosene ...	·30 ·375	1·00 1·25	NaCL ...	2%	Soln.	1·0	164·5	49·0	420·0	4·0	74·8	
7	600	3,000	Pine Oil ...	·66	2·2	Pot. Xanthate	0·2	·66	1·0	154·8	50·0	430·0	3·5	78·0	
8	600	3,000	Eu Py tar ... Kerosene ...	·30 ·375	1·00 1·25	Pot. Xanthate	0·2	·66	1·0	158·2	48·0	430·0	4·0	74·8	

WILFLEY CONCENTRATION AND RETREATMENT OF WILFLEY TAILS BY FLOTATION OF MENZIES CONSOLIDATED "OLD CONCENTRATES."

Sample No. 1—Assay Value, 15·9 dwts. Au. per ton (2,000lbs.).

Test No.	Ore wt. gram.	Water wt. gram.	Oil.			Reagents.			Time of grinding.	Float.		Tails.		Recovery in conct.	Remarks.
			Description.	Wt. gram.	Wt. lb. ton.	Description.	Wt. gram.	Wt. lb. ton.		Wt. gram.	Au. dwt. ton.	Wt. gram.	Au. dwt. ton.		
1	1,000	...	...	...	...	...	...	...	30 mins.	93·6	85·0	Wilfley concentration.			
Wilfley Tails divided into two parts and slimed in P. Mill and then floated.															
A	...	3,000	Pine Oil ...	·60	2·6	Pot. Xanthate	·2	·88	30 mins.	119·0	31·0	...	2·4	84·9	
B	...	3,000	Eu Py tar ... Kerosene ...	·30 ·25	1·33 1·11	Pot. Xanthate	·2	·88	30 mins.	58·5	24·0	600			

A. S. WINTER,
Research Metallurgist.

WILFLEY CONCENTRATION AND RETREATMENT OF WILFLEY TAILS BY CYANIDATION OF MENZIES CONSOLIDATED "OLD CONCENTRATES."

Sample No. 1.—Assay value, 15·9 dwt. Au. per ton (2,000lbs.).

Test No.	Ore Wt. gram.	Wilfley Conc.		Wilfley Tails.		Solution.		Treatment.	Tails, dwt. Au. ton.	KCN Consumption.	Extraction of Au.	Remarks.
		Wt. gram.	Au. dwt. ton.	Wt. gram.	Au. dwt. ton.	vol. c.c.	KCN %					
2	2,000	234·8	76·0	1,700·0	8·0	...	...	30 mins. grinding ...	...	lbs. per ton. ...	% 49·6	Wilfley tails dried and cyanidation tests made.
A	...	...	...	400	8·0	800	·06	8½ hours agitation, 14 hours contact	6·0	2·4	25·0	1·0 gram NaOH added.
B	...	...	...	500	8·0	1,000	·094	8½ hours agitation, 14 hours contact.	6·2	3·76	22·5	1·25 gram NaOH added.
C	...	...	...	500	8·0	1,000	·094	8½ hours agitation, 14 hours contact.	5·8	3·76	27·5	1·25 gram NaOH added. 0·25 gram Lead Acetate added.

DIRECT CYANIDATION TESTS ON MENZIES CONSOLIDATED "OLD CONCENTRATES."

Test No.	Ore.		Solution.		Treatment.	Tails Au. dwt. ton.	KCN consumption.	Extraction of Au.	Remarks.
	Wt. gram.	Au. dwt. ton.	Vol. c.c.	KCN. %					
1	500	15·9	1,024	·31	8½ hours agitation, 14 hours contact	11·2	lb. per ton. 12·5	% 29·5	Agitated with water and washed three times before cyanidation.
2	500	15·9	1,036	·409	8½ hours agitation, 14 hours contact	11·0	16·7	30·8	
3	500	15·9	1,036	·409	8½ hours agitation, 14 hours contact	11·2	16·7	29·5	

10th July, 1925.

A. S. WINTER,
Research Metallurgist.

FLOTATION TESTS ON MENZIES CONSOLIDATED COY'S "OLD CONCENTRATES" USING COPPER SEPARATION COY'S REAGENTS BEFORE FLOTATION.

Assay Value of " Old Concentrates," 15·6 dwts. Au. per ton (2,000lbs.).

Test No.	Ore Wt. gram.	Water wt. gram.	Oil.			Reagents.		Float.		Tails.		Recovery Au. per cent.	Remarks.
			Description.	Wt. gram.	Wt. lb. ton.	Description.	Wt. gram.	Wt. gram.	Au. dwt. ton.	Wt. gram.	Au. dwt. ton.		
10	750	3,000	Kerosene ... Eu Py tar	·55 ·24	1·47 ·64	NaCl ... $FeSO_4$ ... Fe	2% soln. 30 20	184·0	48·0	506·0	4·80	69·2	*Treatment*:—Material first slimed in Pebble Mill for 45 mins. then heated in Pachuca to 80° C.; added 60 grams NaCl, 30 grams $FeSO_4$ and 20 grams Fe, continued agitation with steam pipe for 15 mins., transferred to Pebble Mill and agitated further 10 mins. with ·1 gram. Pot. Xanthate, ·55 gram. Kerosene, and ·24 gram. Oil mix. Floated Pyrite.
10B	500 Tails from Test 10 plus CuO. Assay Cu = 3·2%	3,000	Kerosene ... Eu Py tar...	·3 ·18	1·2 ·72	NaCl ... $FeSO_4$ ... Fe	2% soln. 40 30	27·5	42·0 Cu = 33%	462·0	2·8 Cu = 1·5%	82·0	*Treatment*:—Placed mixed Tails and CuO in Pachuca in hot soln. (80°) of NaCl and $FeSO_4$, agitated 5 mins. with steam and air, then added Fe over 15 mins. Transferred to Pebble Mill and agitated 15 mins. with ·3 gram. Kero. and ·18 gram. oil mix. Floated Cu, etc.
11	750	3,000	Pine ...	·81	2·16	NaCl ... $FeSO_4$ ... Fe	2% soln. 30 20	188·0	47·0	502·0	4·4	71·8	*Treatment*:—Same as in Test 10 with exception of oil, Pine Oil being used instead of mixed oils.
11B	470 Tails from Test No. 11 plus CuO Assay Cu = 3·5%	3,000	Kerosene ... Eu Py tar	·3 ·18	1·2 ·72	NaCl ... $FeSO_4$ ... Fe	2% soln. 40 30	29·5	37·0 Cu = 39%	430·0	2·2 Cu = 1·2%	85·8	*Treatment*:—Same as in Test No. 10B.

A. S. WINTER,
Research Metallurgist.

TESTS ON MENZIES CONSOLIDATED OLD CONCENTRATES.

In reply to the question put forward by the State Mining Engineer in his letter of 24th August, 1925, relative to the percentages of the sulphides recovered from these concentrates by flotation, with and without the use of Copper separation reagents, I have the honour to furnish herewith the information asked for.

In order to determine the point at issue, flotation tests have been carried out under exactly identical conditions, except as regards the use and omission of Copper separation reagents, the results of which are as follows:—

A.—DIRECT FLOTATION WITHOUT ADDITION OF COPPER SEPARATION REAGENTS.

Weight of ore taken	750 grammes.
Percentage sulphur (as sulphide) ...	8·24
Concentrate—	
Weight	218·3 grammes.
Percentage sulphur (as sulphide)	25·81
Percentage sulphur recovered in concentrate	91·17
Residue—	
Weight	477·0 grammes.
Percentage sulphur (as sulphide)	1·09

B.—FLOTATION WITH ADDITION OF COPPER SEPARATION REAGENTS.

Weight of ore taken	750 grammes.
Percentage sulphur (as sulphide) ...	8·24
Concentrate:—	
(a) Without reagents—	
Weight	184·0 grammes.
Percentage sulphur (as sulphide)	29·4
(b) With reagents—	
Weight	27·5 grammes.
Percentage sulphur (as sulphide)	5·1
Percentage sulphur recovered in concentrates	89·80
Residue—	
Weight	484·0 grammes.
Percentage sulphur (as sulphide)	0·9

Hence, it appears that no benefit is derived from the use of these reagents, but that a slightly better result is obtained without their use.

It may be noted that the total units of sulphur recovered in all the products (concentrates and residues) are somewhat less in "B" than in "A," doubtless due to the solvent action of the reagents employed. Hence, if the sulphur recovered in the concentrates is expressed as a percentage of the total sulphur in the whole of the products, there is a slight, but not very material improvement obtained by the use of the reagents. This improvement is, however, offset by the increased loss of sulphur due to solution.

A. S. WINTER,
Research Metallurgist.

School of Mines,
Kalgoorlie, 18th February, 1926.

TESTS ON HEAVY SULPHIDE ORE FROM "LADY CARMEN" G.M., COOLGARDIE.

At the request of Inspector Greenard cyanide tests have been carried out on sulphide ore from the "Lady Carmen" G.M., Coolgardie.

The first sample tested consisted of battery sands said to have resulted from the treatment of a parcel of this ore at the Coolgardie State battery, which was supplied by Inspector Greenard.

These sands consisted of a mixture of sulphide and oxidised ore, together with a considerable quantity of lime which had apparently been added during treatment.

As it was considered that these sands were not typical of the class of ore occurring in the "Lady Carmen" mine, it was decided to carry out confirmatory tests on a parcel of the raw ore which we had personally received from the owners of the mine, when we visited the mine in company with Inspector Greenard.

The treatment of this ore by battery amalgamation has been proved unsuccessful, and as the ore is so heavily mineralised, gravity or flotation concentration is out of the question.

The results of tests on the sands indicated the possibility of successful treatment of the raw ore by direct cyanidation, and to determine this tests were carried out on the raw ore. These tests confirmed the results on the tests on the sands.

From the results so far obtained it appears that fine grinding of the ore is not necessary, and apparently the ore should be ground in water, not in cyanide solution, and then agitated with the solution. We realise that the consumption of cyanide is too high, but as these preliminary tests have given such satisfactory results, we feel sure that this consumption of cyanide can be reduced. As there appears to be a considerable quantity of ore of this description in the Coolgardie district, we consider that a further investigation of the treatment of this class of ore is necessary.

B. H. MOORE,
Lecturer in Metallurgy.

A. S. WINTER,
Assistant Lecturer in Metallurgy.

13th June, 1924.

CYANIDE TESTS.

"LADY CARMEN" ORES.

Test No.	Ore.		KCN Sol.		NaOH lb. per ton.	Lead Acetate lb. per ton.	Size of Ore.	Agitation.		Residue, dwt. Au per ton.	Solution, per cent. KCN.	Consumption, lb. per ton KCN.	Extraction per cent.	Grading Analyses.
	Dwt. Au per ton.	Wt. grams.	Volume.	KCN per cent.				Method.	Time, hours.					
1	17·2	500	1,000	0·319	2·24	4·0	Slimed in Pebble Mill	Pebble Mill	10	0.4	0.080	9.56	97.7	Plus 100 0·20 per cent. ,, 120 0·49 ,, ,, 150 4·05 ,, ,, 200 0·98 ,, Minus 200 94·28 ,,
2	17·2	500	825	0·319	2·24	4·0	Ground dry. *See* grading analysis	Pebble Mill. No Pebbles	10	0.4	0.142	5.84	97.7	Plus 40 0·77 per cent. ,, 60 6·32 ,, ,, 80 12·55 ,, ,, 100 4·57 ,, ,, 150 21·97 ,, ,, 200 4·55 ,, Minus 200 49·17 ,,
								SANDS.						
1	7·04	1,000	3,000	0·325	*Nil*	2·0	As received	Air Pebble Mill. No Pebbles	0·5 9	0·2	0·254	4·26	97·1	Plus 40 23·10 per cent. ,, 60 20·05 ,, ,, 80 15·00 ,, ,, 100 2·03 ,, ,, 150 15·53 ,, ,, 200 1·45 ,, Minus 200 22·84 ,,
2	7·04	500	1,000	0·475	*Nil*	2·0	Slimed in KCN solution in Pebble Mill	Pebble Mill	9	0·4	0·130	20·7	94·3	Plus 100 0·45 per cent. ,, 120 0·90 ,, ,, 150 0·94 ,, ,, 200 2·14 ,, Minus 200 95·57 ,,

B. H. MOORE
Lecturer in Metallurgy.

13th June, 1924.

A. S. WINTER,
Assistant Lecturer in Metallurgy.

RESIDUES FROM SURPRISE LEAD MINE.

REPORT ON FLOTATION TESTS.

Grading Analysis.

Assay value of sample ... ... 4·33 per cent. Pb.

I.M.M. Screen.	Per cent.	Pb. per cent.	Percentage of total lead.
Plus 10	19·940	0·74	3·72
Plus 20	25·275	0·17	1·08
Plus 40	20·350	2·53	12·97
Plus 60	9·085	4·27	9·77
Plus 80	7·245	5·34	9·74
Plus 100	1·525	0·67	0·26
Minus 100	16·220	15·30	62·51
	99·640	3·97 (calculated)	100·04

From the above it is evident that the bulk of the lead is contained in the minus 20-mesh product, and, therefore, no serious loss would be entailed by separating the plus 20-mesh product and retreating the minus 20-mesh product to recover the galena. A considerable proportion of the finer grade material is present in the residues in the form of comparatively hard agglomerations which are difficult to disintegrate in the dry state on the screens. This accounts for variations in the proportions separated in the dry state through 20-mesh and 60-mesh screens, and also for the variations in the lead content of the minus 20-mesh and minus 60-mesh products. In practice it would, therefore, be necessary (unless a preliminary crushing were resorted to to break up these lumps) to pulp the residues in a mixer with water, and to sort out the finer material in the wet state.

Test 1 on the residues as received could not be expected to be successful owing to the coarseness of the bulk of the material, which is therefore unsuitable for flotation, and is also liable to choke the cell.

Direct flotation tests have been carried out on minus 60-mesh and minus 20-mesh products, the former without and with regrinding, and the latter after regrinding.

In addition, a test has been carried out by producing a Wilfley concentrate, regrinding and floating the Wilfley tails. This line of action was taken because it was considered that the percentage of galena in the minus 20-mesh product was so high as to necessitate a preliminary gravity concentration before flotation.

The results of these tests indicate that a satisfactory recovery of the galena can be obtained from these residues—

(1) by screening through 20-mesh screen, discarding the oversize and sliming and floating the undersize;

(2) by screening through 20-mesh screen, discarding the oversize, and subjecting the undersize to gravity concentration on a Wilfley table, sliming and floating the Wilfley tails.

Mr. C. M. Harris has informed us that these residues consist partly of current and partly of old residues. In treating old residues no doubt a small quantity of acid would be necessary to counteract the effect of oxidation, but in treating current residues this should not be necessary.

School of Mines,
Kalgoorlie, 6th December, 1924.

B. H. MOORE.
A. S. WINTER.

RESIDUES FROM SURPRISE LEAD MINE.

Flotation Tests.

Test No.	Ore.								Water gram.	Oil.			H_2SO_4.		Concentrate.		Tails.		Recovery of lead, per cent.	Time of grinding in pebble mill, hours.
	Wt. gram.	Pb. per cent.	I.M.M. Screen.	Oversize		Undersize.				Description.	Wt. gram	Wt. lb. per ton.	Wt. gram.	Wt. lb. per ton.	Wt. gram.	Pb. per cent.	Wt. gram	Pb. per cent.		
				Wt. gram.	Pb. per cent.	Wt. gram.	Wt. used gram.	Pb. per cent.												
1	500	4·65	...	...	...	...	...	...	3,000	Euc. ...	0·48	1·92	...	...	17·72	29·70	482·1	3·68	23·7	...
2	2,000	4·65	60	1,522	1·87	477·8	450	14·06	3,000	Euc. ...	1·92	7·68	...	...	59·4	36·0	402·0	9·56	28·1	...
3	2,000	4·65	60	1,501·4	1·87	498·6	498·6	14·06	3,000	Euc. ... Euc. grease	0·38 0·38	1·54 1·54	...	...	83·5	37·8	414·0	9·2	28·9	2
4	1,000	4·65	20	475	1·6	525	500	7·54	3,000	Euc. ...	0·8	3·2	3·7	14·8	59·88	48·15	422·3	2·72	58·9	2
5	1,000	4·65	20	458·5	1·6	541·5	500	7·54	... 3,000	... Euc. ...	... 0·96	... 3·8	... 3·7	... 14·8	58·77 19·30	40·27 27·45	463·0 ...	... 2·14	... 65·0	... (a) 1·5 (b)
6	1,000	4·65	20	523	1·6	477	450	7·54	3,000	Euc. ...	1·12	5·0	1·8	7·2	37·1	48·6	367·5	3·08	57·6	1·5

Remarks—Test 1—Flotation as received.
Test 2—Flotation of –60 portion without regrinding.
Test 3— „ „ „ after „
Test 4— „ –20 „ „ „
Test 5—(*a*) Concentrate from Wilfley table.
(*b*) Float from reground Wilfley tails.
Test 6—Flotation of –20 portion after regrinding.

B. H. MOORE,
Lecturer in Metallurgy.
A. S. WINTER,
Research Metallurgist.

School of Mines, Kalgoorlie, 6th December, 1924.

RESIDUES FROM SURPRISE LEAD MINE.

Supplementary Report on Concentration Tests.

Wet Grading Analysis.

Assay Value of Sample ... ... 4·57 per cent. Pb.

I.M.M. Screen.	per cent.	Lead per cent.	Percentage of Total lead.
Plus 10	38·74 ...	0·91 ...	7·46 } 9·7
Plus 20	11·62 ...	0·91 ...	2·24 }
Minus 20	49·64 ...	8·58 ...	90·24
	100·00 ...	4·72 (calcd.) ...	99·94

On account of the presence in the residues of hard agglomerated lumps of slime, which are difficult to disintegrate when screening dry, it was decided to screen out the plus 10 and plus 20-mesh material after thoroughly mixing the sample with water by agitation in the pebble mill, since, in practice, the current residues would be screened wet as they left the concentrating plant. In this way over fifty per cent. of the material was removed as oversize containing only 9.7 per cent. of the total lead, the oversize products assaying 0.91 per cent. lead, and therefore being sufficiently poor to be discarded.

If retreatment of these residues is contemplated, and this is certainly warranted, over fifty per cent. could be very cheaply removed and discarded by simple screening through a trommel in the wet state, giving a valuable undersize product assaying 8.58 per cent. lead, or nearly double the grade of the original residues, and containing 90.24 per cent. of the total lead in the residues.

With lead at the present price of approximately £40 per ton, *i.e.*, 8s. per unit, these residues are worth 36.56s. per ton. Screening through 20-mesh gives an undersize product worth 68.64s. per ton, and of approximately half the original weight, which lends itself to simple methods of concentration, giving good recoveries.

As shown in the attached tabulation, tests have been carried out on the minus 20-mesh product—

(a) by direct flotation after regrinding;

(b) by Wilfley concentration followed by regrinding of tails and flotation.

The cheapest and simplest method of treating the minus 20-mesh product is by direct concentration on a Wilfley table without further grinding. This method has given a recovery of 66.5 per cent., based on the actual weight of concentrate produced. This figure would, no doubt, be exceeded when treating the undersize on a large scale.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

RESIDUES FROM SURPRISE LEAD MINE.

SUPPLEMENTARY REPORT ON CONCENTRATION TESTS.

Test No.	Ore.								Water gram.	Oil.			H_2SO_4.		Concentrate.		Tails.		Re-covery of Pb. per cent.	Time of grinding in pebble mill, hours.
	Wt. gram.	Pb. per cent.	I.M.M. Screen.	Oversize.		Undersize.				Kind.	Wt. gram	Wt. lb. per ton.	Wt. gram.	Wt. lb. per ton.	Wt. gram.	Pb. per cent.	Wt. gram	Pb. per cent.		
				Wt. gram.	Pb. per cent.	Wt. gram.	Wt. used gram.	Pb. per cent.												
7	2,500	4·57	20	1,259	0·91	1,241	500	8·58	3,000	Euc. ...	0·78	3·12	3·7	14·8	52·5	48·88	424·2	2·9	63·3	(a) 2
										Euc. ...	0·39	1·56	1·85	7·4	...	...	...	...	...	...
										Na_2S ...	1·0	4·0	...	...	17·5	18·5	...	...	...	(b)
	WILFLEY CONCENTRATION AND FLOTATION.																			
	Wilfley Concentration ...						500	8·58	...	...	...	...	...	...	79·7	35·8	...	...	66·5	(c)
	Flotation of Reground Tails						...	...	3,000	Euc. ...	0·8	3·2	3·7	14·8	23·5	20·38	396·8	2·05	72·3	(d) 2

Remarks.—(a) First Float.
(b) Second Float.
(c) Wilfley Concentrate, –20 mesh, not reground.
(d) Float from Reground Wilfley Tails.

A. S. WINTER.
Research Metallurgist.
B. H. MOORE.
Lecturer in Metallurgy.

School of Mines, Kalgoorlie, 27th February, 1925.

Residues from the Surprise Lead Mine.

Flotation tests under varying conditions have been tried on the residues received from the Surprise Lead Mine. The results obtained are very encouraging, especially as the recoveries are from residues, and also as the sample from which these results have been obtained has been here nearly nine months, no doubt higher recoveries could be expected from current residues. We have now run out of this material, and will have to await the arrival of a new sample before being able to continue the work as suggested by the State Mining Engineer.

From the flotation tests on the whole of the material as received (after re-grinding to slime in the Pebble mill), it will be seen that the best results were obtained in a neutral solution using potassium xanthate and pine oil. A series of tests have been carried out on these lines with fairly consistent results (as will be seen in the tabulations).

Three tests have also been carried out by first grading the material over a 20-mesh 1 mm. screen, discarding the plus 20 product and floating the minus 20 product. The reagent and the oil used in these tests being the same as used in the tests on the material as received, a first and second float has been taken off with a view of making the first one as high grade as possible, the first float in one case being 51.5 per cent. Pb.

I do not anticipate any difficulty in getting a high grade saleable product from this material. It may be perhaps necessary to introduce a small amount of some reagent as would be used in selective flotation.

A. S. WINTER,
Research Metallurgist.

School of Mines,
Kalgoorlie, 9th July, 1925.

FLOTATION TESTS ON RESIDUES FROM THE SURPRISE LEAD MINE.

NO. 1 SAMPLE ASSAY VALUE—4·8 % Pb.

Test No.	Ore Wt. grams.	Water Wt. grams.	Oils.			Reagents.			Time of grinding.	Float.		Tails.		Re-covery in conc. per cent.	Remarks.
			Description.	Wt. grams.	Wt. lb. ton.	Description.	Wt. grams.	Wt. lb. ton.		Wt. grams.	Pb. per cent.	Wt. grams.	Pb. per cent.		
8	500	3,000	Eu. Py. tar Kero.	·36 ·20	1·44 0·80	...	...	...	60 mins.	51·1	35·35	440·0	1·01	78·9	
9	500	3,000	Eu. Py. tar Kero.	·36 ·20	1·44 0·80	H_2SO_4 ...	3·6	14·4	60 mins.	48·3	37·40	441·0	1·11	76·8	
10	500	3,000	Eu. Py. tar Kero	·36 ·20	1·44 0·80	NaOH ...	1·0	4·0	60 mins.	50·8	26·3	440·0	2·40	50·0	Float very frothy and mixed.
11	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate	0·2	0·8	60 mins.	59·5	34·0	430·0	0·4	91·6	
12	500	3,000	Pine Oil ...	·54	2·16	NaCl ... Pot. Xanthate	50 0·2	200 0·8	60 mins.	56·3	33·33	434·0	0·88	81·6	
13	500	3,000	Pine Oil ...	·54	2·16	NaOH ... Pot. Xanthate	0·4 0·2	1·6 0·8	... 60 mins.	... 86·7	... 25·85	... 403·0	... 0·43	... 91·0	Float very frothy and mixed.
14	500	3,000	Pine Oil ...	·54	2·16	...	...	...	60 mins.	60·7	29·3	430·0	1·41	70·6	
15	500	3,000	Eu.	·54	2·16	Pot. Xanthate	0·2	0·8	60 mins.	57·2	31·31	431·0	0·91	81·0	
16	500	3,000	Eu. Py. tar	·54	2·16	Pot. Xanthate	0·2	0·8	60 mins.	51·3	29·6	440	1·01	78·9	Tests Nos. 8 to 16 inclusive, floated 15 mins.

FLOTATION TESTS ON RESIDUES FROM SURPRISE LEAD MINE.

No. 1 Sample Assay Value—5·05 % Pb.

Test No.	Ore Wt. grams.	Water Wt. grams.	Oils. Description.	Oils. Wt. grams.	Oils. Wt. lb. ton.	Reagents. Description.	Reagents. Wt. grams.	Reagents. Wt. lb. ton.	Time of grinding.	Float. Wt. grams.	Float. Pb. per cent.	Tails. Wt. grams.	Tails. Pb. per cent.	Recovery in conc. per cent.	Remarks.
17	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate	·2	0·8	60 mins.	45·1	39·0	430·0	1·1	78·2	Some of float lost in this test.
18	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate	·2	0·8	60 mins.	63·6	33·4	425·0	0·9	82·2	
19	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate	·1	0·4	60 mins.	64·0	32·4	425·0	0·96	81·0	Tests Nos. 17 to 22 inclusive, floated 8 mins.
20	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate	·1	0·4	60 mins.	A 38·7 B 15·0	45·0 14·7	... 430·0	... 1·1	... 78·2	
21	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate	·1	0·4	60 mins.	A 41·2 B 15·3	43·80 13·10	... 430·0	... 0·9	... 82·2	
22	500	3,000	Pine Oil ...	·54	2·16	Pot. Xanthate.	·1	0·4	60 mins.	A 43·0 B 15·3	43·4 13·6	... 430·0	... 1·06	... 79·0	

RESIDUES FROM SURPRISE LEAD MINE.

Assay Value of Sample—5·05 % Pb.

Grading Analysis:

IM.M. Screen.	Per cent.	Lead per cent.	Percentage of Total Lead.
Plus 20	46·5	1·4	13·18
Minus 20	53·5	8·02	86·82

Flotation of—20 Product—Assay Value 8·02 % *Pb.*

Test No.	Ore Wt. grams.	Water Wt. grams.	Oils. Description.	Oils. Wt. grams.	Oils. Wt. lb. ton.	Reagents. Description.	Reagents. Wt. grams.	Reagents. Wt. lb. ton.	Time of grinding.	Float. Wt. grams.	Float. Pb. per cent.	Tails. Wt. grams.	Tails. Pb. per cent.	Recovery in conc. per cent.	Remarks.
23	500	3,000	Pine ...	·66	2·64	Pot Xanthate	0·2	0·8	60 mins.	A 55·4 B 37·4	47·47 15·45	... 398·0	... 1·71	... 78·7	Tests 23–25 floated 10 mins.
24	500	3,000	Pine ...	·66	2·64	Pot Xanthate	0·2	0·8	60 mins.	A 43·7 B 42·4	51·51 19·5	... 404·0	... 1·84	... 77·05	
25	500	3,000	Pine ...	·66	2·64	Pot Xanthate	0·2	0·8	60 mins.	A 52·5 B 33·3	50·7 16·86	... 404·0	... 1·91	... 76·18	

Report on investigation work carried out in the Metallurgical Laboratory on residues from the Surprise Lead Mine.

A second bag of residues from the Surprise Lead Mine arrived at the School on 3rd August, and tests have been conducted on this material on lines suggested by the State Mining Engineer.

Assay value of residues = 2.4 per cent. Pb.

Grading Analysis—

Plus	8	=	89.0	
„	16	=	149.3	
„	20	=	28.3	
			——	266.6
„	30	=	58.1	
„	40	=	32.7	
„	60	=	39.2	
„	80	=	27.3	
„	100	=	4.3	
„	150	=	26.0	
„	200	=	4.0	
Minus	200	=	41.7	
			——	
			499.9	

Plus 20 product = 53.3 per cent. by weight, assay value = 1.11 per cent. Pb.

Minus 20 product = 46.7 per cent. by weight, assay value = 3.53 per cent. Pb.

It will be particularly noted that this sample is very much lower in lead than the bag received during the latter part of last year, which assayed 4.8 per cent. Pb.

Direct flotation tests have been carried out on the residues as received, after fine grinding, and also on the minus 20 product. Selective flotation tests were tried using (a) sulphur dioxide, and (b) potassium cyanide; and also classification of the residues into sands and slime by a rising current of water, followed by flotation of the classified products.

Both copper and zinc have been found in the concentrates produced by flotation; in one case test 5 float B, the amount of zinc present was 17.5 per cent., while in test 7, float A, the copper present was 2.0 per cent. In the selective tests the separation of Pb. and Zn. was poor, and the Cu. appeared to remain with the Pb.

It is my opinion that residues of the grade of this bag are too low in values to be economically treated, but the tests undertaken show:—

(a) That a large percentage of lead can be floated.

(b) Grading of the material through a 20-mesh screen produces a higher grade minus 20 product.

(c) Classification of the residues into sand and slime produces a low grade sand and a slime of higher value.

(d) The slimed material, without further grinding, does not give high recoveries of lead by flotation, probably due to the fact that the fine particles are partially oxidised; but this would not occur in current residues, therefore separation of the slime, which is only a comparatively small amount, and retreatment by flotation would possibly give good results.

Sufficient work has not been undertaken on the selective side, but I do not anticipate any difficulty in that direction, if the residues are high enough in value to be treated.

If it is necessary to do any further testing of this material, we would require a fresh sample, as we used up all the last sample in the tests shown in this report.

A. S. WINTER,
Research Metallurgist.

School of Mines,
Kalgoorlie, 2nd September, 1925.

FLOTATION TESTS ON RESIDUES FROM SURPRISE LEAD MINE.

No. 2 Bag received 3rd August, 1925.

	Residues.				Water	Oil.			Reagents.			Float.				Tails.				Apparent Recovery in conc.		
Test No.	Wt. gram.	Pb. %	Zn. %	Cu. %	Wt. gram.	Description.	Wt. grm.	Wt. lb. ton.	Description.	Wt. gram.	Wt. lb. ton	Wt. gram.	Pb. %	Zn. %	Cu. %	Wt. gram.	Pb. %	Zn. %	Cu. %	Pb. %	Zn. %	Cu. %
1	500	2·4	0·91	0·14	3,000	Kero. ... ... Eu. Py. tar ...	·30 ·18	1·2 ·72	Pot. ... ... Xan.	... 0·05	... ·20	... 34·6	... 23·8	... 10·9	... 1·35	... 455	... 0·7	... ·14	... 0·05	... 70·8	... 84·6	... 64·3
2	500	2·4	0·91	0·14	3,000	Pine	·54	2·16	Pot. Xan. ...	·05	·20	37·2	22·2	...	...	453	0·8	...	...	66·6	...	...
3	500	2·4	0·91	0·14	3,000	Kero. ... ... Eu. Py. tar ...	·30 ·18	1·2 ·72	Pot. ... ... Xan.	·05 ...	·20 ...	... 34·3	... 22·4	... ...	... ...	... 455	... 0·8	... ...	... ...	... 66·6	... ...	... ...
4	600	2·4	0·91	0·14	3,000	Pine	·66	2·2	Pot. Xan ...	·05	·16	46·1	22·2	...	...	544	0·7	...	...	70·8	...	...
5	600	2·4	0·91	0·14	3,000	Pine	·66	2·2	$NaHCO_3$ ... $ZnSO_4$ ... KCN ... ... H_2SO_4 ...	1·2 ·12 ·15 9·0	4·0 ·4 ·5 30·0	A26·0 ... B10·6 ...	35·4 ... 3·2 ...	9·55 ... 17·5 ...	1·7 ... ·4 ...	... ... 554 ...	... ... 0·86 ...	... ... ·14 ...	... ... 0·06 ...	... ... 64·1 ...	... ... 84·6 ...	... ... 57·1 ...
6	600	2·4	0·91	0·14	3,000	Pine	·66	2·2	Pot. Xan. ... $NaHCO_3$ ... $ZnSO_4$ ... KCN ... ... H_2SO_4 ...	·05 1·2 ·12 ·15 9·0	·16 4·0 ·4 ·5 30·0	35·9	27·2	13·4	1·35	554	0·9	·14	0·06	62·5	84·6	57·1
7	600	3·55	1·2	0·16	3,000	Pine	·66	2·2	$NaHCO_3$ ... $ZnSO_4$ ... KCN ... ... H_2SO_4 ...	1·2 ·12 ·15 9·0	4·0 ·4 ·5 30·0	A28·5 ... B14·1 ...	46·0 ... 6·4 ...	12·9 ... 16·0 ...	2·0 ... ·46 ...	... ... 547 ...	... ... 1·4 ...	... ... ·18 ...	... ... 0·06 ...	... ... 60·5 ...	... ... 80·2 ...	... ... 57·1 ...
8	600	3·55	1·2	0·16	3,000	Pine	·66	2·2	$NaHCO_3$ ... $ZnSO_4$ ... KCN ... ... H_2SO_4 ... Pot. Xan. ...	1·2 ·12 ·15 9·0 ·05	4·0 ·4 ·5 30·0 ·16	41·4	34·0	...	...	548	1·1	...	...	67·7	...	...

NOTE.—Tests Nos. 1 to 6 carried out on residues as received: Nos 7 and 8 on minus 20-mesh product.

WILFLEY CONCENTRATION AND FLOTATION TESTS ON RESIDUES FROM SURPRISE LEAD MINE.

Test No.	Residues.			Water Wt. grams.	Oil.			Reagents.			Float.			Tails.			Recovery. Pb. %	Remarks.
	Wt. gram.	Pb. %	Zn. %		Description.	Wt. gram.	Wt. lb. ton.	Decription.	Wt. gram.	Wt. lb. ton.	Wt. gram.	Pb. %	Zn. %	Wt. gram.	Pb. %	Zn. %		
9	600	3·28	...	3,000	Pine ...	·66	2·2	Pot. Xanthate.	0·05	·16	37·0	33·3	...	553	1·3	...	60·3	–20 Product floated without further grinding.
10	6,000	3·28	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Wilfley concentration test. Produced 565 grams conc. = 15·50 % Pb.
10A	500	15·50	4·55	3,000	Pine ...	·54	2·16	H_2SO_4 ...	3·6	14·4	A 77·1	58·6	12·7	336	5·05	...	67·4	*Retreatment of Wilfley Concentrate:* Slimed in pebble mill increased temp. to 35°C. passed SO_2 till pulp acid (to endeavour to retard flotation of ZnS) oiled with 18 drops Pine Oil and floated off very clean but mixed sulphides. Then added 20 cc. 10% H_2SO_4, produced very frothy mixed float.
											B 76·6	19·7	10·4	...	...	...	...	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	*Retreatment of Wilfley Tails:—* Classified in a rising current of water into sands and slimes.
10B	600	0·86	...	3,000	Pine ...	·66	2·2	Pot. Xanthate.	·05	·16	28·0	11·1	...	562	0·4	...	53·4	Sands from Wilfley tails after classification as above.
10C	600	5·65	...	3,000	Pine ...	·66	2·2	Pot. Xan.	·05	·16	59·4	18·1	...	530	4·4	...	20·3	*Slimes* from Wilfley tails after classification as above.

FLOTATION TESTS ON RESIDUES FROM SURPRISE LEAD MINE.

Test No.	Residues.			Water Wt. gram.	Oil.			Reagents.			Float.			Tails.			Recovery. Pb. %	Remarks.
	Wt. gram.	Pb. %	Zn. %		Description.	Wt. gram.	Wt. lb. ton.	Decription.	Wt. gram.	Wt. lb. ton.	Wt. gram.	Pb. %	Zn. %	Wt. gram.	Pb. %	Zn. %		
11	600	3·28	...	3,000	Pine ...	·66	2·2	H_2SO_4 ...	3·6	14·4	...	...	...	...	...	...	...	Mixed float at start—test negative.
12	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,000 grams –20 product classified in a rising current of water into sands and slime. 460 grams slime produced = 7·5% Pb. 1,540 grams sands produced = 1·78% Pb.
12A	430	7·5	...	3,000	Pine ...	·45	2·09	Pot. Xanthate.	0·05	·23	45·5	39·5	...	374·5	3·8	...	49·3	Slimes from above.

PRELIMINARY REPORT ON THE INVESTIGATION OF A SAMPLE OF ANTIMONIAL GOLD ORE FROM THE BLUE SPEC MINE AT NULLAGINE.

This ore consisted of a quartz matrix, containing the antimony minerals stibnite Sb_2S_3 and cervantite, $Sb_2O_3.Sb_2O_5$ and no free gold was visible.

In the treatment of this ore three main factors have to be investigated, viz., recovery of gold, recovery of antimony, and realisation of antimony-gold concentrates. The method of occurrence of the gold in the ore, *i.e.,* whether contained in the antimony minerals or in the quartz gangue, has an important bearing on the method to be adopted for recovery of the gold. If the gold occurs in the quartz gangue, it may be possible to separate the antimony minerals by suitable methods of concentration, yielding a concentrate rich in antimony, but low in gold, and a residue rich in gold, but low in antimony from which cyanidation might result in a satisfactory extraction. On the other hand, if the gold is contained in the antimony minerals, concentration will probably yield a concentrate high in both gold and antimony and a residue sufficiently low in both antimony and gold to be discarded. This latter possibility introduces the problem of the disposal of the high grade gold-antimony concentrate or its treatment for recovery of both gold and antimony. In addition to concentration methods, it may be possible to recover both gold and antimony separately and economically by chemical or electro-chemical methods.

The preliminary tests, a description of which is here given, were taken to determine the mode of occurrence of the gold and the possibility of recovering the two metals in marketable products. Pressure of work connected with the finalising of the Oroya Links investigation has not admitted of other than preliminary tests being carried out, which have indicated that the greater portion of the gold is recoverable, by concentration, in the form of a high-grade concentrate. These tests have, however, been too few to enable us to determine the maximum recovery possible or the methods to be adopted for the recovery of the metals. Concentration methods involving flotation for recovery of both gold and antimony are complicated by the presence of the antimony oxide, which cannot be floated by ordinary methods. Stibnite, however, is readily floated and the concentrate produced is of high grade, both as regards gold and antimony.

Four direct flotation tests and one combined gravity and flotation test, with three re-treatments, have been carried out, the results of which indicate the possibility of recovering a high percentage of the gold and the bulk of the stibnite in the concentrate. Determinations of the antimony content of the ore and products of the tests have not yet been made, but the results of the tests show that while practically all the stibnite is readily recovered, the cervantite is more difficult to recover.

The details of the tests made are as follows:—

Test 1.—*Direct Flotation.*

500 gram ore, slimed in pebble mill for 3 hours with 500 c.c. water and 0.25 gram kerosene and 0.3 gram eucalyptus-tar mixture (1:4), and floated in Ruth machine after dilution of pulp to 3,000 c.c.; rapid flotation of stibnite took place.

Concentrate—Weight, 147.2 gram; value, 252 dwt. au. per ton.
Residue—Weight, 365.5 gram; value, 19.2 dwt. au. per ton.
Recovery of gold—72.16 per cent.

Test 2.—*Direct Flotation.*

As for Test 1, with the addition of 1 gram of sodium sulphide, in pebble mill to endeavour to sulphidise the cervantite.

Concentrate—Weight, 156.2 gram; value, 265.2 dwt. au. per ton.
Residue—Weight, 357.9 gram; value 12.3 dwt. au. per ton.
Recovery of gold—80.59 per cent.

Test 3.—*Direct flotation of slimed ore, followed by retreatment of residues from primary flotation.*

600 gram ore slimed in pebble mill one hour with 500 c.c. water and 0.25 gram kerosene, and 0.3 gram eucalyptus-tar mixture (1:4) and 0.05 gram potassium xanthate, and floated in Ruth machine after dilution to 3,000 c.c. The residue produced in this primary flotation operation was then subjected to a second flotation after regrinding for 20 minutes with 25 gram stibnite containing no gold.

Primary concentrate—Weight, 117.2 gram; value, 396.0 dwt. per ton.
Primary residue—Weight, 473.2 gram; value, 11.8 dwt. per ton.
Secondary concentrate—Weight, 46.5 gram; value, 92.2 dwt. per ton.
Final residue—Weight, 382.5 gram; value, 10.0 dwt. per ton.
Recovery of gold—82.19 per cent.

Test 4.

As for Test 3, but with addition of 25 gram galena containing no gold, instead of stibnite.

Primary concentrate—Weight, 121.2 gram; value, 404.0 dwt. per ton.
Primary residue—Weight, 471.0 gram; value, 22.8 dwt. per ton.
Secondary concentrate—Weight, 39.3 gram; value, 108.6 dwt. per ton.
Final residue—Weight, 386.2 gram; value, 13.8 dwt. per ton.
Recovery of gold—86.3 per cent.

Test 5.—*Combined gravity and flotation concentration.*

1,000 gram ore finely ground was concentrated on Wilfley table, the residues reground for 1 hour with 0.25 gram kerosene and 0.3 gram eucalyptus-tar mixture (1:4), and floated in Ruth machine.

Wilfley concentrate—Weight, 258.4 gram; value, 154.4 dwt. per ton.
Wilfley residue—Weight, 662.0 gram; value, 35.2 dwt. per ton.
Flotation concentrate—Weight, 181.0 gram; value, 66.0 dwt. per ton.
Flotation residue—Weight, 383.0 gram; value, 15.8 dwt. per ton.

A much more extended investigation is necessary to determine the most suitable method of treatment, and if a full investigation is to be made, it will be necessary that the syndicate controlling the mine furnish the School with a sample of ore of about 1 cwt. for further testing. To avoid delay, this sample might be procured during the Christmas vacation.

A. S. WINTER,
Research Metallurgist.
B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 7th December, 1925.

MANGANESE ORE.

MAGNETIC CONCENTRATION TESTS.

In accordance with instructions, we have carried out a series of magnetic concentration tests on the sample of manganese ore forwarded by Mr. G. Lambert, M.L.A., through the State Mining Engineer.

The object of these tests was to reduce the iron content of the sample.

The ore was crushed and sampled, and a portion finely ground for testing. As it was impossible to detect the iron minerals present by the naked eye, it was considered imperative that the sample for treatment should be very finely divided so as to enable the more magnetic particles to be separated. The fineness of division of the sample is shown by the following grading analysis:—

Plus 100—0.7 per cent.
Plus 150—7.2 per cent.
Plus 200—2.5 per cent.
Minus 200—89.6 per cent.

The tests were carried out on the "Rapid" Magnetic Concentrator under varying conditions as to rate of feed, intensity of magnetic field, and distance of magnets from the feed belt. It was recognised that the best method of approaching this problem was to endeavour to produce a small quantity of "magnetics" high in iron and a maximum of tails low in iron and high in manganese. It was found that the manganese mineral itself is magnetic, and that the difference in magnetic permeability between the oxides of manganese and of iron is so slight that unless the magnets are set well up from the belt, an excessive quantity of the manganese mineral is taken off with the iron mineral in the magnetics. In fact, by setting the magnets close to the belt it was found possible to take off the whole of the feed in the form of a magnetic concentrate. We have found that, even by successive retreatments of the tails, it was not possible to make a reduction in the iron content of the tails.

From the results of the tests carried out, it seems improbable that the iron content of this sample can be economically reduced below about three per cent. by this method of treatment. This may possibly indicate that this amount of iron is present in actual combination with the manganese dioxide as a definite mineral, a manganite of iron.

Three per cent. of iron appears to be below the limit for chemical purposes, as stated in the result of a concentration test on manganese ore, details of which are given in the Summary Report of the Mines Branch of the Department of Mines, Canada, for 1918, page 146.

B. H. MOORE.
A. S. WINTER.

13th June, 1924.

MANGANESE ORE.

Magnetic Concentration Tests.

Chemical Analysis:

Mn.	51·83 per cent.
MnO	78·27 „
MnO_2	3·03 „
Fe	5·09 „
$Fe_2 O$	7·27 „
SiO_2	0·92 „

Test No.	Magnetics, Fe, per cent.	Tails, Fe, per cent.	Remarks.
1	12·98	3·84	
2	6·75	3·74	
3	15·74	4·42	
4	12·47	4·88	
5	14·60	3·95	
6	14·70	3·48	
7	16·21	4·16	
8	21·40	5·20	
9	27·01	3·43	
10	21·09	3·22	
11	15·06	2·91	
12	...	2·91	Tails from first treatment.
...	30·44	3·22	From re-treatment of first magnetics.
13	14·13 (*a*)	2·91	(*a.*) Magnetics from first three treatments of sample.
...	...	3·01	
...	...	2·91	(*b.*) Magnetics from final (4th) treatment.
...	4·05 (*b*)	2·59	In this test the tails from the first treatment of the sample were re-treated three times.

B. H. MOORE,
A. S. WINTER.

13th June, 1924.

MANGANESE ORE.—MAGNETIC CONCENTRATION TESTS.

Test No.	Weight of magnetics extracted per cent. (based on actual weights of magnetics).
1	13·6
2	12·0
3	3·4
4	2·5
5	6·4
6	8·3
7	8·0
8	2·5
9	6·7
10	11·0
11	19·0
12	4·2 (Final magnetics from retreatment of first magnetics).
13	18·0 (Magnetics from sample treated three times).
	67·7 (Magnetics from fourth treatment with magnets set close to belt).

Test No.	Feed.		Magnetics.		Tails.		Remarks.
	Wt. gram.	Fe per cent.	Wt. gram.	Fe per cent.	Wt. gram.	Fe per cent.	
14	50	5·09	4·1	22·03 Calcd.	45·9	3·22	First treatment.
...	4·1	22·03	1·5	47·8	2·6	7·17	Re-treatment of magnetics.

B. H. MOORE.
A. S. WINTER.

4th July, 1924.

REPORT ON MAGNETIC CONCENTRATION OF HEMATITIC ILMENITE.

In accordance with the request of the State Mining Engineer, magnetic concentration tests have been carried out in the Metallurgical Laboratory of the School of Mines on a sample of hematitic ilmenite from near Mornington Mills, in the Darling Range.

Before carrying out quantitative tests, a number of qualitative tests were performed to determine the behaviour of the sample under different conditions of operation of the magnetic concentrator. These tests indicated that there was very little possibility of concentrating the ilmenite either in the magnetic concentrate or in the tails from the concentrator. Notwithstanding these results, two quantitative tests were carried out under different conditions to determine whether it was possible to remove the more magnetic minerals in the form of a magnetic concentrate, and, therefore, to produce a residue of higher grade in ilmenite than the feed. The variable conditions in the two tests were the intensity of the magnetic field and the height of the magnets above the travelling belt.

Test A.

Operating conditions—

Height of first magnet above belt—½ inch.
Height of second magnet above belt—⅜ inch.
Maximum intensity of magnetic field—1.35 amp.
Weight of feed, —100 mesh—50 gram.
Magnetic concentrate—Weight, 12.2 gram.
Magnetic concentrate—TiO_2 per cent., 20.0.
Tails—TiO_2 per cent., 22.32.

Test B.

Operating conditions—

Height of first magnet above belt—⅜ inch.
Height of second magnet above belt—¼ inch.
Intensity of magnetic field—0.9 amp.
Weight of feed, —100 mesh—50 gram.
Magnetic concentrate—Weight, 35.9 gram.
Magnetic concentrate—TiO_2 per cent., 18.26.
Tails—TiO_2 per cent., 21.36.

The comparatively close agreement between the titanium contents of the concentrates and tails in each of these tests under the two extremes of operating conditions, shows that it is impossible by magnetic methods to make an economic concentration of the ilmenite, either in the concentrate or the tails.

The results of magnetic concentration tests by P. E. Dulieux, on Canadian titaniferous magnetites, are quoted in "Titanium," by A. H. A. Robinson, published by the Mines Department, Canada, Bulletin No. 579, 1922, pp. 67, 69. These results show that even on this more magnetic material, a satisfactory concentration of the ilmenite into a high grade product is not possible.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 13th May, 1926.

W.A. SCHOOL OF MINES.

TESTS TO DETERMINE GRINDING EFFICIENCY OF COARSE ORE INSTEAD OF PEBBLES.

Ore supplied by Mr. W. H. Vale.

Ore crushed through rolls.

Grading Analyses.

	%
Plus 5	24·1
„ 8	24·05
„ 16	23·7
„ 20	3·6
„ 40	10·3
„ 60	3·25
„ 80	2·0
„ 100	·35
Minus 100	8·65
	100·00

No. 1 Test.

"Grits" ... ... 2,500 grams.
Crushed Ore ... ... 1,000 „
Water ... ... 400 ccs.
Grinding in pebble mill—60 mins.

Grading Analyses.

	%
Plus 5	12·0
, 8	9·25
„ 16	13·1
„ 20	2·5
„ 40	8·85
„ 60	5·05
„ 80	5·05
„ 100	0·9
Minus 100	43·3
	100·00

Loss of "Grits" due to grinding 3·2%

No. 2 Test.

"Grits" ... ... 2,500 grams.
Crushed Ore ... ... 1,000 „
Water ... ... 400 ccs.
Grinding in pebble mill for—4 hours.

Grading Analyses.

Plus 5	3·1
„ 8	·5
„ 16	·55
„ 20	·20
„ 40	1·05
„ 60	1·45
„ 80	3·70
„ 100	1·25
Minus 100	88·20
	100·00

Loss of "Grits" due to grinding—5·1%

No. 2 Sample (sulphide ore) crushed through rolls.
"Grits" from previous tests used for grinding.

Grading Analysis of Roll Product.

I.M.M. Screen	%
Plus 5	28·00
„ 8	19·90
„ 16	21·90
„ 20	3·46
„ 40	10·68
„ 60	3·84
„ 80	2·44
„ 100	0·46
Minus 100	9·32
	100·00

No. 3 Test.

"Grits" ... ... 2,419 gram.
Roll product ... ... 1,000 „
Water ... ... 400 ccs.
Grinding in pebble mill—2 hours·

Grading Analysis of Roll Product.

I.M.M. Screen.	%
Plus 5	7·75
„ 8	4·58
„ 16	4·50
„ 20	0·90
„ 40	4·10
„ 60	4·50
„ 80	4·50
„ 100	0·80
„ 200	7·60
Minus 200	60·77
	100·00

Loss of "Grits" due to grinding—1·7%

No 4 Test.

"Grits" ... ... 2,372 gram.
Roll product ... ... 1,000 „
Water ... ... 400 ccs.
Grinding in pebble mill—4 hours.

Grading Analysis of Product.

I.M.M. Screen.	%
Plus 5	0·23
„ 8	0·20
„ 16	0·25
„ 20	0·12
„ 40	0·53
„ 60	0·93
„ 80	2·80
„ 100	0·70
„ 200	5·85
Minus 200	88·39
	100·00

Loss of "Grits" due to grinding—2·65%

15th May, 1926.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

REPORT ON THE EXPERIMENTAL HEAP LEACHING OF WHIM CREEK COPPER ORE WITH FERROUS SULPHATE SOLUTION AT THE SCHOOL OF MINES OF W.A., KALGOORLIE.

Pursuant to instructions received from the State Mining Engineer, an experimental leaching test has been carried out on Whim Creek copper ore with ferrous sulphate solution along lines laid down by Mr. H. R. Sleeman, Manager, Pilbarra Copper Fields, Ltd. For this purpose a small heap leaching plant was erected in connection with the Metallurgical Laboratory of the School of Mines.

Leaching Plant.—The plant consisted of an enclosed ore pile, 7 feet 6 inches high by 3 feet square, containing 3 tons 3 cwt. 27 lb. of oxidised copper ore forwarded from Whim Creek for this purpose, together with six 40-gallon barrels, two of which were used for precipitation of dissolved copper by means of iron, and the remaining four for collection of the spent liquor for return to the heap by means of a pump installed for this purpose in the Metallurgical Laboratory. The ore pile was supported on an elevated inclined floor from which the effluent from the heap, containing dissolved copper, entered the cementation barrels at the bottom and passed upwards through the iron, which consisted of black iron scrap, petrol tins, and iron and steel turnings.

Method of Leaching.—When oxidised copper ores are leached at ordinary temperature with ferrous sulphate solution the following reactions probably take place:—

$$4CuCO_3 + 4FeSO_4 + O_2 + 6H_2O \geqslant 4CuSO_4 + 4Fe(OH)_3 + 4CO_2$$

or

$$\left\{\begin{array}{l} 12FeSO_4 + 3O_2 + 6H_2O \geqslant 4Fe_2(SO_4)_3 + 4Fe(OH)_3 \\ 12CuCO_3 + 4Fe_2(SO_4)_3 + 12H_2O \geqslant 12CuSO_4 + 12CO_2 + 8Fe(OH)_3. \end{array}\right.$$

In many copper leaching processes, both on oxidised and sulphide ores, ferric sulphate is used as a solvent, but in this process, proposed by Mr. H. R. Sleeman, ferrous sulphate is the starting point, although from the above equations it appears that ferrous sulphate is first partially oxidised in the heap by atmospheric oxygen to ferric sulphate, which then constitutes the active solvent. Most of the ferric sulphate so formed is converted by the reaction responsible for the solution of the copper into ferric hydroxide, which is deposited in the heap, with the result that the effluent from the heap contains very little dissolved ferric sulphate; but, in its passage through the cementation barrels most of this ferric sulphate is reduced to ferrous sulphate, so that the liquor entering the heap is essentially a solution of ferrous sulphate. If, as appears probable, ferric sulphate is the active solvent, it is reasonable to conclude that solution of the copper will be hastened by intermittent leaching, *i.e.,* by alternately leaching and allowing the heap to aerate for some time.

That ferric sulphate is the active solvent seems to be borne out by the results of preliminary leaching tests on this ore carried out in the Metallurgical Laboratory under the two extremes of conditions, viz., without and with aeration. These tests, the results of which follow, indicate that a free supply of oxygen is essential for rapid solution of the copper.

Preliminary Laboratory Experiments to determine the Solvent Action of Ferrous Sulphate without access of Air.

For this purpose a series of five tests was carried out by agitation of minus 40 mesh ore with ferrous sulphate solution in sealed jars, half filled with the pulp. All the tests were carried out under exactly similar conditions, except as regards the time factor, the time of agitation varying from half an hour to ten hours. At the conclusion of each test, the liquor was assayed for dissolved copper and ferrous iron.

The charge in each test was as follows:—

Ore	... 1,000 gram.
Water	... 2,000 c.c.
Ferrous sulphate, $FeSO_4 \cdot 7H_2O$	... 100 gram.
Ferrous iron content of reacting solution	1·13% Fe
Assay value of ore	... 4·8% Cu
Density of ferrous sulphate solution	... 1·027
Volume of ferrous sulphate solution	... 2,045 c.c.

Test No.	Time of agitation.	Loss of ferrous iron.		Copper in solution.	
	hours.	gram.	per cent.	gram.	per cent.
1 ...	0·5	2·73	13·01	0·326	0·016
2 ...	1·0	2·73	13·01	0·301	0·015
3 ...	2·0	2·73	13·01	0·276	0·013
4 ...	6·0	3·51	16·73	0·226	0·011
5 ...	10·0	3·71	17·66	0·102	0·005

Test No. 5, after standing exposed to air for three days, showed no ferric iron in solution and a loss of ferrous iron of 6.05 gram, equivalent to 28.83 per cent., and a gain in copper content of 0.426 gram, equivalent to 0.208 per cent.

The results of these tests indicate that when the ore is agitated with ferrous sulphate solution in contact with the limited amount of air sealed up in the jar with the pulp, the solvent action of this solution on the oxidised copper minerals is slight. Increased time of treatment under these conditions results in a continuous reduction of the amount of copper in solution, probably due to the ferrous sulphate reducing the cupric sulphate to insoluble cuprous sulphate.

Comparison with the results obtained in the air agitation tests shows that the presence of a free supply of air is essential for solution of the copper.

Preliminary Laboratory Experiments to determine the Solvent Action of Ferrous Sulphate in conjunction with Air.

This determination was carried out in a glass vessel by agitation of minus 40 mesh ore with ferrous sulphate solution by means of compressed air, the charge being sampled at intervals, and estimations made of the dissolved copper and ferrous iron.

The charge was as follows:—

Ore	1,000 gram.
Water	2,000 c.c.
Ferrous sulphate, $FeSO_4$, $7H_2O$ ...	150 gram.
Ferrous iron content of reacting solution ...	1·69% Fe
Density of ferrous sulphate solution ...	1·041
Volume of ferrous sulphate solution ...	2,065 c.c.
Assay value of ore: Copper ...	4·8%
Assay value of ore: Iron ...	12·7%

Time of agitation.	Loss of ferrous iron.		Copper in solution.		Remarks.
hours.	gram.	%	gram.	%	
1·0	2·36	6·76	0·329	0·016	
1·5	4·93	14·12	1·645	0·080	
2·0	6·50	18·64	3·114	0·151	
2·5	6·70	19·21	4·177	0·202	
3·0	7·69	22·02	4·683	0·227	
5·5	8·87	25·41	6·836	0·331	
7·5	10·64	30·50	7·722	0·374	
9·5	13·60	38·97	9·115	0·441	

At this stage the volume of solution had been reduced by fifty per cent. 2,000 c.c. water and 150 gram. ferrous sulphate were then added, making a total volume of 3,100 c.c. of solution, which then contained 1·451 per cent. ferrous iron, Fe″, and 0·141 per cent. copper (equivalent to 4·371 gram Cu.)

11·5	14·49	40·94	9·87	0·478	Calculated to original volume of solution.
13·5	15·08	42·25	11·77	0·570	
15·0	15·37	42·91	13·22	0·640	
17·5	15·97	44·23	15·49	0·750	

The charge then stood 44 hours (over Saturday and Sunday) when the solution contained 1·356 per cent. ferrous iron, Fe″, and 0·319 per cent. Cu. (equivalent to 9·86 gram Cu.)

24·5	16·56	45·54	24·24	1·174	Calculated to original volume of solution.
31·0	19·52	52·11	27·73	1·343	
36·5	19·81	52·78	32·66	1·581	
41·0	Not determined.		35·31	1·710	

Hence, forty-one hours' agitation, together with the periods during which the ore was in contact with the solution without agitation, resulted in the extraction of 73.56 per cent. of the copper. At this stage it became necessary to terminate the test, and the residue, after thorough washing to remove soluble copper and iron, was assayed, with the following result:—Copper, 1.6 per cent.; iron, 13.2 per cent.

In the tests in which the quantity of oxygen available was limited to that of the air enclosed in the jars, it is evident that solution of the copper took place until this oxygen had been used up, and that, as the time of agitation was increased, copper, instead of continuing to dissolve, was gradually thrown out of solution, probably by being reduced by ferrous sulphate, $FeSO_4$, to insoluble cuprous sulphate, Cu_2SO_4.

On the other hand, in the series of tests in which the ore was agitated with ferrous sulphate solution by means of air, the amount of copper in solution increased continuously with the time of agitation, indicating that the active solvent is ferric sulphate produced by oxidation of ferrous sulphate in accordance with the equation previously given.

The necessary oxidising conditions during the leaching of heaps of oxidised ore by this process could be obtained by working on a number of heaps which would be alternately under treatment and receiving the necessary oxidation by aeration on standing.

Nature of the Ore.—The ore, as received, had been crushed to half-inch mesh and the slime removed by washing, in order that percolation of the solvent liquor through the heap should not be retarded. The following is the grading analysis of the ore as received:—

I.M.M. Screen.	Per cent.
plus 5	40.10
plus 8	12.10
plus 12	10.30
plus 16	4.92
plus 20	3.33
plus 40	11.32
plus 60	5.04
plus 80	3.90
plus 100	0.72
plus 150	3.66
minus 150	4.61

The principal copper minerals occurring in the ore were found to be malachite, $CuCO_3\ Cu(OH)_2$, azurite, $2CuCO_3.Cu(OH)_2$, and chrysocolla, $CuO.SiO_2.2H_2O$.

The assay value of the ore was as follows:—Copper, 4.8 per cent.; iron, 13.68 per cent.

Laboratory tests with solutions of ferrous sulphate and chloride, both cold and hot, have shown that chrysocolla is insoluble in these solutions, and therefore the total copper content of the ore does not represent the percentage of copper which can be removed by leaching with these solutions. Of the 4.8 per cent. of copper present in the ore, only 3.68 per cent. is soluble in acetic acid. Solubility in acetic acid is assumed to indicate the amount of copper present as carbonates and oxide, the insoluble portion being considered to be present in the form of chrysocolla, which is not attacked by that acid.

That chrysocolla is not attacked by solutions of ferrous sulphate or chloride is shown by the fact that while leaching was in progress large pieces of unaltered chrysocolla could be seen in the pool of liquor on the top of the heap, and also that when the heap was being dismantled similar pieces of unaltered chrysocolla could be seen in any portion of the heap. Hence, for the purpose of leaching with solutions of ferrous sulphate or chloride, the actual value of the ore is 3.68 per cent. copper.

Samples of slime were received from Mr. Sleeman, which it was understood had been washed out of the ore at Whim Creek. The weights and copper contents of ore and slime are as follows:—

——	Dry Weight.	Copper.	Copper, Weight.
	lbs.	per cent.	lbs.
Ore	8,162	4·8	391·78
Slime (Truck 1)	848	2·64	22·38
Slime (Truck 2)	611	2·72	16·62
Totals ...	9,621	...	430·78

Hence—

Value of original ore ...	... 4·47% Copper
Value of slime	... 2·67% „
Percentage of copper in slime	... 9·05
Percentage of slime removed	... 15·16

Hence, by removal of 15.16 per cent. of the ore in the form of slime assaying 2.67 per cent. copper, to permit of free percolation during leaching, the grade of the residual ore was increased from 4.47 per cent. to 4.8 per cent. copper.

Preparation of Heap.

After thorough mixing for the purpose of sampling and of securing uniform distribution of particles of different sizes throughout the heap, the ore heap was built up by introducing the ore at the sides and allowing it to rill towards the centre. This was done to avoid dumping and packing of the ore, and so to allow of even percolation of the solvent liquor through the whole of the heap. A shallow depression was left on top of the heap to permit of a small accumulation of liquor during leaching, so as to obtain a uniform distribution of the liquor over the whole transverse area of the heap, and prevent it from running down the sides of the heap. The bottom six inches of the heap was left open to the air, which it was expected would assist in the aeration of the heap. This is as nearly similar as possible to the condition that would obtain in the leaching of large tonnages of ore.

Ferrous Sulphate Leaching.

Intermittent Leaching.—Intermittent leaching consisted in leaching continuously throughout each day for periods varying from 6 hours to 15 hours, as shown in the "Statement of Operations," and allowing the heap to stand over night and over the week ends. The total time of actual leaching under these conditions was 80 hours, during which time the total copper dissolved was 22.8 lbs. The six hour leaching periods were Saturday morning runs, and after the long standing over the week end there was usually a marked increase in the weight of copper dissolved during each Monday, showing the benefit derived from aeration of the heap on standing.

Continuous Leaching.—During this period of five days leaching was carried out without intermission, the copper dissolved being 26.22 lbs., and the rate of solution being much less than during the period of intermittent leaching. This falling off in the rate of solution of the copper tends to show that the presence of oxygen in the heap is favourable to the solvent action of ferrous sulphate.

Aeration of Solution.—As it was impossible to aerate the heap artificially, an attempt was made, at Mr. Sleeman's suggestion, to bring about a similar result by aeration of the liquor, by the introduction of a compressed air jet into the sump. The result was unsatisfactory, and it is our opinion that it is not aeration of the liquor that is necessary, but rather aeration of the ore. The rate of solution of copper was much slower than by any other of the leaching methods adopted, 5.77 pounds of copper being dissolved in 41 hours. Owing to the poor result obtained, this method of leaching was soon terminated.

Ferrous Chloride Leaching.

Cold Solution Leaching.—The chloride solution was made up by adding to the liquor 40 pounds of sodium chloride, NaCl, which is the amount necessary to produce a solution of concentration fifty per cent. greater than the concentration equivalent to that of the ferrous sulphate.

The solvent action of ferrous chloride on oxidised copper minerals is well known and has been successfully made use of in several leaching processes, usually at elevated temperatures.

In the heap test the ore was leached intermittently with ferrous chloride solution for a total period of 111.5 hours, during which 32.66 pounds of copper were dissolved from the ore. In this case the rate of solution of the copper was much greater than under any of the conditions of leaching with ferrous sulphate.

Warm Solution Leaching.—From experience with the metallic contact process in which ferrous chloride solution at 70 degrees Centigrade is used as a solvent, it was expected that by warming the leaching solution a higher rate of solution of copper would also be obtained in heap leaching. During the necessarily short period when these conditions were used, it was found that the rate of solution was higher than under any other of the conditions adopted, 5.77 pounds of copper being dissolved in 15 hours with the solution at temperatures ranging from 28 to 33.5 degrees Centigrade. These temperatures are more nearly equivalent to the temperatures of solution that would prevail at Whim Creek than those obtaining during the remainder of the heap testing during June and July at Kalgoorlie, when the liquor temperatures ranged from 10 to 12 degrees Centigrade. High temperatures increase the solvent action when ferrous chloride is used, and it is probable that a similar effect would be produced in the case of ferrous sulphate leaching.

The following figures show the comparative rates of solution of copper, in pounds per hour, under the different conditions of leaching:—

—	Method.				
	Intermittent.	Continuous.	Aeration.	Cold Chloride.	Warm Chloride.
Rate of solution ...	0·2850	0·2185	0·1407	0·2929	0·3846
Comparative Rate ...	2·02	1·55	1·0	2·08	2·73

Rate of Percolation.

The rate of percolation has varied from a minimum of 14 gallons per hour to a maximum of 41 gallons per hour, but the result of the test has not shown any definite relationship between the rate of percolation and the amount of copper dissolved. The most suitable rate of percolation must be determined for each case, although, apparently, the most important conditions are that percolation shall be uniform throughout the heap, that there shall be no channelling of the heap, and that percolation shall not be retarded by packing of the ore or by excessive deposition of ferric hydroxide in the heap. From an economic point of view it is necessary to determine the minimum rate of percolation consistent with maximum extraction of copper.

Deposition of Ferric Hydroxide.

As shown by the equations representing the dissolving action, ferric hydroxide is produced during the decomposition of the copper carbonates in the heap, either by ferrous sulphate or chloride. As this substance is of a colloidal nature, it is possible that excessive deposition of the hydroxide may seriously retard the rate of flow of the liquor through the heap, although in the heap test very little trouble was experienced from this cause. During the first few days, however, a small quantity of ferric hydroxide was deposited on the top of the heap, but any harmful effect from this cause was prevented by digging up the surface of the heap at intervals. When the heap was dismantled for sampling, it was evident that ferric hydroxide had been deposited throughout the heap, which was verified by the iron content of the ore having increased from 13.68 per cent. to 15.44 per cent.

Precipitation.

At the commencement of the test the iron used for precipitation of copper from the effluent was tinned iron (petrol tins), but with this material precipitation was slow on account of the protective coating of tin. When black iron scrap and iron and steel turnings were added to the cementation barrels, precipitation was much more rapid, in fact, on some days precipitation was so rapid that the sump solution entering the heap contained no copper.

An impression seems to exist that the solvent action of ferrous sulphate solution on oxidised copper minerals is increased if the solution contains a certain percentage of copper sulphate, and that therefore it is a disadvantage to precipitate the whole of the copper from the effluent. To obtain information on this point, the following experiments were carried out in the Metallurgical Laboratory:—

1. 750 gram of minus 40 mesh ore was agitated, by means of air, in a glass pachuca with 2,000 c.c. of ferrous sulphate solution containing 1.026 per cent. ferrous iron, for three hours. At the end of that time the solution contained 0.139 per cent. copper.

2. 750 gram of minus 40 mesh ore was agitated for three hours by means of air in a glass pachuca with 2,000 c.c. of ferrous sulphate and copper sulphate solution containing 1.026 per cent. ferrous iron and 0.190 per cent. copper. At the end of that time the solution contained 0.310 per cent. copper.

In each experiment the same loss of ferrous iron took place. The following is a comparison of the results of the two tests:—

Test No.	Initial copper content of solution.	Final copper content of solution.	Gain in copper content.
	%	%	%
1 ...	0·0	0·139	0·139
2 ...	0·190	0·322	0·132

Hence it appears that no advantage is gained by delivering the solution to the heap with an initial copper content where the whole of the copper can without difficulty be precipitated.

Theoretically, the consumption of iron should be equivalent to the copper precipitated,

$$CuSo_4 + Fe \geqslant Cu + FeSO_4$$

i.e., in precipitating 63.6 pounds of copper, 56 pounds of iron should be used. In the heap test 86 pounds of iron were consumed, which would be equivalent to 97.6 pounds of copper, while the copper precipitated was 98.4 pounds.

The cement copper produced, containing 81.02 per cent. copper, may be classed as a high grade product, readily marketable. The cement copper, being of a spongy nature, absorbs fine particles of iron, fine particles of ore and ferric hydroxide carried into the cementation barrels from the heap by the effluent. This product could be melted with suitable fluxes to remove the impurities and cast into ingots for shipment.

Conclusions.

From the result of this test we consider that:—

1. Heap leaching of Whim Creek ore with ferrous sulphate or ferrous chloride solution offers no difficulty.
2. Intermittent leaching yields more rapid extraction than continuous leaching.
3. Ferrous chloride is a more efficient solvent than ferrous sulphate for oxidised copper ores.
4. The rate of solution of the copper increases with the temperature.
5. Aeration of the heap by allowing it to stand for certain periods increases the rate of solution of the copper.
6. Aeration of the liquor results in no appreciable increase in rate of solution.
7. Deposition of ferric hydroxide in the heap normally causes no trouble.
8. Precipitation by means of metallic iron is rapid and complete and yields a high grade cement copper.
9. Apparently, complete precipitation of the copper from the solution does not result in diminished rate of extraction of copper from the ore.
10. The presence of copper sulphate in the liquor entering the heap does not increase the rate of solution of copper from the ore.
11. Chrysocolla is not attacked by solutions of ferrous sulphate or chloride, either cold or hot.

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Lecturer in Metallurgy.

School of Mines,
Kalgoorlie, 31st July, 1926.

HEAP LEACHING OF WHIM CREEK COPPER ORE WITH FERROUS SULPHATE SOLUTION.

Statement of Daily Operations and Liquor Analyses.

Date.	Hours leaching.	Rate of flow, gallons, per hour.	Inflow.			Out flow.			Copper dissolved.			Comm. $FeSO_4$ added. lb.	Iron. added. lb.	NaCl added. lb.
			Ferrous iron, lb. per 1,000 gallons.	Ferric iron, lb. per 1,000 gallons.	Copper lb. per 1,000 gallons.	Ferrous iron, lb. per 1,000 gallons.	Ferric iron, lb. per 1,000 gallons.	Copper lb. per 1,000 gallons.	Lb. per 1,000 gallons.	Lb. per day.	Total lb.			
					Intermittent Leaching.									
2-6-26	...	...	201·26	(Circulating liquor through Heap).										
3-6-26	...	...	...	...	...	...	...	...	...	...	...	130	...	...
4-6-26	15	37	61·70	0·80	9·19	57·45	2·00	11·60	2·41	1·34	...	...	46	...
5-6-26	6	31	60·10	0·37	8·58	52·99	2·81	16·24	7·66	1·42	...	...	...	...
8-6-26	15	27	49·04	3·23	10·40	36·50	11·67	23·90	13·50	5·47	...	...	...	...
9-6-26	12	22	77·40	0·00	8·60	52·70	6·20	19·00	10·40	2·75	...	50	...	...
10-6-26	11	14	77·40	0·00	6·13	56·90	13·80	28·20	22·07	3·39	...	...	53	...
11-6-26	15	36	63·70	1·90	5·52	57·18	7·42	17·16	11·64	6·28	...	...	...	...
12-6-26	6	39	62·15	1·40	5·52	53·26	6·19	14·71	9·19	2·15	22·80	...	...	...
					Continuous Leaching.									
14-6-26	24	41	55·60	0·70	7·36	49·70	4·60	14·10	6·74	6·63	...	...	...	...
15-6-26	24	35	57·49	0·93	4·29	53·6	2·77	15·32	11·03	9·26	...	...	62	...
16-6-26	24	28	55·53	1·87	4·59	50·96	1·31	10·73	6·14	4·13	...	...	...	...
17-6-26	24	24	54·55	1·82	3·06	49·00	4·30	7·36	4·30	2·48	...	...	...	...
18-6-26	24	23	53·08	0·22	3·68	47·53	1·67	10·42	6·74	3·72	26·22	...	...	...
					Aeration of Liquor.									
23-6-26	11	31	95·37	2·00	8·58	88·42	5·88	15·63	7·05	2·40	...	80	...	...
24-6-26	15	23	94·08	2·27	9·19	88·05	7·27	14·71	5·52	1·90	...	...	...	...
25-6-26	15	18·5	94·88	2·49	5·52	84·06	10·24	17·78	5·30	1·47	5·77	...	...	...
					Chloride Leaching.									
29-6-26	15	22	66·10	4·62	12·26	54·16	15·54	25·75	13·49	4·45	...	...	24	40
30-6-26	12	24	62·02	2·55	14·10	50·61	12·94	27·58	13·48	3·88	...	...	...	...
1-7-26	9	18	56·90	4·60	4·90	41·89	19·61	28·20	23·30	3·77	...	...	...	...
2-7-26	12	19	57·36	2·09	8·27	45·89	10·48	23·60	15·33	3·49	...	...	...	...
6-7-26	15	33	71·04	0·71	5·52	65·15	2·50	14·71	9·19	4·55	...	40	112	...
7-7-26	15	26·5	72·43	0·34	3·06	64·64	3·01	12·26	9·20	3·61	...	...	...	...
8-7-26	15	20	71·20	0·55	0·31	59·62	5·00	15·63	15·32	4·60	...	...	...	...
9-7-26	14	20	69·90	0·00	0·00	60·02	2·50	12·26	12·26	3·43	...	...	...	...
10-7-26	4·5	32	69·25	1·47	0·00	60·53	3·08	6·13	6·13	0·88	32·66	...	...	...
					Warm Solution Leaching.									
12-7-26	8	21	66·60	0·00	0·00	44·83	13·65	18·30	18·30	3·07	...	Temp. 28 deg. C.		
13-7-26	7	18	59·61	3·99	0·00	42·57	18·93	21·40	21·40	2·70	5·77	Temp. 33·5 deg. C.		
											93·22	300	297	40

The " Copper dissolved " does not include that dissolved during circulation of liquor for the purpose of obtaining uniformity of concentration, during which period no samples were taken.

HEAP LEACHING OF WHIM CREEK COPPER ORE WITH FERROUS SULPHATE SOLUTION.

STATEMENT OF RESULTS OF TEST.

Ore.

Tonnage treated	3 tons 3 cwt. 27lbs. (dry weight).
Total copper.	4·8%
Extractable copper (soluble in acetic acid)	3·68%
Non-extractable copper (chrysocolla)	1·12%
Total Iron	13·68%
Weight of copper in heap { Extractable	260·65lb.
Weight of copper in heap { Non-extractable	79·33lb.

HEAP ASSAYS ON TERMINATION OF TEST.

Heap sampled at top and bottom and at one-foot intervals.

Sample No.	Copper.		Iron.		
	Total.	Water soluble.	Total.	Water soluble.	
				Ferrous.	Ferric.
	per cent.	per cent.	per cent.	per cent.	per cent.
1 (Top)	2·91	trace	14·09	0·142	0·043
2	2·94	trace	14·25	0·082	0·226
3	3·06	trace	13·83	0·062	0·225
4	2·79	trace	16·40	0·103	0·122
5	3·18	trace	17·84	0·092	0·072
6	3·18	trace	14·81	0·082	0·226
7	2·97	trace	15·17	0·092	0·195
8	3·06	trace	16·91	0·092	0·093
9 (Bottom)	3·25	trace	14·45	0·113	0·010

CEMENT COPPER.

Dry weight	121·45 lb.
Assay value, copper	81·02 per cent.
Weight of copper	98·4 lb.

RECOVERY.

Percentage of extractable copper	37·75 per cent.
Percentage of total copper	28·94 per cent.

IRON BALANCE SHEET.

	lb.	lb.	lb.
Iron in heap after leaching, 15·44 per cent.		...	1093·6
Iron in heap before leaching, 13·68 per cent.		...	968·9
Increased weight of iron in heap		124·7	
Iron in cement copper, 3·07 per cent....		3·7	
Iron in final liquor, 120 gallons at 0·631 per cent.		7·6	
		136·0	
Iron used in precipitation	86		
$FeSO_4 \cdot 7H_2O$ added, 300lb., 95·6 per cent. pure iron added as $FeSO_4 \cdot 7H_2O$	57·8		
	143·8		
Balance lost owing to leakage from heap and during adjustment of pump		7·8	

CONSUMPTION OF REAGENTS.

	lb.
$FeSO_4 \cdot 7H_2O$ added, 300lb. at 95·6 per cent.	286·8
$FeSO_4 \cdot 7H_2O$ in final liquor	38·0
Consumption of $FeSO_4 \cdot 7H_2O$	248·8
Equivalent to commercial ferrous sulphate	260
Consumption of metallic iron	86
Consumption of salt, NaCl	40

REPORT ON AN INVESTIGATION CARRIED OUT IN THE METALLURGICAL LABORATORY ON SLIMES FROM THE SURPRISE LEAD MINE.

Six bags of accumulated slime were forwarded to the School of Mines from the Surprise Lead Mine which we received verbal instructions to test for the purpose of determining whether a sufficiently high recovery of the contained lead could be obtained to enable the economical treatment of this material to be entered upon.

Preliminary examination showed that this material was of an extremely colloidal nature, and, as it was in the form of a pug, crushing for the purpose of preparing samples for testing was impossible. Great difficulty was experienced in disintegrating the slime to produce a pulp for testing purposes. The difficulties experienced in pulping this material would become a serious drawback to any attempt to treat the slime on a large scale. In the laboratory each sample for testing was pulped by hand-puddling the material with water. Even by this method pulping was difficult, as each lump of slime had to be worked with water between the hands until completely disintegrated.

The total lead content of the slime was 8.08 per cent. After the series of flotation tests shown in the accompanying table had been conducted, with unsatisfactory results, a further examination of the slime was made to ascertain, if possible, the cause of the low percentage recovery by flotation. This examination disclosed the presence of oxidised lead compounds. It was found that 62.5 per cent. of the lead was readily soluble in dilute acetic acid (10 per cent.), and that varying proportions were soluble in the following other solvents, viz., sodium chloride (cold and hot), potassium nitrate, and ammonium nitrate. It was found that in tests carried out on small quantities of the slime the percentage extracted by the solvent was much greater than in tests on large quantities. Cold sodium chloride was practically without effect. Hot saturated sodium chloride gave extractions up to 50 per cent. of the total lead on small samples, but on the larger scale it was found impossible to duplicate these results. The solubility in solutions of potassium nitrate was too small to make this method of attack of any value on a larger scale. Ammonium nitrate proved an efficient solvent, but the cost of this reagent would be prohibitive, and therefore no large scale testing was conducted with this reagent.

From these leaching tests it appears that if the remainder of the lead were present wholly in the form of galena the highest recovery that could be expected by flotation would be in the neighbourhood of 40 per cent. It is not possible to determine by analytical methods the actual percentage of galena present in slime because of the presence of pyrite and other sulphides.

Flotation tests were carried out under varying conditions as described in the table of tests, but in no case was a commercial recovery of the lead obtained. On account of the presence of oxidised lead compounds attempts were made to sulphidise these for the purpose of making them amenable to flotation. For this purpose sodium sulphide and hydrogen sulphide were used, the latter in both cold and hot pulp, but in every case the tests gave negative results. Potassium xanthate, which might have been expected from its effect on the flotation of pyritic ores to have given improved results in the case of partially oxidised ores, such as this slime, was of no benefit.

Combined flotation and leaching tests were tried on pulps of varying density: (a) floating with addition of sulphuric acid, (b) floating without addition of sulphuric acid, followed by treatment of the flotation residue by agitation at elevated temperatures (up to 105° C.) with a saturated solution of sodium chloride. The results were in all cases negative, the final residues varying from 5.6 to 6.6 per cent. lead.

On account of the complexity of the lead compounds present it appears that there is very little probability that the lead contents of this material can be readily and economically concentrated into a marketable product, and, in addition, serious difficulties would be met with in converting this slime into a pulp for treatment.

If a lead smelter were in operation in the neighbourhood of the mine, it might be a commercial proposition to convert this material into a smelting product for admixture with rich ores by production of a sinter by roasting or by briquetting the slime.

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18th September, 1926.

FLOTATION TESTS ON SLIMES FROM THE SURPRISE MINE.

Test No.	Ore.		Water Wt. gram.	Oils.			Re-agents.			Float.			Residue.		Time of flotation. min.	Recovery of Pb, per cent.	Remarks.
	Wt. gram.	Pb. %		Description.	Wt. gram.	Wt. lb. per ton.	Description.	Wt. gram.	Wt. lb. per ton.	Wt. gram.	Wt. %	Pb. %	Wt. gram.	Pb. %			
1	600	8·08	3,000	Euco-tar ... Kero. ...	0·24 0·25	0·90 0·93	NaCl ... Pot. Xanth.	2% 0·05	soln. 0·187	61·5	10·2	24·08	529	5·74	15	28·9	
2	600	8·08	3,000	Euco. ... Kero. ...	0·15 0·25	0·56 0·93	NaCl. ... Pot. Xanth.	2% 0·05	soln. 0·187	77·5	12·9	26·13	513	5·18	15	35·9	
3	600	8·08	3,000	Euco-tar ... Kero. ...	0·24 0·40	0·90 1·50	KCN ... Pot. Xanth.	0·2 0·05	0·75 0·187	52·0	8·7	28·20	538	5·94	15	26·5	
4	600	8·08	3,000	Euco-tar ... Kero. ...	0·15 0·25	0·56 0·93	NaCl ... KCN ... NaOH ... Pot. Xanth.	2% 0·2 0·02 0·05	soln. 0·75 0·075 0·187	86·2	14·4	20·5	504	5·33	15	34·0	
5	600	8·08	3,000	Euco. ... Kero. ...	0·15 0·25	0·56 0·93	KCN ... Pot. Xanth.	0·4 0·05	1·5 0·187	74·6	12·4	29·72	516	5·12	15	36·6	
6	600	8·08	3,000	Euco. ... Kero. ...	0·15 0·25	0·56 0·93	KCN ... Pot. Xanth.	0·5 0·05	1·875 0·187	83·6	13·9	30·75	506	4·61	15	42·9	
7	600	8·08	3,000	Euco. ... Kero. ...	0·15 0·25	0·56 0·93	KCN ... Pot. Xanth.	0·6 0·05	2·25 0·187	19·8 62·4	3·3 10·6	32·03 26·13	508	5·12	15	36·6	
8	600	8·08	3,000	Euco. ...	0·24	0·90	H_2SO_4 ... Pot. Xanth.	3·6 0·05	13·4 0·187	97·5	16·2	24·08	493	4·97	15	38·5	
9	600	8·08	3,000	Euco. ...	0·24	0·90	H_2SO_4 ... $Na_2S_2O_3$ ... Pot. Xanth.	3·6 4·0 0·05	13·4 15·0 0·187	84·4	14·1	18·45	506	5·94	15	26·5	
10	600	8·08	3,000	Euco. ...	0·24	0·90	H_2SO_4 ... Pot. Xanth.	1·8 0·05	6·7 0·187	93·3	15·5	25·62	497	4·97	15	38·5	
11	600	8·08	3,000	Euco. ...	0·24	0·90	H_2SO_4 ... Pot. Xanth.	7·2 0·05	26·8 0·187	68·1	11·3	29·47	522	5·38	15	33·4	
12	600	8·08	3,000	Euco. ...	0·24	0·90	H_2SO_4 ... $CuSO_4$ ... Pot. Xanth.	3·6 2·0 0·05	13·4 7·5 0·187	...	...	...	...	...	...	...	Test negative.
13	600	8·08	3,000	Euco-tar ... Kero. ...	0·15 0·125	0·56 0·46	H_2SO_4 ... Pot. Xanth.	3·6 0·05	13·4 0·187	30·9 32·9	5·1 5·5	41·0 17·42	526	5·38	15	33·4	
14	500	8·08	3,000	Euco tar ... Kero. ...	0·15 0·125	0·67 0·56	H_2SO_4 ... Pot. Xanth.	3·6 0·05	16·1 0·224	37·3	7·5	32·28	453	5·94	15	26·5	
15	500	8·08	3,000	Euco. ...	0·24	1·07	H_2SO_4 ... Pot. Xanth.	3·6 0·05	16·1 0·224	56·9	11·4	24·6	433	5·94	15	26 5	

HEAP LEACHING OF WHIM CREEK COPPER ORE.

FINAL REPORT ON SMALL COLUMN TEST.

Since the last progress report (9th October), leaching of the 2½ inch column of ore was carried out intermittently for four days, during the greater portion of which period leaching was very erratic owing to the necessity for continual stoppages to repair leaks in the column. These leaks eventually became so serious that it was found impossible to continue the test, which was therefore terminated, the column of ore sampled and assayed, and the cement copper cleaned up, with the following result:—

Copper value of final ore—		
20lb. @ 2.15% Cu	=	0.430lb.
2lb. @ 2.72% Cu	=	0.0544lb.
Total copper in leached ore	=	0.4844lb.
Copper in original ore	=	0.7392lb.
Copper extracted in 35 days	=	0.2548lb.
	=	34.47 per cent.
Cement copper recovered—		
100 gram @ 89.5%	=	89.5 gram
	=	0.19874lb.
	=	26.88 per cent.

The difference between the percentage extractions based on assay values of ore and on the weight of copper recovered is due to the serious losses of liquor by leakage from the column.

These results are higher than those shown in the progress reports, which are based on solution assays, for the following reasons:—

(1.) Some of the dissolved copper was precipitated by the iron of the column itself, resulting in corrosion of the column and a lower copper content in the outflow than that representing the actual copper dissolved.

(2.) The quantity of ore was so small and its total copper content so small that the amount of copper dissolved per day was extremely small and therefore difficult of accurate determination in the solution by ordinary methods of assay.

(3.) It was difficult to control and gauge accurately the very slow rate of flow of liquor through the column, especially during the period of continuous leaching.

This test was carried out at Mr. Sleeman's request in the small column supplied by Mr. J. W. Sutherland, but, except that it has shown that a further extraction could be obtained from the ore leached in the large heap, we consider that the test has been of practically no value on account of the very small quantity of ore that could be employed and the exceedingly slow rate of flow of liquor necessary during the test. On account of the corrosion of the column it was impossible to carry the test to a conclusion, *i.e.*, to a point at which copper ceased to be dissolved, although during the last four days of this test the rate of solution, as determined from the liquor assays, was very small.

The ore used in this test had been leached in the large heap and had been air-dried and exposed to atmospheric action from July 13th till 6th September, so that the rate of solution of copper in the early period of the test was comparatively rapid on account of the oxidation that had taken place during the two months' exposure of the ore to atmospheric action.

A further test is now being carried out on 166 pounds of the heap-leached ore in a wooden column. 6 inches square by 7 feet 6 inches deep, using a solution of ferrous sulphate and sodium chloride under conditions of intermittent leaching. This test was commenced on 21st October, and is being carried out to attempt to leach the ore to a finish, *i.e.*, to a point at which copper ceases to be dissolved, and therefore no special attention is being paid to the rate of solution of the copper, except in so far as it shows whether the rate of solution is diminishing as the test proceeds. Therefore the important points to be determined are the time at which copper ceases to be dissolved and the value of the ore after cessation of the solution of the copper.

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B. H. MOORE,
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School of Mines, Kalgoorlie,
30th October, 1926.

HEAP LEACHING OF WHIM CREEK COPPER ORE.

REPORT ON COLUMN LEACHING TEST WITH FERROUS CHLORIDE SOLUTION.

As stated in our final report on the small column leaching test, dated 30th October, a further leaching test has been carried out on ore previously leached in the large heap, in a wooden column, 6 inches square by 7 feet 6 inches deep, using a solution of ferrous sulphate and sodium chloride under conditions of intermittent leaching. This test was commenced on 21st October and was concluded on 2nd December, the object being to ascertain the extraction that could be obtained in the longest period for which it was possible to carry on the test.

This ore had been previously under treatment in the large heap with ferrous sulphate and ferrous chloride solutions for a period of forty-one days under varying conditions of leaching, after which it was exposed to atmospheric conditions for a period of one hundred days before the column test was commenced. The total period of treatment has, therefore, been as follows:—

- Leaching in heap—41 days (2nd June to 13th July).
- Atmospheric oxidation—100 days (13th July to 21st October).
- Column leaching—42 days (21st October to 2nd December).

It was particularly noticeable that at the commencement of the column leaching test, *i.e.*, after 100 days' exposure of the ore to atmospheric conditions subsequent to the first leaching in the heap, solution of the copper was very rapid, and that as the test proceeded the rate of solution gradually fell off. This confirms the results of previous experiments which had indicated the necessity for oxidation of the ore heap at intervals during the leaching process.

The following data show the conditions of leaching and the result of the column test:—

- Weight of ore—166lb.
- Time of leaching—42 days.
- Average ferrous iron content of inflow—70lb. per 1,000 gal.
- Average rate of flow of inflow—12 gal. per 24 hours.
- Average daily leaching period—16 hours.
- Copper content of ore used in test—3.14 per cent.
- Copper content of leached ore—1.38 per cent.
- Extraction in column test—56.05 per cent.
- Cement copper, copper content—82.58 per cent.

It will be seen from the above that the total copper extracted from the ore, which originally assayed 4.8 per cent. copper during a combined leaching and oxidation period of 183 days, was 71.25 per cent.

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School of Mines, Kalgoorlie,
6th December, 1926.

PROGRESS REPORT No. 1.

FLOTATION OF PYRITIC GOLD ORES.—TREATMENT OF FLOTATION CONCENTRATES.

An Investigation to determine the possibility of Direct Cyanidation of Flotation Concentrates without Preliminary Roasting.

As a result of investigations carried out in the early days of the Kalgoorlie field on the cyanidation of Kalgoorlie ores it appears to have become an accepted fact that it is not possible to obtain an extraction of more than seventy per cent. of the gold values of these ores by cyanidation, either with or without the aid of bromocyanogen or other reagents, without a preliminary oxidation of the sulphides and tellurides by roasting.

By reason of the results of our work on the treatment of these ores by flotation, and roasting and cyanidation of the flotation concentrates, we are convinced that this method is capable of successful application to the treatment of these ores, and that the cost of treatment by this method will be very much lower than the cost by existing methods, because of the small quantity of material requiring treatment after flotation. If flotation concentrates could be economically treated by direct cyanidation without roasting, not only would the cost of treatment be still further materially reduced, but also the size of the plant necessary, and its cost would be greatly diminished on account of the elimination of the roasting furnaces. The necessity for an investigation into the possibility of treating these concentrates without roasting therefore becomes obvious.

It seems peculiar that the majority of the pyritic gold ores of Western Australia should be amenable to direct cyanidation without roasting, whereas in a few isolated instances, particularly that of Kalgoorlie, previous investigations have not shown the possibility of this method of treatment. There appears to be no specific reason for this difference, unless it be that the presence of small quantities of tellurides is the disturbing factor in the case of the Kalgoorlie ores. If the presence of tellurides is the cause of this difference in behaviour during treatment, the addition of bromocyanogen to the cyanide solution should bring about the decomposition of the minute amount of these minerals usually occurring in these ores. In other parts of the world where small quantities of tellurides occur in the sulphide ores, the use of bromocyanogen has enabled satisfactory extractions of the gold content of those minerals to be made. Probably the action of bromocyanogen in conjunction with alkali cyanides on telluride of gold is expressed by the equation

$$BrCN + 3NaCN + 2AuTe_2 > 2NaAu(CN)_2 + NaBr + 4Te.$$

We consider it probable that a close investigation of this subject may enable means to be determined by which this problem can be solved.

Since, in the treatment of flotation concentrates, we are dealing with a very high grade material, it must be clearly understood at the outset that a high percentage extraction may still leave the cyanide residues of too high grade to be discarded, and therefore a high percentage extraction is of no value unless accompanied by the production of low grade residues. Therefore the object to be aimed at in this investigation is primarily the economical production of low grade residues from the treatment of the flotation concentrate and the means by which this result can be attained.

For testing purposes, concentrates are obtained, as required, by flotation, so that the material cyanided shall be as nearly as possible similar in character to that which would be subjected to the same treatment in a large scale mill. The tests so far carried out have been considered to be in the nature of preliminary tests which might possibly indicate or suggest lines of attack to be followed subsequently. These tests are divided into six series, and the results of some of those tests are distinctly encouraging and suggest that certain definite lines be followed with a probability of success.

Series 1.—*Concentrates produced from Golden Horseshoe Ore.*

The object of this series was to ascertain if the tellurides and sulphides could be selectively floated, and if so, whether success could be attained by cyaniding the two products under different sets of conditions. The tellurides float more readily than the pyrite, and for that reason a minimum amount of float was first taken off in the minerals separation type flotation machine, without sub-aeration, and the residual pulp was then floated in the Ruth machine with sub-aeration, from which the major portion of the concentrate was taken off. The latter, which should contain no tellurides, was subjected to direct cyanidation, but the results were not encouraging and this method of attack was therefore discontinued for the present.

Series 2.—Concentrates produced from Great Boulder Ore.

This series was carried out to determine whether the addition of certain oxidising agents would assist in the cyanidation, but the results were negative.

Series 3.—Concentrates produced from Great Boulder Ore.

In this series bromocyanogen was first used on fresh de-watered concentrates. Besides the bromocyanogen and potassium cyanide, no other reagents were used. Results were still not very satisfactory.

Series 4.—Concentrates produced from Great Boulder and Boulder Perseverance Ore.

This series was similar to Series 3, except that the concentrates, after de-watering, were de-oiled before being cyanided. De-oiling was brought about by carefully heating the ore until the contained oil was volatilised, but the temperature was carefully regulated so that no oxidation of the sulphides took place, as the oils were readily eliminated at a very low temperature without any change taking place in the pyritic concentrates. De-oiling had a marked effect on the behaviour of the concentrate during air agitation with cyanide solution. In the case of de-oiled concentrates, no frothing action took place, whereas the frothing action was very pronounced in the case of concentrates which had been de-watered only, but not de-oiled. Very encouraging results were obtained, which showed that a high percentage extraction could be obtained by the use of potassium cyanide and bromocyanogen without the addition of reagents to prevent the action of cyanicides. In one case a residue of 5.5 dwt. per ton was obtained from a concentrate assaying 150 dwt. per ton, giving an extraction of 96.33 per cent. The consumption of cyanide was high, although in the absence of protective agents that was only to be expected.

Series 5.—Concentrates produced from the Croesus Proprietary (Oroya Links, Ltd.) Ore.

The results of Series 4 indicated that a similar method of cyanidation should be adopted, but that in order to minimise the consumption of KCN, protective agents such as lime and lead acetate should be added to the pulp. Varying quantities of lime and lead acetate were used, both alone and in combination. The best result obtained was that in Test 56, in which the residue was 5 dwt. per ton from a 56 dwt. concentrate, representing an extraction of 91.07 per cent., with a consumption of 3.51 lb. of potassium cyanide per ton of concentrate. When no lime was added, the consumption of cyanide was greatly increased, although the residues were comparatively low grade. A similar, but less marked, effect is noticed in connection with the use of lead acetate.

Series 6.—Concentrates produced from Wiluna Ore.

This series shows that concentrates produced from Wiluna ore are not so readily attacked as the Kalgoorlie concentrates, probably owing to the presence of a considerable proportion of arsenical pyrites. These tests, which were carried out similarly to those of Series 5, gave entirely negative results.

These tests have all been carried out on very small quantities of concentrates, and it is now our intention to proceed along the lines suggested by Series 5, using larger quantities of concentrates produced from Kalgoorlie ores.

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School of Mines, Kalgoorlie,
19th October, 1926.

CYANIDATION TESTS ON FLOTATION CONCENTRATES.

Test No.	Ore.	Concentrate		Cyanide Solution.			Re-agents added.	Residue Au, dwt./ton.	Extraction per cent.	Cyanide solution after treatment.		KCN consumption, lb./ton.	Treatment.
		Wt., gram.	Au., dwt., per ton.	Vol. c.c.	KCN. %	BrCN., Vol. and Wt. gm.				KCN, %	KOH, %		
							SERIES 1.						
1	Golden Horseshoe	40	80·0	400	0·5	...	... ...	24·0	70·0	Not detd.	Not detd.	...	Air agitation—24 hours.
2	Do.	20	62·0	400	0·5	...	... ...	21·0	66·1	„	„	...	Air agitation—24 hours.
3	Do.	40	52·0	400	0·5	...	... ...	22·5	56·7	„	„	...	Air agitation—24 hours.
4	Do.	40	84·0	400	0·5	...	... ...	26·5	68·4	„	„	...	Air agitation—24 hours.
5	Do.	40	84·0	400	0·5	...	... ...	30·0	64·3	„	„	...	Air agitation—24 hours.
							SERIES 2.						
6	Great Boulder ...	40	150·0	400	0·5	...	... ...	100·0	33·3	„	„	...	Air agitation—24 hours.
7	Do.	40	150·0	400	0·5	...	Acidified with H_2SO_4	141·0	6·0	„	„	...	Air agitation—24 hours.
8	Do.	40	150·0	400	0·5	...	0·5 gm. NH_4SO_4	101·0	32·66	„	„	...	Air agitation—24 hours.
9	Do.	40	150·0	400	0·5	...	2·0 gm. CaOClCl	84·0	44·0	„	„	...	Air agitation—24 hours.
10	Do.	40	150·0	400	0·5	...	0·5 gm. $KMnO_4$ ...	81·0	46·0	„	„	...	Air agitation—24 hours.
11	Do.	40	150·0	400	0·5	...	0·5 gm. H_2CrO_4 ...	91·0	39·26	„	„	...	Air agitation—24 hours.
12	Do.	40	150·0	400	0·5	...	0·5 gm. $K_2Cr_2O_7$, H_2SO	141·0	6·0	„	„	...	Air agitation—24 hours.
13	Do.	40	150·0	400	0·5	...	0·25 gm. $K_2Cr_2O_7$, H_2SO_4	113·0	24·66	„	„	...	Air agitation—24 hours.
14	Do.	40	150·0	400	0·5	...	1·0 gm. CaOClCl ...	107·0	28·66	„	„	...	Air agitation—24 hours.
15	Do.	40	150·0	400	0·5	...	0·25 gm. H_2CrO_4	106·0	29·33	„	„	...	Air agitation—24 hours.
16	Do.	40	150·0	400	0·5	...	0·25 gm. $KMnO_4$ ...	92·0	38·66	„	„	...	Air agitation—24 hours.
17	Do.	ore/600	14·8	3,000	0·1	...	... ...	64·0 4·4	Flotn. Flotn.	Conct. Residue	... ...	... ...	Agitated 30 minutes in Ruth flotation machine.
							SERIES 3.						
18	Do.	40	144·0	200	0·5	10 c.c.	... ...	46·0	68·05	Not detd.	Not detd.	...	Air agitation—24 hours
19	Do.	40	144·0	200	0·5	10 c.c.	... ...	45·0	68·75	„	„	...	Air agitation—24 hours.
20	Do.	40	144·0	200	0·5	15 c.c.	... ...	47·0	67·36	„	„	...	Air agitation—24 hours.
21	Do.	40	144·0	200	0·5	20 c.c.	... ...	39·5	72·57	„	„	...	Air agitation—24 hours.
22	Do.	40	144·0	200	0·5	30 c.c.	... ...	83·0	42·36	„	„	...	Air agitation—24 hours.
23	Do.	40	144·0	200	0·5	40 c.c.	... ...	94·0	34·72	„	„	...	Air agitation—24 hours.
24	Do.	40	144·0	200	0·1	60 c.c.	... ...	111·0	22·89	„	„	...	Air Agitation 24 hours
25	Do.	40	144·0	200	0·5	60 c.c.	... ...	84·0	41·66	„	„	...	Air Agitation—24 hours; 10cc. BrCN each ½-hr.
26	Do.	40	144·0	200	1·0	60 c.c.	... ...	56·0	61·66	„	„	...	Air Agitation—24 hours
27	Do.	40	148·0	200	0·5	50 c.c.	... ...	40·0	72·97	„	„	...	Air Agitation—24 hours
28	Do.	40	148·0	200	0·5	50 c.c.	... ...	33·0	77·70	„	„	...	Air Agitation—34 hours; 10cc. BrCN at int'vls
29	Do.	40	148·0	200	0·5	50 c.c.	... ...	30·0	79·73	„	„	...	Air Agitation—48 hours
30	Do.	40	148·0	200	0·5	...	... ...	89·0	38·66	„	„	...	Air Agitation—34 hours
31	Do.	40	148·0	200	0·5	...	... ...	88·0	40·54	„	„	...	Air agitation—48 hours.
32	Do.	40	148·0	200	0·5	...	... ...	71·0	52·09	„	„	...	Air agitation—72 hours.
							SERIES 4.—DE-OILED CONCENTRATES.						
33	Do.	50	158·0	500	0·5	50 c.c.	... ...	9·5	93·97	„	„	...	Air agitation—24 hours, 10c.c., BrCN, added at intervals.
34	Do.	40	158·0	400	0·5	...	... ...	30·0	81·02	„	„	...	Air agitation—9 hours; further contact, 15 hours.
35	Do.	40	158·0	400	0·5	50 c.c.	... ...	18·9	88·04	„	„	...	Air agitation—5 hours; 10c.c., BrCN. added half-hourly.
36	Do.	40	158·0	200	0·1	0·93 gm.	... ...	32·0	79·11	„	„	...	Air agitation—24 hours; BrCN added at intervals.

CYANIDATION TESTS OF FLOTATION CONCENTRATES—*continued.*

Test No.	Ore.	Concentrate		Cyanide Solution.			Re-agents added.	Residue Au, dwt./ton.	Extraction, per cent.	Cyanide solution after treatment.		KCN consumption, lb./ton.	Treatment.
		Wt., gram.	Au., dwt., per ton.	Vol. c.c.	KCN. %	BrCN., Vol. and Wt. gm.				KCN, %	KOH, %		
						SERIES 4.—DE-OILED CONCENTRATES—*continued.*							
37	Great Boulder ...	40	158·0	200	0·2	0·93 gm.	... ...	23·5	84·86	Not detd.	Not detd.	...	As for Test 36.
38	Do.	40	158·0	200	0·3	0·93 gm	... ...	13·5	91·47	„	„	...	As for Test 36.
39	Do.	40	158·0	200	0·4	0·93 gm.	... ...	12·5	92·09	„	„	...	As for Test 36.
40	Do.	40	158·0	200	0·5	0·93 gm.	... ...	16·5	83·23	„	„	...	As for Test 36.
41	Do.	40	158·0	200	0·5	0·93 gm.	... ...	9·5	93·98	„	„	...	Air agitation—24 hours; BrCN added all at commencement.
42	Boulder Perseverance	40	150·0	400	0·5	0·93 gm.	... ...	18·0	88·00	„	„	...	Air agitation—24 hours; BrCN added at intervals.
43	Do.	40	150·0	200	0·4	1·49 gm.	... ...	38·0	74·66	„	„	...	Air agitation—16 hours; BrCN added all at commencement.
44	Do.	40	150·0	200	0·5	1·12 gm.	... ...	10·0	93·33	...	„	...	As for Test 43.
45	Do.	40	150·0	200	0·6	0·93 gm.	... ...	6·75	95·50	...	„	...	As for Test 43.
46	Do.	40	150·0	200	0·7	0·93 gm.	... ...	8·00	94·66	...	„	...	As for Test 43.
47	Do.	40	150·0	200	0·8	0·93 gm.	... ...	8·00	94·66	...	„	...	As for Test 43.
48	Do.	40	150·0	200	0·9	0·93 gm.	... ...	8·00	94·66	...	„	...	As for Test 43.
49	Do.	40	150·0	400	1·0	0·93 gm.	... ...	5·5	96·33	...	„	...	As for Test 43.
						SERIES 5.—DE-OILED CONCENTRATES.							
50	Croesus Proprietary	40	56·0	200	0·48	1·465	1 gm. CaO ...	9·5	83·03	...	...	...	Air agitation—24 hours: BrCN added all at commencement.
51	Do.	40	56·0	200	0·48	1·465	·00225 gram lead acetate	10·0	82·14	...	...	...	As for Test 50.
52	Do.	40	56·0	200	0·48	1·465	1 gm. CaO; ·00225 gm. lead acetate	8·0	85·71	...	...	...	As for Test 50.
53	Do.	40	56·0	200	1·02	1·465	2 gm. CaO ...	6·0	89·28	...	...	...	As for Test 50.
54	Do.	40	56·0	200	1·02	1·465	0·0045 gm. lead acetate	6·0	89·28	...	...	...	As for Test 50.
55	Do.	40	56·0	200	1·02	1·465	2 gm. CaO; ·0045 gm. lead acetate	5·5	90·18	...	...	...	As for Test 50.
56	Do.	80	56·0	400	1·02	2·05	4 gm. CaO; ·009 gm. lead acetate	5·0	91·07	...	...	...	Air agitation—24 hours; 50c.c., BrCN added at commencement, 20c.c. one hour before end of Test.
						SERIES 6.—DE-OILED CONCENTRATES.							
57	Wiluna	40	82·0	200	0·48	1·465	1 gm. CaO; ·00225 gm. lead acetate	56·0	31·70	Not detd.	Not detd.	...	Air agitation—24 hours; BrCN added all at commencement.
58	Do.	40	82·0	200	0·48	1·465	As for Test 57 ...	53·5	34·75	„	„	...	As for Test 57.
59	Do.	40	82·0	200	0·73	1·465	As for Test 57 ...	52·0	36·58	„	„	...	As for Test 57.
60	Do.	40	82·0	200	0·72	1·465	As for Test 57 ...	55·0	32·92	„	„	...	As for Test 57.
61	Do.	40	82·0	200	1·02	1·465	2 gm. CaO; ·0045 gm. lead acetate	52·0	36·58	„	„	...	As for Test 57.
62	Do.	40	82·0	200	1·02	1·465	As for Test 61 ...	53·0	35·36	„	„	...	As for Test 57.
63	Do.	40	82·0	400	0·48	2·05	1 gm. CaO: ·00225 gm. lead acetate	52·0	36·58	„	„	...	Air agitation—24 hours; 50c.c., BrCN added at commencement, 20c.c. three hours before completion of Test.
64	Do.	30	82·0	200	1·02	...	As for Test 63 ...	51·0	37·80	„	„	...	Air agitation—24 hours.

School of Mines, Kalgoorlie,
19th October, 1926.

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B. H. MOORE,
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PROGRESS REPORT No. 2.

FLOATION OF PYRITIC GOLD ORES.—TREATMENT OF FLOTATION CONCENTRATES.

An Investigation to Determine the Possibility of Direct Cyanidation of Flotation Concentrates without Preliminary Roasting—**continued.**

In the series of tests described in the previous report on this investigation, dated 19th October, 1926, it was found advantageous to de-oil the flotation concentrates by careful heating without roasting. Hence, in the tests described in the present report, the flotation concentrate has, except where the contrary is specifically stated, been carefully de-oiled before cyanidation.

The principal object aimed at in all these tests has been the attainment of the maximum possible solvent action on the gold and the determination of the conditions necessary to secure this result, while at the same time keeping the consumption of cyanide as low as possible, although no special steps have been taken to ascertain means by which consumption of cyanide may be kept at the minimum consistent with the production of low grade residues. In treating high grade material of this nature the principal results to be aimed at are, in order of importance:—

1. Solution of the maximum quantity of gold, *i.e.*, production of low grade residues.
2. Determination of the conditions of treatment most suitable for economic working, *i.e.*, for minimum consumption of cyanide and other reagents.

No attention has as yet been paid to the second of these points, all efforts having been concentrated on the determination of means by which the first, and all-important, result, may be attained. We feel certain that if means can be devised by which practically complete solution of the gold may be obtained —and results so far indicate that this is probable— the determination of satisfactory working conditions is possible, by the application of which the consumption of cyanide and other reagents will be reduced to a minimum and the treatment thus rendered economically practicable.

Results obtained up to the present have been distinctly encouraging and have undoubtedly shown that a high percentage extraction is possible although, on account of the high grade of the concentrates, a percentage extraction, which in the treatment of moderate grade ore would be considered exceptionally satisfactory, is not accompanied by the production of residues of sufficiently low grade to render their subsequent re-treatment unwarranted. Residues as low as 4 dwt. per ton from concentrates assaying 67.5 dwt. per ton, although representing a high percentage extraction, are still of too high grade to be discarded, and therefore it is necessary that still lower grade residues must be produced, before success can be said to have been attained.

Tests 65-76 in which air agitation for 24 hours was adopted, with addition of varying amounts of bromocyanogen at the commencement of the treatment, showed that the residues could be reduced to 5.5 dwt. per ton. Further tests, 77-82, on the re-treatment of some of the residues produced by this method, showed that the residues could be still further reduced to a minimum of 4 dwt. per ton. The residues were retreated for 16 hours, making a total time of treatment of 40 hours.

Tests 83-90 in which the concentrates were ground in the pebble mill for 6 hours, with and without the addition of bromocyanogen, and without any air agitation, showed that air agitation was necessary to obtain results which, however, were not comparable with those obtained by air agitation alone. Residues from tests 84, 85, 86 were re-treated by air agitation with addition of bromocyanogen, the residues being reduced from 19.0 to 7.5 dwt. in one particular case.

Tests 95-97 were carried out to determine the effect of the addition of bromocyanogen and air agitation for one hour, the lowest grade residue obtained being 19 dwt. per ton.

Tests 98-103 were carried out to determine the effect of grinding in cyanide solution, with and without the addition of bromocyanogen. Subsequently to this period of grinding, the pulp was air agitated for 3.5 hours, the lowest grade residue obtained being 8.5 dwt. per ton, obtained by the use of bromocyanogen.

Test 94 shows the effect of a single large addition of bromocyanogen. Half-hourly determinations of free cyanide in solution and gold in residues were made after the first five hours. Six hours' treatment resulted in residues of 9 dwt. per ton being produced.

Test 109 was similar to test 94, but the time of cyanidation was increased to 25 hours, the proportion of bromocyanogen was decreased, and the lowest grade residue was 15 dwt. per ton.

Test 104, of nine hours duration, shows the effect of air agitation without bromocyanogen, but the result was unsatisfactory.

Test 106 shows the effect of grinding the concentrate in cyanide solution for 16.5 hours, followed by air agitation for 8 hours, no bromocyanogen being used in the test. The residue obtained after 22.5 hours total treatment was 7 dwt. per ton, while a further two hours' agitation showed no increase in extraction.

Test 107 was similar to test 106 but for the addition of bromocyanogen during the pebble mill grinding, the result being a reduction in the grade of the residue to 6 dwt. per ton.

Test 108 was similar to test 107, except that a further addition of bromocyanogen was made at the commencement of the air agitation period. This resulted in the production of a 5 dwt. residue after 18.5 hours total treatment, no further reduction in grade of the residue taking place on a further 6 hours treatment. Sampling of the pulp during the air agitation period was carried out every two hours.

Test 105 was similar to test 107, but was carried out on concentrates which had not been de-oiled. As the final residue was 10 dwt. per ton as compared with 6 dwt. per ton under similar conditions in the case of de-oiled concentrates, it is apparent that the presence of oil seriously affects the solvent action of the cyanide solution.

Test 110 shows the effect of grinding in the pebble mill in "Aero Brand" cyanide solution and subsequent air agitation without the addition of bromocyanogen. A 4 dwt. residue was obtained after 21.5 hours total treatment.

In test 111, in which "Aero Brand" cyanide was also used, and bromocyanogen was added at the commencement of the pebble mill grinding and of the air agitation periods, a 4 dwt. residue was also obtained, but in 19.5 hours as compared with 21.5 hours in test 110. In neither case was any further reduction of grade obtained by continuing the air agitation for a longer period.

The remarkable results obtained by the use of "Aero Brand" cyanide indicate the necessity of further investigation being undertaken with this reagent. both with and without the addition of bromocyanogen.

From the result of this investigation to the present date, the following conclusions have been arrived at:—

1. In dealing with flotation concentrates, the sulphide particles are filmed with oil which must be removed on account of the inhibition of solution of the gold. A satisfactory extraction cannot be obtained from concentrates that have not been de-oiled.
2. Comparatively strong cyanide solution—approximately 0.5 per cent. KCN—is necessary.
3. The use of bromocyanogen gives improved results when the solution is made up with ordinary sodium or potassium cyanide, but the two small scale tests carried out with "Aero Brand" cyanide indicate that similar results may be obtained either with or without the use of bromocyanogen, although in the former case solution of the gold is more rapid than in the latter case.
4. Air agitation is essential.
5. An improvement in extraction is obtained by first grinding in cyanide solution and then subjecting to air agitation.
6. A high percentage extraction is readily obtainable.
7. It appears difficult to reduce the grade of the residues below 4 or 5 dwt. gold per ton, the best results obtained up to the present having been as follows: 5.5 dwt. residue from 150 dwt. concentrate, 5.5 dwt. residue from 120 dwt. concentrate, and 4 dwt. residue from 67.5 dwt concentrate.
8. De-oiling is easily carried out by heating the concentrate to the temperature necessary to volatilise the oil, and this temperature is so low that no chemical change in the nature of the concentrate, *i e.*, roasting or oxidation, takes place.

We desire to express our appreciation of the courtesy of Mr. C. E. Blackett, Metallurist of the Golden Horseshoe Estates, for supplying us with a quantity of "Mining Salts" (Bromo salts) for preparation of bromocyanogen; also Mr. S. G. Turrell, Kaloorlie representative of the American Cyanamid Company, for a supply of "Aero Brand" Cyanide.

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School of Mines, Kalgoorlie,
2nd December, 1926.

CYANIDATION TESTS ON FLOTATION CONCENTRATES.

Test No.	Ore.	Concentrate.		Cyanide Solution.		Reagents added.			Residue, Au. dwt. per ton.	Extraction, per cent.	Cyanide Solution after treatment.		KCN Consumption, lb. per ton.	Treatment.
		Wt. gram.	Au. dwt. per ton.	Volume c.c.	KCN per cent.	BrCN Wt. gram.	CaO Wt. gram.	Lead Acetate, Wt. gram.			KCN per cent.	KOH per cent.		
65	Croseus Proprietary	200	56	800	0·99	10·85	20	0·45	6·0	89·3	0·7325	0·35	23·07	Air agitation, 24 hours. All BrCN added at commencement.
66	do. do.	200	56	800	0·99	5·42	20	0·45	6·5	88·4	0·835	0·34	13·89	do. do. do.
67	do. do.	200	56	600	0·99	10·85	20	0·45	6·5	88·4	0·675	0·38	21·17	do. do. do.
68	do. do.	200	56	600	0·99	5·42	20	0·45	6·5	88·4	0·805	0·36	12·43	do. do. do.
69	do. do.	200	56	1,000	0·99	10·85	20	0·45	5·5	90·2	0·780	0·36	23·52	do. do. do.
70	Associated	200	120	800	0·99	4·18	20	0·45	10·0	91·7	0·870	0·312	10·75	do. do. do.
71	do.	200	120	800	0·495	3·41	20	0·45	9·5	92·1	0·415	0·238	7·17	do. do. do.
72	do.	200	120	800	0·495	2·79	20	0 45	11·0	90·8	0·415	0·316	7·17	do. do. do.
73	do.	200	120	800	0·495	2·17	20	0·45	10·5	91·25	0·480	0·305	1·34	do. do. do.
74	do.	200	120	800	0·495	3·41	20	0·45	10·5	91·25	0·4575	0·283	3·36	do. do. do.
75	do.	200	120	800	0·495	2·79	20	0·45	5·5	95·4	0·4375	0·149	5·15	do. do. do.
76	do.	200	120	800	0·495	2·17	20	0·45	6·5	94·6	0·455	0·119	3·58	do. do. do.

Retreatment of Residues from Tests 70, 72, 73, 74, 75, 76.

77	do.	100	10·0	400	0·195	*nil*	2	0·09	6·5	Total. 94·6	...	...	...	These tests were conducted on the residues from previous tests, to determine whether the value of the residues could be reduced still lower by retreatment. Air agitation —16 hours.
78	do.	100	11·0	400	0·195	0·31	2	0·09	6·5	94·6	...	...	...	
79	do.	100	10·5	400	0·195	*nil*	2	0·09	6·0	95·0	...	...	...	
80	do.	100	10·5	400	0·195	0·31	2	0·09	5·5	95·4	...	...	...	
81	do.	100	5·5	400	0·195	*nil*	2	0·09	4·0	96·6	...	...	...	
82	do.	100	6·5	400	0·195	0·31	2	0·09	4·0	96·6	...	...	...	
83	do.	300	120	1,000	0·375	0·69	3	0·225	39·0	67·5	0·307	0·0196	5·07	Ground in pebble mill, 6 hours; no air agitation.
84	do.	200	100	800	0·502	*nil*	...	...	25·0	75·0	0·040	0·0967	41·4	do. do. do.
85	do.	200	100	800	0·502	*nil*	1	...	20·5	79·5	0·091	0·145	36·82	do. do. do.
86	do.	200	100	800	0·502	*nil*	1	0·045	19·0	81·0	0·194	0·0386	27·6	do. do. do.
87	do.	200	100	800	0·491	0·18	1	0·045	18·0	82·0	0·121	0·063	33·15	do. do. do.
88	...	200	100	800	0·489	0·27	1	0·045	18·5	81·5	0·110	0·073	33·9	do. do. do.
89	do.	200	100	800	0·487	0·36	1	0·045	18·0	82·0	0·189	0·031	26·7	do. do. do.
90	do.	200	100	800	0·485	0·45	1	0·045	18·0	82·0	0·097	0·073	34·76	do. do. do.
91	do.	200	25	800	0·473	0·45	1	0·045	15·0	85·0 (total)	0·297	0·090	15·76	Residue from Test 84 retreated.
92	do.	200	20·5	800	0·473	0·45	1	0·045	12·0	88·0 (total)	0·232	0·128	21·59	Residue from Test 85 retreated.
93	do.	200	19·0	800	0·473	0·45	1	0·045	7·5	92·5 (total)	0·320	0·074	13·7	Residue from Test 86 re treated.
95	Croseus Proprietary	100	64·0	500	0·0215	1·73	1·0	0·045	18·0	71·9	0·0041	0·005	19·5	BrCN added at commencement. Air agitated 1 hour.
96	do. do.	100	64·0	500	0·0215	2·60	1·0	0·045	19·0	70·3	0·007	0·0037	16·2	do. do. do.
97	do. do.	100	64·0	500	0·0215	3·46	1·0	0·045	23·0	64·1	0·007	0·0015	16·2	do. do. do.
98	do. do.	100	64·0	500	0·516	...	1·0	0·045	12·0	81·25	0·389	0·175	14·22	Agitated in pebble mill 45 min., then air-agitated 3½ hours.
99	do. do. ...	100	64·0	500	0·516	0·341	1·0	0·045	11·0	82·8	0·413	0·071	11·53	do. do. do.
100	do. do.	100	64·0	500	0·516	0·682	1·0	0·045	8·5	86·7	0·391	0·012	14·0	do. do. do.
101	do. do.	100	64·0	500	1·029	...	1·0	0·045	10·5	83·6	0·840	0·045	21·17	do. do. do.
102	do. do.	100	64·0	500	1·029	0·341	1·0	0·045	10·0	84·4	0·930	0·119	11·09	do. do. do.
103	do. do.	100	64·0	500	1·029	0·682	1·0	0;045	9·0	86·0	0·820	*nil*	23·41	do. do. do.

CYANIDATION TESTS ON FLOTATION CONCENTRATES—*continued.*

Time—Hours.	Reagents added.			Residue, Au., dwt. per ton.	Extraction, per cent.	Solution Assays.			KCN consumption, lb. per ton.
	BrCN, lb. per ton.	CaO, lb. per ton.	Lead acetate, lb per ton.			KCN, per cent.	KOH, per cent.	BrCN, per cent.	
Test 94.—Effect of Single Large Addition of BrCN on Concentrate Assay Value—64·0 dwt. Au. per ton.									
0	...	11·2	0·50	...	...	0·4875	...	...	...
5·0	...	...	...	14·5	77·3	0·3375	0·007	...	16·8
5·0	9·685	...	...	11·0	82·8	0·270	nil	0·041	24·3
5·5	...	...	...	10·0	84·4	0·360	nil	0·004	14·28
6·0	...	...	...	9·0	86·0	0·330	0·014	nil	17·64
Test 109.—Effect of Single Large Addition of BrCN on Concentrate, Assay Value—67·5 dwt. Au. per ton.									
0	...	14·9	0·67	...	...	0·485	...	...	...
17	3·8	...	...	16·0	76·3	0·420	0·063	...	4·86
19	...	...	...	16·0	76·3	0·390	0·066	...	7·10
21	...	...	...	16·0	76·3	0·380	0·044	...	7·84
23	...	...	...	16·0	76·3	0·360	0·015	...	9·3
25	...	...	...	15·0	77·8	0·360	0·037	...	9·3
Test 104.—Effect of Air Agitation without BrCN on Concentrate, Assay Value—64·0 dwt. Au. per ton.									
0	...	11·2	0·5	...	...	0·468	...	...	...
5·5	...	...	...	15·0	76·5	0·348	0·041	...	10·7
9·0	...	...	...	14·0	78·1	0·305	0·022	...	14·6
Test 106.—Effect of Grinding in Pebble Mill in KCN Solution, and Air Agitation without BrCN on Concentrate, Assay Value—67·5 dwt. Au per ton.									
0	...	14·9	0·67	...	...	0·485	...	...	...
16·5 (Peb. mill)	...	...	...	10·0	85·2	0·300	0·052	...	13·81
18·5	...	...	...	9·0	86·7	0·280	0·089	...	15·30
20·5	...	...	...	9·0	86·7	0·280	0·059	...	15·30
22·5	...	...	...	7·0	89·6	0·275	0·044	...	15·68
24·5	...	...	...	7·0	89·6	0·275	0·044	...	15·68
Test 107.—Effect of Grinding in Pebble Mill in KCN Solution and BrCN, and Air Agitation on Concentrate, Assay Value—67·5 dwt. Au per ton.									
0	3·8	14·9	0·67	...	...	0·485	...	...	...
16·5 (Peb. Mill)	...	...	...	9·0	86·7	0·300	0·048	...	13·81
18·5	...	...	...	9·0	86·7	0·285	0·052	...	14·9
20·5	...	...	...	8·0	88·1	0·280	0·037	...	15·3
22·5	...	...	...	8·0	88·1	0·280	0·026	...	15·3
24·5	...	...	...	6·0	91·1	0·280	0·030	...	15·3
Test 108.—Effect of Grinding in Pebble Mill in KCN Solution and BrCN, and Air Agitation with Additional BrCN, on Concentrate, Assay Value—67·5dwt. Au. per ton.									
0	3·8	14·9	0·67	...	...	0·485	...	...	...
16·5 (Peb. Mill)	...	...	...	8·0	88·1	0·325	0·056	...	11·9
16·5	3·8	...	...	...	...	...	...	...	...
18·5	...	...	...	5·0	92·6	0·290	0·037	...	14·56
20·5	...	...	...	5·0	92·6	0·270	0·022	...	16·0
22·5	...	...	...	5·0	92·6	0·255	0·022	...	17·2
24·5	...	...	...	5·0	92·6	0·245	0·030	...	17·9

CYANIDATION TESTS ON FLOTATION CONCENTRATES—*continued.*

Time—Hours.	Reagents added.			Residue, Au., dwt. per ton.	Extraction, per cent.	Solution Assays.			KCN consumption, lb. per ton.
	BrCN, lb. per ton.	CaO, lb. per ton.	Lead acetate, lb per ton.			KCN, per cent.	KOH, per cent.	BrCN, per cent.	
Test 105.—Effect of Grinding in Pebble Mill in KCN Solution and BrCN, and Air Agitation without De-oiling Concentrate, Assay Value—65·0 dwt. Au. per ton.									
0	3·8	14·9	0·67	...	...	0·485	...	...	...
16·5	...	...	...	24·0	63·07	0·325	0·048	...	11·9
18·5	...	...	...	24·0	63·07	0·325	0·06	...	11·9
20·5	...	...	...	22·0	66·1	0·325	0·052	...	11·9
22·5	...	...	...	19·0	70·8	0·305	0·03	...	13·4
24·5	...	...	...	19·0	70·8	0·300	0·03	...	13·8
Test 110.—Effect of Grinding in Pebble Mill in "Aero Brand" Cyanide Solution and Air Agitation without BrCN, on Concentrate, Assay Value—67·5 dwt. Au. per ton.									
0	...	14·9	0·67	...	...	0·425	...	...	...
17·5 (Peb. Mill)	...	...	...	12·0	82·2	0·240	0·046	...	27·6
19·5	...	...	...	6·0	91·1	0·215	0·046	...	31·3
21·5	...	...	...	4·0	94·0	0·215	0·041	...	31·3
23·5	...	...	...	4·0	94·0	0·205	0·022	...	32·8
25·5	...	...	...	4·0	94·0	0·165	0·022	...	38·8
Test 111.—Effect of Grinding in Pebble Mill in "Aero Brand" Cyanide Solution and BrCN, and Air Agitation with additional BrCN, on Concentrate, Assay Value—67·5 dwt. Au. per ton.									
0	4·75	14·9	0·67	...	...	0·425	...	...	...
17·5 (Peb. Mill)	...	...	...	8·0	88·1	0·24	0·046	...	27·6
17·5	4·75	...	...	...	...	...	...	...	...
19·5	...	...	...	4·0	94·0	0·225	0·046	...	29·9
21·5	...	...	...	4·0	94·0	0·22	0·037	...	30·6
23·5	...	...	...	4·0	94·0	0·2	0·186	...	33·6
25·5	...	...	...	4·0	94·0	0·165	0·186	...	38·8

REPORT ON CYANIDATION OF "LADY CARMEN" PYRITIC GOLD ORE.

In accordance with instructions, we have carried out a series of cyanidation tests on samples of pyritic gold ore from the Lady Carmen gold mine, Coolgardie. Preliminary tests were first carried out on this ore in June, 1924, at which time the only ore available for testing purposes was that which had lain on the surface, exposed to atmospheric oxidation, for some time, and which we had received early in 1923.

For the present series of tests, the only ore available was that obtained in 1923, which had further oxidised, and a small sample furnished by Mr. Lloyd Pascoe, which had been lying on the surface for some years. It was necessary to use these weathered samples because the workings of the mine are under water, and it is therefore impossible to secure fresh samples, which, in the case of this class of ore, are essential for testing purposes, because of the rapidity and the extent to which oxidation of the sulphides apparently takes place on exposure to the air for lengthy periods of time.

In June, 1924, two cyanidation tests were carried out on this ore, with the following results:—

Ore, assay value—17.2 dwt. Au per ton (2,000 lb.).

Cyanidation residues, assay value—0.4 dwt. Au per ton (2,000 lb.).

Extraction, per cent.—97.7

Cyanide consumption, lb. per ton (2,000 lb.)—9.56 and 5.8.

These tests indicated that the gold in this ore, containing over 50 per cent. of sulphides of iron, was readily extractable by cyanidation without roasting. The mineral contained in this ore is essentially pyrrhotite, which, on exposure, rapidly oxidises, and the high consumption of cyanide in these two tests was due to the fact that the ore had been exposed to atmospheric oxidation for a considerable time, and therefore was in a condition not suitable for cyanidation. The series of tests now concluded has confirmed the results of those preliminary tests, but as the tests have been carried out on the same samples of ore, which have been broken and exposed to oxidation for four years, the consumption of cyanide has been exceptionally high, and incapable of reduction within economic limits.

The accompanying tabulations show the results of all the tests carried out. The salient features of this investigation are as follows:—

1. A high percentage extraction, with low grade residues, can be obtained by direct cyanidation without roasting.
2. Comparatively strong cyanide solution is necessary, viz., 0.2 to 0.4 per cent. KCN. This may require modification with freshly broken ore.
3. The gold rapidly dissolves in cyanide solution.
4. Extremely rapid solution of the gold and a high extraction are obtained by grinding in cyanide solution, followed by air agitation for a short period. This effect may be obtained in the ordinary method of grinding in tube mills, where the pulp will receive an efficient aeration.

It is to be regretted that a freshly broken sample of this ore is not available and cannot be obtained for testing, as such a sample would enable the correct factors for economical treatment to be determined, particularly the strength of cyanide solution and the consumption of cyanide. We consider that in the treatment of freshly broken ore the consumption of cyanide would not be excessive, and this ore must be cyanided when freshly broken on account of the rapidity of oxidation of the sulphides.

The high grade of this ore and the readiness with which it yields a high percentage of its gold content to cyanidation tend to make it a valuable proposition if the ore bodies are as extensive as we have been led to believe. Similar ore bodies are said to exist in the vicinity of Coolgardie, which are worthy of investigation, especially as the results on Lady Carmen ore lead to the conclusion that these sulphides differ from those of Kalgoorlie in being readily amenable to direct cyanidation and that high percentage extractions are possible in a plant specially designed for the treatment of this class of ore.

A small sample of ore from the "Ada" mine near Coolgardie was submitted by the original holders of the Lady Carmen lease, which was found to differ greatly from the Lady Carmen ore in that it contained only a small percentage of mineral, a large proportion of which was mispickel. This sample also had been subjected to atmospheric oxidation, and therefore was not in the best possible condition for treatment by flotation or cyanidation. As the small quantity of sample received appeared to have been taken from near the surface, and no instructions had been received with regard to the testing of this ore, no systematic testing has been carried out.

If the information furnished to us as to the existence and quantities of these sulphide ores in the Coolgardie district is reliable, it is apparent that systematic investigation, sampling, and testing of these ores are advisable especially in view of the successful application of flotation to the concentration of pyritic gold ores and the ease of cyanidation of the Lady Carmen ore. Such investigations might possibly lead to the revival of the industry at Coolgardie.

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19th November, 1926.

CYANIDATION TESTS ON "LADY CARMEN" PYRITIC GOLD ORE.

Test No.	Ore.		Cyanide Solution.		Reagents added.		Residue, Au, dwt. per ton.	Extraction per cent.	Cyanide solution after treatment.		KCN Consumption, lb. per ton.	Treatment.
	Wt. gram.	Au. dwt. per ton.	Volume c.c.	KCN per cent.	CaO, wt. gram.	Lead acetate, wt. gram.			KCN per cent.	KOH per cent.		
1	500	21·5	1,000	0·1	0·5	0·09	13·5	37·2	0·004	*nil*	4·3	Air agitation—16 hours.
2	500	21·5	1,000	0·2	0·5	0·09	9·0	58·1	0·0105	*nil*	8·5	do. do. do.
3	500	21·5	1,000	0·3	0·5	0·09	6·5	69·8	0·0225	*nil*	12·4	do. do. do.
4	500	21·5	1,000	0·4	0·5	0·09	1·0	95·3	0·046	trace	15·8	do. do. do.
5	500	21·5	1,000	0·2	0·5	0·09	10·5	51·1	0·007	*nil*	8·6	do. do. do.
6	200	21·5	1,000	0·1	0·5	0·09	3·0	86·04	0·009	*nil*	10·2	Air agitation—18 hours.
7	200	21·5	1,000	0·2	0·5	0·09	1·5	93·0	0·061	*nil*	15·6	do. do. do.
8	200	21·5	1,000	0·3	0·5	0·09	1·0	95·3	0·108	*nil*	21·5	do. do. do.
9	200	21·5	1,000	0·4	0·5	0·09	0·5	97·7	0·153	0·036	27·66	do. do. do.
10	200	21·5	1,000	0·1	1·0	0·09	4·5	79·1	0·001	*nil*	11·1	do. do. do.
11	200	21·5	1,000	0·2	1·0	0·09	4·0	81·4	0·099	0·006	11·3	do. do. do.
12	200	21·5	1,000	0·3	1·0	0·09	1·0	95·3	0·185	0·009	12·9	do. do. do.
13	200	21·5	1,000	0·4	1·0	0·09	0·5	97·7	0·1035	0·06	33·2	do. do. do.
14	200	21·5	800	0·293	3·0	0·045	2·0	90·7	0·114	0·018	16·03	Ground in pebble mill with 2 gram. CaO for 60 min. ; pulp filtered and washed, then air-agitated 5 hours.
15	200	21·5	800	0·293	4·0	0·045	1·0	95·3	0·111	0·021	16·3	Treatment same as in Test 14, except that 3 gram. CaO used.
16	200	21·5	800	0·293	5·0	0·045	1·5	93·0	0·114	0·034	16·03	Treatment same as in Test 14, except that 4 gram. CaO used.
17	500	21·5	1,000	0·282	4·0	0·225	6·5	69·8	0·020	0·019	11·73	Ground in pebble mill with KCN solution and reagnts for 6 hours. No air agitation.
18	500	21·5	1,000	0·282	5·0	0·225	2·0	90·7	0·021	0·074	11·69	do. do. do. do.
19	500	21·5	1,000	0·282	6·0	0·225	4·5	79·1	0·021	0·122	11·69	do. do. do. do.
20	200	24·0	800	0·2	1·0	0·045	9·0	62·5	0·043	trace	14·06	Test carried out on flotation conct. on account of oxidised condition of ore. Air agitation—19 hours.
21	200	24·0	800	0·2	1·0	0·045	1·5	93·7	0·011	trace	16·9	do. do. do. do.
22	200	24·0	800	0·38	1·0	0·045	1·5	93·7	0·023	*nil*	32·0	do. do. do. do.
23	200	24·0	800	0·38	1·0	0·045	1·0	95·8	0·030	0·066	31·36	do. do. do. do.
24	200	21·5	800	0·093	1·0	0·045	4·0	81·4	0·008	*nil*	7·6	Ground in pebble mill 45 minutes with KCN and reagents then air-agitated 60 minutes.
25	200	21·5	800	0·198	1·0	0·045	1·0	95·3	0·052	0·0133	13·08	do. do. do. do.
26	200	21·5	800	0·285	1·0	0·045	0·5	97·7	0·121	0·0149	14·70	do. do. do. do.
27	200	21·5	800	0·391	1·0	0·045	0·5	97·7	0·206	0·0253	16·60	do. do. do. do.
28	200	24·0	800	0·198	1·0	0·045	5·5	77·08	0·027	0·283	15·3	Flotation concentrate air-agitated 3 hours.
29	200	24·0	800	0·398	1·0	0·045	5·0	79·16	0·148	0·0550	22·4	do. do. do.

SUMMARY OF TESTS YIELDING OVER NINETY PER CENT. EXTRACTION.

Test No.	Ore, Au, dwt. per ton.	Residue, Au. dwt. per ton.	Extraction per cent.	Conditions of Treatment.			Time of Agitation. hours.
				Solution KCN, per cent.	Ore : solution ratio.	Method of Agitation.	
4	21·5	1·0	95·3	0·4	1 : 2	Air	16
7	21·5	1·5	93·0	0·2	1 : 5	Air	18
8	21·5	1·0	95·3	0·3	1 : 5	Air	18
9	21·5	0·5	97·7	0·4	1 : 5	Air	18
12	21·5	1·0	95·3	0·3	1 : 5	Air	18
13	21·5	0·5	97·7	0·4	1 : 5	Air	18
14	21·5	2·0	90·7	0·293	1 : 4	Air	5
15	21·5	1·0	95·3	0·293	1 : 4	Air	5
16	21·5	1·5	93·0	0·293	1 : 4	Air	5
18	21·5	2·0	90·7	0·282	1 : 2	Grinding in solution	6
21	24·0	1·5	93·7	0·2	1 : 4	Air	19
22	24·0	1·5	93·7	0·38	1 : 4	Air	19
23	24·0	1·0	95·8	0·38	1 : 4	Air	19
25	21·5	1·0	95·3	0·198	1 : 4	Grinding in solution ... Air	0·75 1
26	21·5	0·5	97·7	0·285	1 : 4	Grinding in solution ... Air	0·75 1
27	21·5	0·5	97·7	0·391	1 : 4	Grinding in solution ... Air	0·75 1

PRELIMINARY REPORT ON AN INVESTIGATION INTO THE BENEFICIATION OF FERRUGINOUS SANDS FROM THE GREAT VICTORIA GOLD MINE, BURBIDGE.

Under instructions from the State Mining Engineer, this investigation has been commenced at the request of Hon. H. Seddon, M.L.C., for the purpose of determining whether it is possible to concentrate the ferruginous material into a high grade product suitable for iron smelting, and also at the same time to recover the gold contained in the original sands.

The sample submitted consists of sands from the treatment plant at the mine, and although tests on this material may indicate whether beneficiation is possible so far as the iron is concerned, the gold content is so low that it is highly improbable that definite conclusions can be arrived at as to the concentration of that metal, either in the concentrates or the residues from the concentration of the iron minerals.

Preliminary experiments indicated that it was practically impossible to produce by gravity or magnetic methods of concentration a high grade iron concentrate, either by treatment of the sands as received or after fine grinding. In order that a detailed investigation of this ore may be made it is advisable that a sample of crude ore be supplied for testing purposes so that a definite conclusion may be arrived at as to the segregation of the gold contents.

The method of treatment that appears to offer most possibility of success consists in converting the ferric oxide into magnetic oxide by careful heating to a low red heat with a slight excess of powdered charcoal—

$$3Fe_2O_3 + C \Rightarrow 2\ Fe_3O_4 + CO,$$

and then subjecting the product to concentration on the magnetic concentrator. A preliminary test by this method gave the following result:—

	Weight per cent.	Iron content Fe, per cent.
Original sands		46.1
Converted sands, head sample for magnetic concentration ..		54.1
Concentrate	59.6	65.85
Middling	19.0	56.46
Residue	21.4	9.70

In view of the encouraging result of this preliminary test, a further quantity of sand was subjected to the same conversion under carefully regulated conditions of heating and proportion of added charcoal, and concentrated magnetically, the result of which was as follows:—

Material.	Weight per cent.	Iron, per cent.	Gold, dwt. per ton.	Distribution.	
				Iron, per cent.	Gold, per cent.
Converted Material ...	...	51·65	1·2	...	...
Concentrate	64·3	62·01	0·8	77·2	42·8
Middling	12·5	52·52	2·6	12·7	27·1
Residue	23·2	22·70	1·6	10·1	30·9
				100·0	100·8

From this preliminary test it appears probable that by this method of treatment, recovery of the major portion of the iron in the form of a magnetic concentrate of high iron content may be made, while the gold apparently, for the most part, tends to concentrate in the non-magnetic or less magnetic portion of the converted material, *i.e.*, in the residues and middle product of the magnetic concentration.

More reliable information on these points will be possible when a sample of original untreated ore is available for testing.

A. S. WINTER,
Research Metallurgist.

B. H. MOORE,
Lecturer in Metallurgy.

School of Mines, Kalgoorlie,
3rd December, 1926.

DIVISION VI.

OPERATIONS UNDER "THE INSPECTION OF MACHINERY ACT, 1921."

Report of the Chief Inspector of Machinery and Chairman of the Board of Examiners for Engine-Drivers for the Year, 1926.

Office of the Chief Inspector of Machinery,

Department of Mines,

Perth, 15th February, 1927.

The Under Secretary for Mines.

Sir,

I have the honour to submit, for the information of the Hon. the Minister for Mines, the following report on the operations of "The Inspection of Machinery Act, 1921," in the districts proclaimed thereunder, for the year ended 31st December, 1926:—

(1) Inspection of Boilers.

(2) Explosions and interesting defects.

(3) Inspection of Machinery.

(4) Accidents to persons caused by machinery and boilers.

(5) Engine-drivers' examinations and kindred matters.

(6) General.

DIVISION I.

Inspection of Boilers.

The number of useful boilers on the register at the end of the year was 3,341, compared with 3,261 at the end of 1925, showing an increase of 80 boilers. There were 116 new registrations during the year, including air receivers and steam-jacketed vessels; one boiler which had been permanently condemned was reconstructed and reinstated as a boiler, and one was transferred from another department. There were 24 permanently condemned, 11 were transferred beyond the jurisdiction of the Act, and three were converted into tanks, etc.

Of the 116 new registrations, 38 were imported from the United Kingdom, 10 from America, 16 from the Eastern States, and 16 (mostly air receivers) whose origin could not be traced. Thirty-six were made in this State, including 1 loco. portable, 4 locomotives, 1 vertical stationary, 3 return multitubular underfired stationary, 21 air receivers, 5 steam-jacketed vessels, 2 vulcanisers, 1 digester, and 1 cylindrical flat-ended.

Operations in the various Districts.

Return showing operations in the Proclaimed Districts (Boilers only) during the years ended 31st December, 1925 and 1926.

—	Total.	
	1925.	1926.
Total number of boilers registered	3,261	3,341
New registrations during the year	78	116
Boilers re-instated	2	1
Inspections for year—		
Thorough	1,600	1,536
Working	150	98
Boilers condemned during year—		
Temporarily	92	109
Permanently	12	24
Boilers transferred beyond the jurisdiction of the Act	9	11
Number of notices issued for repairs during the year	388	302
Number of certificates issued (including those issued under Section 30) during the year	1,589	1,519

The number of thorough and working inspections was 1,536 and 98 respectively, making a total of 1,634, showing decreases of 64 thorough and 52 working inspections.

In the districts worked from Head Office, Perth, 1,347 inspections were made, or 82.4 per cent. of the total number made in all districts. The inspections made in these districts showed a decrease of 52. In the goldfields districts worked from Kalgoorlie 287 inspections were made, being 17.6 per cent. of the total inspections. The inspections in this district showed an increase of six.

The following table shows the number of boilers temporarily and permanently condemned, as a percentage of inspections made each year, since the inception of the Act controlling boilers:—

Year.	Temporarily.	Permanently.
	%	%
1899	2·64	1·420
1900	2·21	·498
1901	4·34	·511
1902	5·00	·958
1903	2·43	·697
1904	3·08	·389
1905	2·84	·388
1906	3·98	·960
1907	4·36	·802
1908	3·18	·599
1909	2·89	·797
1910	4·49	1·382
1911	3·54	8·070
1912	3·93	2·471
1913	2·64	2·431
1914	2·97	2·178
1915	4·72	1·538
1916	3·97	1·456
1917	3·19	1·301
1918	3·25	1·563
1919	3·14	3·547
1920	3·28	2·171
1921	4·33	1·358
1922	5·22	·940
1923	3·76	1·213
1924	5·44	1·418
1925	5·25	·685
1926	6·67	1·468

It will be seen from the above table that the number of boilers temporarily condemned for repairs during the year has again been large. The repairs in many cases were extensive.

The number of boilers permanently condemned as being no longer safe to be used as steam generators was small, but as there are now many boilers in the State over 30 years old, it is likely that the number that will be permanently condemned will increase in the next few years.

DIVISION II.

Explosions and Interesting Defects.

The only explosions which occurred during the year were the bursting of a steam pipe through water-hammer and of a compressed air main.

The steam pipe was about 450 feet long by 6 inches in diameter, of welded wrought iron, and was properly lagged. It had been under pressure of 160 lbs. per square inch for about 17 years, and continuously so until latterly, when it was shut off for week ends. The explosion took place on a Monday morning just as steam was turned on at the boilers, and caused a rent about five feet long with a maximum opening of 14 inches. The main was well provided for expansion and contraction, but not too well for drainage. The pipe had been supplied by most reputable makers, and although it had torn along the weld there was nothing to account for the explosion except water-hammer, due to undue haste or carelessnesses of the man who turned on steam.

The air-main explosion occurred at a 3in. branch of an 8in. main, and blew the top off a gun-metal valve, and fractured a wrought-iron tee-piece. Dense black smoke accompanied by flame and sparks issued from the fractured valve. Inquiries could not elicit any other explanation than that too much oil for lubrication had been allowed to enter the air cylinder, and that gas had been generated which was ignited by the heat of compression. Fortunately damage by fire to buildings and machinery was prevented.

The proof of marked inferiority of boiler water tubes imported within recent years compared with those of 20 years and more ago should be recorded. Cases have occurred where tubes which had been in service for over 20 years had been replaced by newly imported tubes, which gave out within 12 months. The worst case was one in which a whole nest was renewed, and within a few months some of them had pitted and corroded through. At first glance it might appear that in these cases there had been a serious deterioration in the quality of feed water. Such was proved not to be the case, and the cause was undoubtedly inferior metal in the tubes. The quality of tubes now being supplied is much lower than it was or should be, and it behoves firms of good repute to rectify the matter. For tubes which appear to be first-class (replacing tubes by the same makers which gave 20 years service under similar conditions) to become useless after 12 months is a serious reflection on steel tube makers of to-day.

DIVISION III.

Inspection of Machinery.

Th following return shows a classification of the power-driven machinery in the proclaimed districts.

The total number of groups now registered is 6,332 which shows an increase of 228 for the year.

Electrically-driven groups now number 3,967, showing an increase of 241 during the year. Steam-driven groups total 1,061, a decrease of 45. Gas-driven groups have decreased by 7. Hydraulic groups remain as in 1925, and compressed air groups have decreased by 2. Oil engine groups have increased by 41.

Return showing Classification of various sources of power-driven Machinery in use or likely to be used again in Proclaimed Districts during the years ended 31st December, 1925 and 1926.

Classification.	Totals. 1925.	1926.
No. of groups driven by—		
Steam Engines	1,106	1,061
Oil Engines	995	1,036
Gas Engines	229	222
Compressed Air Engines ...	38	36
Electric Motors	3,726	3,967
Hydraulic Pressure	10	10
	6,104	6,332

The following table shows the number and description of lifts in this State—

Passenger Lifts—

Electrically driven	94
Goods Lifts—	
Electrically driven	86
Hydraulically driven	9
Belt driven	6
Hoists	95
	290

Seven new passenger lifts, 1 goods lift, and 7 hoists were erected during the year, the net increase being 11.

The number of notices ordering protection, etc., for various classes of machinery was 208, which is somewhat smaller than the previous year. As a matter of fact owners generally are showing commendable zeal in trying to make everything as safe as possible. In spite of this, and constant inspection, the personal element creeps in, men take risks, and the unforeseen happens, as witness the still somewhat large number of accidents.

I am pleased to say the regulations relative to lifts are working well, and the lifts in this State compare very favourably with the rest of the world in the matter of safety. When it is remembered that the number of persons carried in these lifts is exceedingly large, one accident during the year, due to a defective door lock (electro mechanical), is a good result.

Return showing Operations in the Proclaimed Districts (Machinery only) during the years ended 31st December, 1925 and 1926.

—	Totals.	
	1925.	1926.
Total registrations of useful machinery	6,104	6,332
Total inspections made ...	4,863	4,825
Certificates bearing fees ...	4,394	4,419
Certificates (Steam) without fees	469	406
Notices issued "Machinery dangerous"	325	208

The total number of registrations shows an increase of 228, mostly electrically-driven groups, or 313 less than the increase in 1925.

In the districts worked from Perth there was an increase of 460 in the number of useful groups registered.

In the Goldfields districts the number of registrations has decreased by 232.

In all districts the number of inspections made was 4,825, compared with 4,863 in 1925.

DIVISION IV.

Accidents to Persons caused by Machinery and Boilers.

During the year accidents to 43 persons were reported, including three which ended fatally. This shows an increase of one as compared with 1925. There has been an increase of one in the number of accidents in the Goldfields districts, and those in the South-Western district remain the same as in the year 1925.

The following table shows the number of persons injured by various kinds of machinery mentioned:—

Class of Machinery.	Number of persons injured.
Woodworking—	
Circular Saws	2
Band Saws	1
Spindle Shapers	4
Buzzers	3
Moulding Machine	1
Metal Working—	
Tin Press	1
Guttering Press	1
Punching Machine	1
Slotting Machine	1
Printing—	
Stapling Machine	1
Rotary Printing Machine ...	1
Tanning—	
Fleshing Machine	1
Engines—	
Steam	1
Oil	1 (1)
Boilers—	
Scalding	2
Gauge Glass	1
Steam Jacketed Pan—	
Scalding	2
Belting—	
(Driving)	6 (2)
Lifts	1
Conveyors—	
Belt	1
Push	2
Gearing—	
Dough Mixer	1
Pump	1
General—	
Gas Producer	1
Hemp Teaser	1
Emery Wheel	1
Quartz Mill	1
Friction Hoist	2
	43

(Numbers within brackets denote Fatal accidents.)

Some comment is necessary relative to the classified list of accidents, and it is to be regretted that three of them were attended with fatal results.

An employee while adjusting a lubricator on a portable oil engine in use in a country district was wearing a coat on account of the day being cold, and the coat became entangled in the governor gear on the engine fly-wheel. The result was that he was thrown with force to the ground, and was so severely injured that he died several hours after the accident. The deceased had been warned not to wear loose clothing, and the jury returned a verdict of "accidental death, no blame being attachable to anyone."

The danger of belt fastenings, especially one of a popular type, has been mentioned in previous annual reports. Two cases occurred in which men were struck while passing below belts, one in a country district and the second on the goldfields, and both proved fatal. In neither case was the accident due to lack of guarding, but because the deceased put himself into a dangerous position, entailing risk which was not justified. In each case the verdict of the coroner's jury was that no blame was attachable to anyone, and that death was due to accident, but in one case it suggested additional guarding by a rider to the verdict.

The guarding of machinery, and of belts in particular, is after all mainly a reminder of danger and a provision for safety against mishaps, and those who disregard its significance take risks for which they are to blame, and which no amount of inspection will prevent.

Among minor causes of accident the chief are buzzers, spindle shapers, and circular saws—all woodworking machinery, mishaps incidental to persons handling material in close proximity to rapidly revolving cutting appliances where guards cannot be placed. It is noteworthy that although no case occurred in which the accident was proved to be due to the absence of a guard, or that one had been removed, it is a common occurrence for inspectors to find them out of place or out of use, but never to be able to get evidence to ascertain the person responsible for such removal. Skilled operators appear to be the worst offenders, and some of them deride or make little of safety appliances, being hard to convince that they are mainly necessary for the apprentice or naturally careless workman. And so it frequently happens that a safety appliance is thrown contemptuously aside by one, and succeeding workmen or boys are loath to replace it for fear of being considered afraid. Workmen as well as employers have to be educated in this regard, and although there is still room for improvement, progress is noticeable.

On the goldfields the nature of accidents is naturally different from those in metropolitan or country districts, and is concerned more with driving or conveyor belts, hauling winches, etc., but as elsewhere, all injuries recorded were proved to be purely accidental and due entirely to the risks which have to be undertaken by the men engaged. In no case was it proved to be due to lack of guarding or undue carelessness on the part of the injured.

Considering the amount of machinery in use in the State the number of accidents reported is small, and although machines are made as safe as possible, accidents will never be entirely prevented.

Only two accidents were reported as due to defects in boiler fittings. In one case a mudhole joint in a vertical crane boiler blew out and scalded a couple of men in the vicinity, and in the second an attendant was struck in the eye by a splinter of glass through the bursting of a gauge glass. In this case the gauge was fitted with a protector, and the piece of glass which did the damage must have ricochetted off the side of the boiler.

Three cases of gassing occurred during the year to men engaged in cleaning scrubbers or repairs to gas engines.

The most serious case, which incapacitated the sufferer for nine days, happened to a fitter who was engaged repairing the engine, first making a joint on the exhaust valve, and then examining the crosshead. The crank case of the engine was enclosed, and after removing the bonnet he put his head into the trunk of the piston to view the crosshead, and work at the crosshead bolt. The foreman who was directing operations noticed him working very slowly and then collapse. He gradually recovered when taken into fresh air. The presence of unburnt gas in the crank enclosure and trunk was quite unsuspected, although gas engines had been in use for years at the mine.

In the other cases, which took place during the cleaning of scrubbers, simple precautions were neglected in the haste to expedite work.

DIVISION V.

Engine-drivers' Examinations and kindred matters.

During the year four examinations were held in Perth, two in Kalgoorlie, two in Leonora, two in Bunbury, one in Northam, and one in Albany. Examinations were advertised to be held at Southern Cross, Mt. Magnet and Geraldton, but fell through owing to the necessary number of candidates not being available.

***Return showing total number of Engine-drivers and Boiler Attendants' Certificates (all classes) granted in* 1926 *as compared with* 1925.**

Class of Certificate.	No. granted. 1925.	1926.
Winding Competency (including certificates issued under Regulation 40 and Section 60 of the Act) ...	4	3
First Class Competency (including certificates issued under Regulations 40 and 45, and Sections 60 and 63 of the Act)	9	7
Second Class Competency (including certificates issued under Regulations 40 and Section 60 of the Act)	15	17
Third Class Competency (including certificates issued under Regulation 45 and Section 63 of the Act)	37	33
Locomotive Competency ...	18	11
Traction Compentency	9	3
Internal Combustion Competency...	11	17
Crane and Hoist Competency ...	14	9
Boiler Attendant's Competency ...	48	83
Interim	2	1
Copies	10	6
Transfers	12	9
Totals	189	199

During the year there were 245 applications received, and 199 certificates were granted, showing an increase of five applications and 10 certificates granted.

One overwind occurred on a mining winding-engine during the year. This resulted in damage to the North poppet head rope wheel and broke the timber bearers, but no person was injured. The accident was investigated, but the Board took no action beyond warning the engine-driver.

DIVISION VI.

General.

The total number of boiler and machinery registrations at the close of the year was 9,673, an increase of 308 registrations. The large increase in the South-Western division more than offset the decline in the goldfields divisions and accounted for the stated net increase.

Two important prosecutions were undertaken for infringement of the Act, one against a timber company for working a boiler without a certificate, and the second against an uncertificated engine-driver.

The boiler case exemplifies the constant vigilance which has to be exercised to ensure that every boiler working has been properly inspected and certificated. In this instance an owner declared that he had no further use for his boiler, and in reply to subsequent enquiries stated that he would not forget to apply for inspection and certificate should he want it again. Some time afterwards he sold the boiler, and it had been working for six months before the fact was discovered. What made the case more serious was that it was an old boiler and had been repaired since the last official inspection, and the manager for the new owners used his own discretion in regard to pressure. Had not chance disclosed this infringement of the Act it might have been used until a serious explosion occurred, because it was in an isolated place in the bush, like scores of other boilers scattered about the country which are out of use.

Electric welding is proving a boon to boiler owners by reducing the cost of repairs. One of its most useful applications is to the welding of foundation corner seams of locomotive and such type boilers. These corners have always been difficult to mak and more difficult to keep tight, and have been a constant source of anxiety to engineers in charge. It is now common practice to supplement the riveting and studding by welding the casing corners to foundation rings even with new boilers.

Owing to the increasing age of so many boilers in this State inspectors have been compelled to order many repairs, the cost amounting in many cases to hundreds of pounds.

To show how important it is for intending importers of boilers and machinery to acquaint themselves with provisions of the Act and standard requirements laid down, two cases may be cited. Boilers which had been passed elsewhere as being in good order and condition for certain pressures had to undergo certain alterations before being certificated in this State.

There was also one instance of a winding-engine which was purchased for the goldfields and proved on arrival to be not only inadequate in brake power but weak in power relative to the load it was expected to haul. It seems difficult to understand why people who intend to invest money in boilers and machinery for use in this State, which is well known to require a high standard of strength and workmanship, do not make sure beforehand that the intended purchase will conform to the Act and Regulations.

Crude oil engines appear to be gaining favour, and are now superseding other types. There are three 35 H.P. crude oil engines already working at Broome, one of 83 H.P. at Ajana, smaller ones at Meekatharra and Merredin, and a dozen or so others in various parts of the country. Additional crude oil engines on order are two of 187 H.P. each for Geraldton, two for Carnarvon of 125 H.P., and 175 H.P. and 35 H.P. for York.

The storage capacity for crude oil is being rapidly increased, mainly for oversea vessels, and consumers on land feel assured of a constant supply.

Revenue.

The total revenue from all sources during the year was £5,537 0s. 8d., and showed a decrease of £213 1s. 7d., as follows.—

Source.	1925.	1926.
	£ s. d.	£ s. d.
Fees for boiler inspections ...	3,020 15 6	2,838 9 6
Fees for machinery inspections	2,284 14 9	2,215 19 0
Engine-drivers' fees	262 1 0	269 10 6
Special Inspections and expenses	182 11 0	213 1 8
£	5,750 2 3	5,537 0 8

The loss of revenue to the Department incurred by not charging fees for boilers and machinery belonging to the Government non-trading concerns was £76 0s. 6d., and the expenses connected with such inspections amounted to £15 9s. 2d.

During the year the amount written off as bad debts was £2, being .036 per cent. of the total revenue.

Expenditure.

The total expenditure was £6,542 7s., a decrease of £293 12s. 9d.

EXPENDITURE FOR YEARS 1925–1926.

Source.	1925.	1926.
	£ s. d.	£ s. d.
Salaries	5,335 9 6	5,286 12 5
Travelling Allowances and Fares	614 14 1	686 10 11
Motor Cars Costs	339 14 7	258 8 8
Hire of Conveyances	101 14 9	82 4 6
Sundries	145 8 10	131 8 1
Purchase of Motor Car ...	253 17 6	...
Engine Drivers	45 0 6	97 2 5
Totals ... ...£	6,835 19 9	6,542 7 0

The operations showed a loss of £1,005 6s. 4d., a decrease of £80 11s. 2d., compared with the loss during the year 1925. The loss represents the cost of enforcing the provisions of the Act, which is helpful, not only to owners of machinery and boilers, but gives the greatest protection to the life and limb of employees and the public.

Mileage.

The distance travelled by inspectors during the year was 43,410 miles, of which 13,754 were by rail, 29,650 by road, and 6 by water.

These figures show an increase of 949 miles when compared with the 1925 mileage.

The large area over which inspection work is spread makes the average miles travelled per inspection great. The average for 1926 was 6.72 miles per inspection. Care is continually exercised in arranging tours of inspection, in order that the mileage travelled is kept as low as possible.

Unfortunately the number of boilers and groups of machinery in use on the Goldfields continues to decline year by year. The distance required to be travelled, however, cannot be decreased, and consequently the mileage remains unaltered for the districts concerned. This condition of affairs tends to increase the average mileage per inspection.

THE STAFF.

The number of inspectors was reduced from eight to seven on 28th February, as a result of the retirement of Inspector Gill. The programme of work was heavy, and it was cheerfully and efficiently performed by inspectors.

The Clerical Staff did not undergo any change, and the work was well done.

I wish to place on record my appreciation of the good work done by the Staff.

I wish also to thank the officers attached to the Crown Law, Police, and Postal Departments for the valuable assistance rendered by them in connection with the administration of the Act.

I have, etc.,

A. M. HOWE,

Acting Chief Inspector of Machinery and Acting Chairman of the Board of Examiners.

DIVISION VII.

ANNUAL REPORT OF THE CHEMICAL BRANCH, MINES DEPARTMENT, FOR THE YEAR 1926.

The Under Secretary for Mines, Perth.

I have the honour to submit, for the information of the Hon. the Minister, my report on the work of this Branch during the year 1926.

STAFF.

The only change in the permanent staff during the year was the resignation of Mr. E. C. Orton, B.Sc., A.A.C.I., who has joined the Commonwealth Service, and who has been succeeded by Mr. F. F. Allsop, B.Sc., A.A.C.I. To cope with the heavy work in the Mineral Section, Mr. A. E. M. Kildahl, A.A.C.I., has been employed as a temporary chemist.

Much ill-health has again been apparent in the staff, far in excess of the normal average. Whilst it is true that some of it was not in any way occupational in origin, it is also true that all free play of air through the building has been cut off by recent additions to adjacent premises, and there never has been in the Laboratory any properly situated and fitted room for toxicological work. This matter is referred to in more detail by Mr. Stacy in his report, and serious consideration should be given to the possibility of remedying it.

The reclassification of members of the professional staff which occurred during the year gave a necessary recognition to their claims for consideration under the greatly lowered purchasing power of money.

NATURE OF MATERIALS EXAMINED.

From detailed tables prepared by the supervising chemists, which will be found on later pages, it is seen that in all 3,381 samples were submitted for examination. These were distributed among the different sections as follow:—

Foods, Drugs, and Toxicology	600
Mineralogy, Mineral Technology, and Geochemistry	1,973
Agriculture, Water and Sewerage	808
	3,381

The preponderance of mineral samples still continues, due largely to an active search for gold, as no less than 1,422 samples were received for gold assay. Other materials forming large proportions of the total were foods (147 samples), waters (422), soils (119), fertilisers (114), and miscellaneous minerals (132), for systematic classification and report as to their possible economic value.

FOODS AND DRUGS.

Only one meeting was held of the Advisory Committee under Section 179 of the Health Act. A number of matters have, however, been considered and dealt with on departmental files and the usual routine tests of foods and beverages carried on. Amongst matters which were considered were the revision of the Food and Drug Regulations as adopted in 1924 in accordance with the report of an Interstate Conference; the desirability of extending the list of permitted dyes in foods as requested by the federal executive of the Manufacturing Confectioners' Association of Australia; the advisability of fixing a legal standard of composition for eau de cologne; the need for a stricter supervision of beverages, etc., supposed to be derived solely from fresh fruit; the necessity of fixing a limit to the permissible number of moulds in sauces, particularly tomato sauce; the use of isopropyl alcohol as a substitute for ethyl alcohol in essences, etc.

One of the most important matters dealt with was Reg. 31 governing the composition of butter. Under this regulation commercial butter was expected to contain 82 per cent. of milk fat. After weighing carefully a number of facts submitted, it was decided to recommend the amendment of the regulation to provide for a content of 80 per cent. of fat in conformity with the legal requirement in New South Wales and Victoria.

Officers of the Government Laboratory have no powers of inspection or sampling under the Health Act, but are dependent upon officers of the Health Department to collect and supply such samples. In addition, a few samples of farm products (potatoes, apples, etc.) are received from the Agricultural Department. The Food and Drug Regulations under the Health Act are concerned mainly with the prevention of adulteration of foods with definitely injurious substances, but they are designed to cope also with undue dilution of foods with perfectly harmless substances, such as water, etc. That these are not unnecessary is illustrated by the following instance: in the year 1926 samples were taken of all the thirty different brands of essences of lemon on the local market. Of these brands only ten satisfied the requirements of the regulations in regard to content of citral and oil of lemon. Two others contained the requisite amount of citral but were low in terpenes which are responsible for part of the typical flavour of the oil; they would have been satisfactory if labelled "terpeneless." The other 18 brands were all adulterated by dilution with rectified or weaker spirit, the deficiency in the essential flavouring components ranging from 5 per cent. to 85 per cent. No less than eight brands showed over 50 per cent. deficiency out of a total of 30 examined.

A number of samples (31) of smoked fish have been examined for dyes and boric acid, the Health Department enforcing the prohibition of these. The use of the vegetable annatto dye had become quite usual with smoked fillet of cod, etc.

Other important foodstuffs analysed were cows' milk (35), human milk (13), meats (15), potatoes (13). The number of samples of cows' milk appears small for a Government Laboratory, but this food is checked thoroughly at the Local Health Boards' Laboratory.

POISONOUS METALS IN FRUIT.

The immense increase during recent years in the use of highly poisonous metallic sprays by fruit growers for controlling insect and fungus pests is causing grave concern amongst health authorities the world over. Sprays recommended by economic entomologists and mycologists include arsenate of lead, a compound of two highly poisonous substances, both cumulative in effect, as well as other arsenic compounds, and basic carbonate and other compounds of copper. So long as such sprays and dusts were only applied to the trees during the very early stages of fruit growth, the danger to human health was extremely slight, as the total amount adhering to the fruit in the first instance was small, and there was ample time for the weather to remove the greater part of it before it was picked for market. Recent practice, however, has been in the direction of repeating the applications at later stages in the development of the fruit, which has increased the risk of poisoning considerably. The argument in defence of lead arsenate sprays that no one is likely at one sitting to consume enough fruit to get a fatal dose of arsenic is fallacious, since not only is the almost equally poisonous lead to be reckoned with, but also the fact that both lead and arsenic are cumulative, and the full effect will be felt of the sum total of the small doses absorbed at each of a series of meals. Furthermore serious effects are observed with quantities far short of fatal doses of either.

In England the authorities have set a limit of 0.01 grains of arsenic (calculated as As_2O_3) per pound of fruit offered for sale, and heavy penalties are imposed for exceeding this amount, besides destruction or return shipment of the stocks affected. In this State Regulation 5 under the Health Act excludes any trace of arsenic or lead from fresh fruit.

A considerable number of apples as well as some other fruit has been examined in the laboratory, and whilst most of them were below the English limit in regard to arsenic, a few ran as high as one-thirtieth to one-tenth of a grain per pound. A large proportion of the arsenic and lead appeared to be held beneath the calyx.

It is stated in the technical journals that all lead arsenate can be removed from the surface by dipping in 2 per cent. caustic soda solution. A small proportion of the arsenic is, however, absorbed into the skin and held there permanently.

Copper compounds have recently been detected in raisins sold in Perth, evidently traceable to dusting of the vines with copper carbonate. Whilst copper is far less toxic than either lead or arsenic, its presence on any foodstuff is plainly contrary to Regulation 5.

SANITATION OF FACTORIES.

At the request of the Health and Labour authorities considerable attention was given to the condition of the atmosphere in regard to dust and chemical fumes in a number of workshops. Determinations were made of carbon monoxide in the air at breathing level in the Albany Woollen Mills (where coke braziers are in use in the winter months), Government Railway Workshops, and Household Management class rooms under the Education Department. In the two former places excellent conditions in this respect were found to prevail, whilst at the last small but appreciable amounts of carbon monoxide were detected.

A number of boot factories were examined in conjunction with the Chief Inspector of Factories, and attention given to the possibility of the air being contaminated with injurious dust from the grinding machines or with chemical fumes from the polishes and stains. In most cases very efficient suction apparatus was found which removed the leather dust practically completely and instantaneously from the wheels, so that little if any dust was inhaled by employees. Examination of the dust from a suction plant revealed its constituents to be mainly leather devoid of arsenic or chromium, with a little carborundum (carbide of silicon) or aloxite (fused aluminium oxide) from the wheels, and shreds of iron and brass from the nails. No silica was present, such as might give rise to silicosis. The stains and polishes were found to be free from volatile or other injurious matter.

Later several workshops were visited where spray-painting of motor car bodies was in progress. With one exception leadless pyroxyline paints were in use. These paints contain a large proportion (80 to 90 per cent.) of highly volatile hydrocarbons and esters, of the physiological effect of which, when inhaled, practically nothing is known. The fluid portion of one popular brand examined consisted of benzene, ethyl acetate, and amyl acetate, of which the first-named is definitely known to be injurious. Realising the possible danger, the spraying in each case was being done under a hood only open on one side and provided with a powerful suction fan. In response to enquiries no complaints of ill-health were received, but as the industry is one of recent date, and in every case the typical odours of several of the solvents were easily perceptible, the health of employees requires careful watching for some time to come.

A very detailed examination was made of the dust from the South Kalgurli crushing mill at Kalgoorlie with a view to determining the risk of silicosis arising amongst the men working in it.

BRAN AND POLLARD.

In view of the great importance of flour mill bye-products to poulterers and dairymen, information was obtained for the Agricultural Department as to the average composition of the local articles with a view to fixing standards under the Fertiliser and Feeding Stuffs Act. It was thought best to base this standard on a maximum allowance of moisture, fibre and ash, rather than, as in the Victoria Act, on a minimum of the main food constituents, protein and carbohydrates, since it was found that slight variations in milling practice produced large relative variations in these constituents. The standards fixed were:

	Bran. %	Pollard. %
Moisture, maximum allowed ...	10·5	11·0
Fibre „ „ ...	8·5	4·5
Ash „ „	3·5	2·0

It was understood that an allowance in each case of 0.5 per cent. would be permitted.

The recently enacted Victoria standards are:

	Bran %	Pollard. %
Fibre, maximum allowed ...	10·0	7·0
Protein, minimum „ ...	14·0	14·0
Ether extract, minimum allowed	2·5	3·0

SOIL INVESTIGATIONS.

A certain wilting disease of wheat which had made its appearance at Dwarda was suspected of being favoured by an alkaline condition of the soil. Assistance was therefore given to the Government Plant Pathologist in a series of chemical investigations and trial growths in the field and laboratory, determinations being made of the pH value of the soils and waters and experimental soils brought to a definite pH for pot growths. This matter still requires further investigation.

A soil survey was made of the recently drained Herdsman Lake on the outskirts of Perth. In view of the presence of suspicious amounts of common salt and magnesium salts in the soil it was considered advisable to allow the swamp to remain uncultivated through last winter and increase the number of subsidiary drains to give every facility for the leaching of the soil by the winter rains which advantageously proved to be unusually heavy. The soil in this lake bed is of an unusual type, being a dark grey marl of a peculiar spongy texture which holds an extraordinary proportion of water without showing it externally or losing its crumbly nature, as much as 70 parts water with 30 parts dry soil in material which was firm enough to walk over. The steam-dried soil contained from 50 to 85 per cent. of calcium carbonate, from 10 to 16 per cent. of free and organic carbon, and from 0.78 to 1.20 per cent. of nitrogen. The soluble potash and phosphorus were low. The reaction of a 10 per cent. suspension was neutral (pH, 6.8 to 7.2). When properly drained and worked this should be a rich horticultural soil.

METROPOLITAN WATER SUPPLY.

Meetings of the Advisory Committee were attended each month, and much useful work done with the object of improving and stabilising the quality of the water supplied. The main source of supply is now rapidly changing. Up till this year unmixed hill stream water was supplied solely during the late winter and early spring, but for the warmer and drier period of the year artesian bore water was used in large excess over the stream water. With the completion of three new pipe head dams in the hills and a coincident heavy winter rainfall, no bore water was used up till December, and even after that only a very small proportion has been added, the bores from time to time being shut off altogether. Each class of water has its merits and defects. The bore water is absolutely sterile, but on the average is much more saline than hills water, and in many cases is unduly hot or unduly charged with iron. The hills water is very pure chemically, both in regard to dissolved and suspended matter, and is invariably cool, but in this warm climate naturally gives high bacterial count. The hills water is saturated with oxygen, and contains a fair proportion of carbonic acid, resulting in the corrosion of iron pipes and formation of a brown turbidity in the water. The bore water contains much more carbonic acid and practically no oxygen, but exposure to the air rapidly brings it to the same condition in this respect as the hills water.

Chemical treatment of the waters, which is closely watched by this Department, consists in chlorination and liming of the hills waters, and treatment of the bore waters with copper sulphate and lime.

When the new pipe line was first in use a distinct iodoform taste was observable from time to time in the water, due to the action of free chlorine on the phenolic constituents of the tar coating. No complaints of this have now been made for some months.

FARMERS' WATER SUPPLIES.

In the agricultural and pastoral areas of the State the main sources of water supply are wells. In many areas a large proportion of these are brackish or saline, which accounts for about 150 samples of such waters being submitted during the year with a request for advice as to their suitability for stock watering and domestic use.

In a paper on water supply problems read at the Perth meeting of the Australasian Association, tentative standards were put forward for the limiting salinity of water for stock, as no authoritative standards appeared to be in existence in this State. With the class of water mainly available here, in which the chief saline impurities are oceanic salts, the following standards were thought to be justified by past experience:—

STANDARDS FOR STOCK WATERS.

——	Horses.		Cattle.		Sheep.	
	Parts per million.	Grains per gallon.	Parts per million.	Grains per gallon.	Parts per million.	Grains per gallon.
Total salts, max....	6,500	450	10,000	700	13,000	900
Magnesium, Mg. max.	260	18	400	28	520	36
Aluminium, Al max..	5	0·35	7	0·5	10	0·70
Iron, Fe.* max.	1	0·07	1	0·07	1	0·07
Nitric Nitrogen, max.	20	1·5	30	2·0	40	3·0
pH should be between	5·5 and 8·5		5·5 and 8·5		5·5 and 8·5	

* In solution, not in suspension.

Partly in pursuance of data regarding this matter a week was spent in May in the wheat and sheep district lying between York, Quairading, and Beverley.

CERAMIC RESOURCES.

The resources of the south-western portion of the State in clays and other ceramic materials continue to be investigated in the laboratory, and as opportunity presents itself, in the field. Deposits of clay have been inspected at York and Balkuling, and of felspar at Jacob's Well. On Location 10395, at Jacob's Well, a pegmatite vein has been costeened, which appears capable of yielding a large quantity of both microcline and albite suitable for fine pottery purposes. An analysis of the latter is given by Mr. Bowley on page 15. Two partial analyses of the potash felspar (microcline perthite) showed:—

Potash, K_2O	10·48	10·14
Soda, Na_2O	4·10	4·56
Iron oxide, Fe_2O_3	·14	·12

The vein from which the felspars were taken is about 40 feet in width, and is separated by a greenstone dyke from a second vein of similar quality, but rather narrower.

Mr. Bowley's report shows that 28 clays were examined in the laboratory. Other ceramic materials examined were chromite and kyanite, both used in the production of high class refractories. In view of the numerous samples of kyanite received from time to time from the Chittering Valley, a few days were spent in examining this district from its junction with the Swan northwards to Mogumber. Kyanite was seen *in situ* at Lower Chittering, South Bindoon, and Wattle Flat. There is a probability that should a commercial demand arise for kyanite in Australia supplies might be obtained from this area. Some details of its occurrence are to be found in the Journal of the Royal Society of W.A. for 1925-6.

Some of the earlier ceramic researches carried out in the mineral laboratory were subsidised by the Commonwealth Government. The reorganisation of the Government laboratories in 1922 interfered with my publication of a summary of the results obtained, but at the urgent request of the Council of Scientific and Industrial Research an effort was made this year to prepare the results for publication, and considerable progress in this direction has been made.

CORUNDUM DEPOSITS EAST OF BEVERLEY.

For some years past specimens of detrital corundum have been sent in from an area lying about 30 miles east of Beverley. This area was visited in May, and the mineral found lying on the surface in several places on the north side of the railway between Jacob's Well and Dangin. The staple rock in the area was found to be more or less gneissic granite traversed by narrow dykes of epidiorite, dolerite, and serpentine. In many places the rocks are completely kaolinised to the depth of many feet. In only one place, Location 13096, Dangin, was the corundum seen *in situ*, viz., in a completely kaolinised foliated rock with little or no quartz, possibly an altered dolerite or more basic rock. In this material the corundum is scattered about in small nodules up to about one inch in diameter. They are translucent and either colourless, lilac or blue. A concentration test yielded 2.2 per cent. of mineral with a density over 3.33. This concentrate had the following composition:—

Al_2O_3	TiO_2	Fe_2O_3	SiO_2	Total.
88·98	5·05	1·21	3·93	99·17

The titania was mainly present as rutile, the alumina as corundum. The matrix was tested as a pottery clay and found to be of medium plasticity (Ashley, figure 39). It contained 67.1 per cent. of clay substance with 30.9 per cent. grit (mostly hydromica) under 90 mesh, and it burnt to a pure white body at 1150°C. If parts of the deposit were found richer in corundum it would be an economic proposition to concentrate it for the corundum to be used as an abrasive, the floated clay matrix to be used in the white ware industry.

The rich blue colour of some of the corundum and its appreciable translucency justifies its being called sapphire, and there is a possibility that stones of that kind will be found in this district sufficiently well coloured and transparent to be cut as gems.

ALUNITE AT CAMPION.

The unique deposits of alunite in some salinas forming part of the Lake Brown "lake country" at Campion, north of Merredin, were first recorded in my annual report for 1925.* It was there shown that a salina covering about 30 acres, known as Reward Lake, had a surface layer of alunite averaging 9 inches in thickness with a content of 7 per cent. of potash, the quantity available being estimated at 45,000 tons.

Brief reference was made to an adjacent lake, now known as Chandler Lake, which was then neither surveyed nor sampled, except that one grab sample from the surface had been found to carry 5.47 per cent. potash in the form of alunite. At my request the Acting Government Geologist has now had this larger lake surveyed and bored. The results were surprising and of great economic importance. Instead of a thin surface layer of alunite, as in the smaller lake, good grade mineral of 6.5 to 7.0 per cent. potash content was found in various parts of the lake to extend to a depth of five feet or even more (no less than 10 feet of 6.9 per cent. in one hole), and this over an area exceeding 300 acres. On a very conservative estimate, therefore, there are three million tons (dry weight) of crude alunite in this lake, in the form of a stiff mud, with a dry surface for two-thirds of the year, but covered with a few inches of water in the wet season. Assay results have been fairly uniform, ranging from 6.09 to 7.62 per cent. potash with an average of 6.83 per cent. for 15 samples. The alunite should be easily raised by one of the recognised methods of dredging. Further details of this deposit are given by Mr. Bowley on page 12 hereunder.

COORONGITE.

Amongst the heterogeneous collection of substances of animal or vegetable origin submitted from time to time as evidence of the occurrence of mineral oil, this substance frequently appears. It was first described from the deposit occurring at the Coorong in South Australia where it frequently covers large areas of swampy ground. In Western Australia it has been found under similar conditions in many localities on and near the South Coast, *e.g.*, Esperance, Ravensthorpe, Pallinup River, Cranbrook and Donnelly River.

* E. S. Simpson, "Sedimentary Alunite at Campion," Ann. Report Chem. Branch, 1925, p. 18.

Considerable excitement was created in Perth in the early part of the year by the announcement that "oil had been struck" at Martigallup near Kendenup. Investigations conducted by Mr. R. C. Wilson in the field and by myself in the laboratory proved that no oil in the sense of petroleum had been met with, but that an extensive sheet of coorongite had been rediscovered on a swamp at Martigallup and an artificial oil obtained from it by distillation, as can be done from almost any organic substance from coal to cucumbers.

These thin (¼ inch to 1 inch) sheets of coorongite appear to form in favourable seasons on the surface of swamps in many parts of the world. Recent researches by Reinhardt Thiessen* proved that they are not connected in any way with a seepage of petroleum but are rubber-like aggregations of the dead cells of a microscopic single celled alga which he calls *Elaeophyton.*. Sooner or later bush fires destroy the layer of coorongite, which is very combustible, and no more is seen until a favourable season again occurs for the intense multiplication of the alga.

At my suggestion Mr. H. E. Hill of the Foods and Drugs Section has been investigating the constitution of the West Australian coorongite, and already some interesting facts have been elucidated. The research is still being continued as opportunity occurs.

BISMUTH IN LEAD ORES.

A very heavy penalty is imposed by smelters on lead ores containing quite small amounts of bismuth, the recent rate being one shilling deduction for every one part in ten thousand (0.01 per cent.). As Eastern States buyers this year suddenly alleged that appreciable quantities of bismuth were present in the ores from Geraldine (Galena) and Northampton, and began to impose heavy penalties, this matter was gone into very carefully. It was found that there was no trace of bismuth in these ores but that there was great difficulty in determining accurately minute amounts of bismuth in the presence of large quantities of lead, and the error, if any, was always on the plus side. Two methods of determination were tried in this laboratory. One was a gravimetric method using the most meticulous precautions to avoid contamination of the final basic bismuth carbonate precipitate. The second was a colorimetric method using potassium iodide and sulphurous acid in a sulphuric acid solution after removal of all interfering elements. This method served to detect as little as one-fiftieth of a milligramme of bismuth.

In view of our results, checked by the buyer's own chemist, who was supplied with details of the methods used, acknowledgment was made that our ores were free from bismuth and the heavy penalty rebated.

COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH.

This council was constituted early in the year by the Commonwealth Government and later committees were established in each State to act as advisers to the Council. The first meeting of the West Australian committee was held in August, and this and four subsequent meetings I attended as a member nominated by the State Government. Already many serious problems affecting both primary and secondary industries in the State are being vigorously attacked.

FEDERAL MINING COMMISSION.

I waited on the members of this Commission whilst they were making inquiries in Perth and submitted evidence regarding the mineral resources of the State and their metallurgical treatment.

AUSTRALASIAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

For the first time in the history this Association held its biennial meeting in Perth. The professional members of the laboratory staff attended the meetings of the Chemical Section and of cognate sections, and took part in the discussions. A paper on Problems of Water Supply in Western Australia was read by myself at a joint meeting of several sections, and is to be published in the Proceedings. The meeting of the Association in Perth is of inestimable benefit to the State, as it brought local scientists into intimate contact with the leaders of science throughout Australia, and interested the latter in many local problems of which they would otherwise be unaware. For the Handbook issued to the visitors articles were prepared on (1) The Government Laboratories, (2) The Mineralogy of Western Australia.

I attach reports on the work of the three sections of the laboratory by the respective Supervising Chemists.

EDWARD S. SIMPSON, D.Sc., B.E., A.A.C.I.,
Government Mineralogist and Analyst.

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*R. Thiessen, Origin of the Boghead Coals. U.S. Geol. Surv. Prof. Paper 132 (1925).

SECTION I.—TOXICOLOGY, FOOD AND DRUGS SECTION.

By C. E. Stacy, A.A.C.I.

During the past year a total of 600 samples have been received from the following sources:—

Health Department	197
Police Department	99
Liquor Inspection Branch	33
Agricultural Departmeit	33
Explosives Department	76
Mines Department	11
Tender Board	28
State Sawmills	8
State Hotels	5
Department of Works and Labour	11
Forestry Department	1
Railway Department	2
Metropolitan Water Supply and Sewerage Department	8
Wyndham Meatworks	1
Merredin Roads Board	3
Perth Public Hospital	6
Public Free	35
Public Pay	29
Departmental	14
Total	600

Samples were classified as follows:—

Foods	147
Essences	39
Toxicological	85
Powellising	8
Hydrometers	10
Thermometers	7
Petroleum—Tests for natural	25
Petrol	1
Kerosene	4
Oils, Lubricating, etc.	38
Turpentine	7
Explosives	76
Air	10
Waters	4
Cattle Dip	8
Ambergris	10
Spirits	40
Spirituous liquors	16
Beers	3
Summer drinks	4
Hop beers	8
Drugs	3
Gypsums	3
Galvanised irons	2
Miscellaneous	42
Total	600

FOODS AND DRUGS.

The number of samples is slightly in excess of those examined last year, and it is gratifying to note that an increase in the number of foods has taken place—147 as against 103 last year. For the past two years not a single sample of a drug, and only one sample of a patent medicine, has been sent in for analysis to the Food and Drugs section of this laboratory.

I have not followed the example of the other sections of the Department in putting in the number of estimations made, as such a method in this section would be misleading. For instance, in food examinations for preservatives a search is made for all ordinary ones and sometimes no estimation is made at all on account of their absence. Also in toxicological work where there is no direct clue, a week or more may be spent in searching for various poisons when the case is a negative one. Various other instances to illustrate this point might be quoted.

Hereunder is a table showing the number and kind of food samples and their quality as judged by the Food and Drug Regulations; also an extract from last year's annual report side by side.

Material.	1925. No. of samples.	1925. No. complying with Regulations re. Labelling.	1925. No. complying with Regulations re. Composition.	1926. No. of samples.	1926. No. complying with Regulations re. Labelling.	1926. No. complying with Regulations re. Composition.
Milk	41	41	39	23	23	14
Milk, condensed	2	...	2	10	10	6
Baking Powders	2	2	2		No samples.	
Custard Powders	2	1	...	1	1	0
Cakes and Pastry	2	2	2		No samples.	
Mustard	2	2	2		do.	
Vinegars	3	2	2		do.	
Pepper	1	1	1		do.	
Cocoa	2	1	...		do.	
Infants' Foods	3	...	3		do.	
Cereal Foods	1	1	1		do.	
Fish	2	2	1	21	21	10
Ice Cream	1	1	1		No samples.	
Essences	1	1	...	39	27	10
Non-excisable fermented drinks	13	9	6	8	8	1
Medicated Wines	14	2	4		No samples.	
Soaps	11	4	9		do.	
Ales and Stouts	4	4	3		do.	

An important matter is the labelling directions on infants' foods. All the three samples in 1925 were incorrectly labelled, but none were received during 1926. A survey of medicated wines also disclosed a bad state of affairs, but no samples were received in 1926, and the same applies to soap.

MILKS.

Comparatively recent legislation in England has introduced what is known as the Reductase test for stale milk. The principle depends on enzymic action. Methylene blue solution added to stale milk is rendered colourless in less than three hours at a definite temperature, whilst with fresh milk it remains unaltered for a similar period. Six samples of ordinary milk as delivered were examined and only two of them were found to be fresh by this standard. The formation of a local standard might well be considered by the Foods and Drugs Advisory Committee.

ESSENCES.

An extraordinary state of affairs was disclosed concerning essences of lemon sold in this State. Out of 39 samples received, 29 failed to comply with the regulations *re* composition, and 12 with the labelling provisions. One is inclined to wonder whether other essences are similarly deficient.

PATENT MEDICINES.

One sample of a patent medicine in the form of confectionery was submitted for analysis and was found to contain a powerful drug entirely concealed by taste and likely to produce a "habit." A certificate showing the danger of such preparations was issued, but I have been informed that the authorities have no power under the regulations to deal with the matter.

SPIRITUOUS LIQUORS.

Fifty-nine samples were examined during the year, including 26 spirits for establishing standards. These liquors also included a number of cocktails, wine cocktails, vermouth, etc., which were being sold as Australian wines under Australian wine licenses. The question as to whether these can be rightly or not sold as Australian wines is a very subtle one and is hedged about with some uncertainties in both the Licensing and Health Acts, under either of which the cases can be considered. At present, however, the matter is *subjudice* to a certain extent, and I am not therefore able to put my own view-point forward, or to argue one way or the other.

Five wines were examined, three of which were very unsound indeed, one being vinegar and totally undrinkable, another on the border line of unsoundness and very objectionable in appearance. In giving evidence before the Licensing Commission in 1922 I recommended that a limit of 0.18 per cent. of acidity calculated as acetic acid should be introduced here under the Licensing Act, this being the maximum figure recognised in European countries, but although it was embodied in the recommendations of the Commission no steps were taken in this direction. It seems a pity that no action can be taken against vendors who place such wretched liquor on sale to the public.

The quality of spirits sold at the various hotels throughout the State appears to be good, only one case of prosecution for false trade description occurring through the year, and a few cases of adulteration by water, which points to the efficiency of the Inspectors under the Licensing Act.

Two samples received during the year were labelled "Orange Gin" and "Lemon Gin." A prosecution was instituted by the authorities in regard to Lemon Gin, the Inspector testing it with his hydrometer and finding it apparently below strength. These liquors, which must be considered to be gin as this word is the last in their designation, contain a very high proportion of sugary extract, or "obscuration," meaning obscuring the true spirituous strength under the prescribed method of test. Licensees should be warned against exposing such liquors for sale, as under the Act a Sykes' hydrometer, which is the only instrument recognised by the Act for taking spirit strength, would indicate a strength considerably below the true one.

During the year some patent metal spirit measures were examined for the presence of dissolved copper in spirit contained in them after standing for considerable periods. After 40 hours a trace of copper could be detected and after one week 1/66th of one grain was found to be present. No harm can very well come from the use of these measures unless the spirit be allowed to remain in them for very long periods, which is unlikely. The licensees using them, however, were warned in this direction and told to periodically clean them out. The profit from the use of these instruments is well on the side of the licensee as they deliver only about 25 cubic centimetres which is considerably less than one ounce.

Other beverages submitted included eight hop beers, the average strength of which was 4.48 per cent. of proof spirit, the highest being 6.36 per cent. and the lowest 1.16 per cent. proof spirit, which, by the way, was the only sample below the permitted strength; all the others well exceeding it. There were three successful prosecutions.

Only four other beverages were examined. Some check, therefore, was kept on saccharin and preservatives, which may be added in increasing quantities to beverages consumed largely by children, to their disadvantage.

During the year 1925-26 14 samples of tonic and medicated wines were examined for the Health Department, only two of which complied with the labelling regulations and only four with the regulations *re* composition. None was examined this year.

TOXICOLOGY.

A very heavy year in this respect has been experienced, no fewer than 85 exhibits being received, a considerable increase on last year, which constituted a record up to that time. Strychnine and cyanide were the poisons in most cases, whilst lysol, veronal, arsenic, chlorodyne, oxalic acid and hydrochloric acid were taken in a number of cases.

One fatal case only calls for particular comment in which dry "cyanide" was taken into the mouth and an attempt made to spit it out. Although no hydrocyanic acid (the active principle of "cyanide") was found in the stomach, the smell was observed by the doctor about the mouth and in the lungs, and there were local marks of corrosion on the mouth. The theory that poison sufficient to kill was absorbed through the mucous membrane of mouth and throat was accepted, and a verdict of suicide returned. It is worthy of notice in this case in corroboration of the above theory that death did not take place until over five hours after taking the poison, which is an unusually long period in cases of cyanide poisoning.

Most of the toxicological analyses I perform in my room, which is situated adjoining the general office, and opening into the main laboratory of the Food and Drugs and Toxicology section. The smell from many of these cases is exceedingly objectionable, and to this Dr. Simpson attributed a good many cases of "malaise" among the staff during the previous year. Bad smells, contrary to public opinion, do not cause sickness directly, but produce a general lowering of the system, thereby weakening the resistance of the body against ordinary pathologic germs. The Government was approached for the purpose of building a second storey room with forced draught and perfect ventilation system whereby the danger to the health of the staff generally might be removed. The Chief Architect made plans of this room, but unfortunately there, for the time at any rate, the matter dropped. It is sincerely to be hoped that the Government may see its way clear in the early future to go ahead with this good work.

EXPLOSIVES.

A very large increase in the number of samples of explosives has taken place during the year, the number of samples submtted beng 76 as aganst 33 for the prevous year.

POWELLISING.

An extraordinary falling off in the number of powellising samples submitted by the State Sawmills Department during the year has taken place, only eight samples having been received as against 101 in 1926, and this even was a very low number compared with previous years. It seems a pity that the efficiency of large plants such as the powellising ones should not be checked more frequently.

SANITATION OF FACTORIES.

At the request of Dr. Dale, the Medical Officer of Health, samples of air were taken at the Albany Woollen Mills, the Midland Junction Railway Workshops and the Household Management, James Street School, as it was thought that carbon monoxide might be present. At the first-mentioned place coke braziers are used at certain times of the year to dry the atmosphere. Samples taken close to the nearest employees were found to be quite free from this gas and the same conditions were found at Midland Junction. At the Household Management Depot at the James Street School, however, 0.008 per cent. and 0.009 per cent. of carbon monoxide were found near the gas stoves and racks used for cooking and ironing respectively. The samples throughout the tests were taken at an average breathing level height.

AMBERGRIS.

Samples of material believed to be ambergris were submitted by various people, all of whom had to be disappointed as the result of analyses. A large quantity of material found at South Beach, Fremantle, was sent in by several independent discoverers, which turned out to be, as far as could be definitely ascertained, decomposed blubber, supposed to be from a dead whale, covered by sand and dislodged by the gales which took place here in the latter part of last June.

DERMATITIS DUE TO DYED CLOTHING.

Two interesting cases of dermatitis caused by clothing were investigated during the year. One was due to a khaki coat supplied to an officer of the Tramways causing chemical dermatitis owing to an excess of free alkali present, induced by the present method of "fixing." Recommendations were made that all new khaki clothing should be washed before wearing.

The other case was also from the Tramways Department and was due to staphylococcal invasion following on slight chemical dermatitis, the principal dye stuff being indigo. According to the opinion of Dr. McGlashan the cause was the personal idiosyncrasy of the subject to the dyestuff, and that probably not one in a hundred would have been affected in a similar manner.

C. E. STACY, A.A.C.I.,

Assistant Government Analyst and Toxicologist.

24th January, 1927.

SECTION II.—MINERALOGY, MINERAL TECHNOLOGY AND GEOCHEMISTRY.

(H. Bowley, A.A.C.I.)

The volume of work of this section is still increasing; 1,973 samples were entered for examination during the year, being an increase of 423 or 27 per cent. on the previous year's figures, of which gold ores accounted for 373 samples. In order to cope with this increase extra assistance was provided, Mr. A. E. M. Kildahl, A.A.C.I., being appointed as assayer, an arrangement by which we were able to avoid any undue delay in the issue of the gold results. The staff of this section now includes six professional officers and one laboratory assistant, but even with this number available it is to be regretted that, though it has been possible to carry out an appreciable amount of research work during the year, numbers of important problems, both of scientific and economic interest, which must have a direct bearing in the establishment of local industries, are awaiting elucidation, a function for which this laboratory is primarily established.

The plant of this section was augmented during the year by the addition of a set of crushing rolls which considerably reduced the time taken in the crushing of samples, also a set of screens and a shaking machine for grading asbestos designed to separate the various grades of commercial asbestos fibre from its gangue; this should prove of great benefit to shippers of fibre.

The following list shows the source of the samples dealt with:—

Department of Mines:	
Minister for Mines	8
Geological Survey	318
State Mining Engineer	547
State Batteries	512
State Prospecting Board	8
Chemical Laboratory	35
Department of Works and Labour ..	2
Government Printer	1
W.A. Museum	1
Roads Board	1
Prospectors	461
Public Pay	79
	1,973

Classified as:	
Abrasives	2
Aluminium ore	2
Alunite	8
Antimony ore	2
Arsenic ore	1
Asbestos	16
Barytes	2
Bismuth ore	7
Building materials	8
Chromite	1
Coal	16
Cobalt ore	1
Copper ore	20
Clay	28
Felspar	16
Garnet	10
Glauconite	11
Gold	1,432
Graphite	5
Gypsum	1
Iron ore	63
Limestone	11
Lithium ore	1
Lead ore	78
Magnesite	3
Manganese ore	22
Metallurgical products	5
Mica	10
Miscellaneous minerals	23
Nickel ore	2
Opal	3
Peat	9
Petroleum	1
Phosphate	2
Pigment	1
Platinum	2
Quartz crystals	3
Rocks	6
Salt	3
Sand	2
Silica, etc.	10
Silver lead ore	11
Sulphur	6
Talc	5
Tantalum ore	3
Tin ore	9
Titanium ore	18
Tungsten ore	1
Water	1
Unclassified	70
	1,973

The increase in gold ores is attributable to the number of core samples received from the prospecting bores put down at various centres by the Mines Department, very few samples being received from the new gold find at Glenelg Hills.

CLAYS.

Interest is still maintained in the search for clays suitable for pottery purposes, 28 samples being received from various localities, whilst a number of firebricks from a new source were examined. The latter in most cases, though highly refractory, were lacking in strength, and the makers have been advised how to improve their product.

The clays tabulated hereunder are of a useful type, three of them being within a reasonable distance of the metropolis:—

2848—Fine-grained refractory clay, Ora Banda.
2741—Fine-grained refractory clay, Clackline.
1687—Fine-grained refractory semi-ball clay, Mt. Hardy.
195—Fine-grained refractory ball clay, Meckering.

The figures obtained on examination were:—

Lab. No.	2648	2741	1687	195
Mechanical Analysis:	%	%	%	%
Clay substance	83·05	84·88	85·35	90·33
Grit under 90 mesh ...	16·39	13·95	14·60	9·56
Grit under 60 mesh ...	·20	·86	·05	·06
Grit under 30 mesh ...	·29	·31	*Nil*	·04
Grit over 30 mesh ...	·07	Trace	*Nil*	·01
	100·00	100·00	100·00	100·00
Sodium Chloride:	1·01	·63	3·08	·03
Plasticity, Ashley Figure ...	36	22	36	78
	%	%	%	%
Air Shrinkage from wet plastic	6·9	1·5	5·3	8·3
Burning Test:				
Linear shrinkage from air dry—				
1050°C.	·18	5·0	3·61	2·16
1150°C.	1·18	4·7	4·94	3·57
1250°C.	7·19	8·5	12·50	12·04
1350°C.	9·71	15·1	15·86	13·63

Lab. No.	2648	2741	1687	195
Porosity (water absorbed)—				
1050°C. ...	41·03	42·7	38·73	31·61
1150°C. ...	38·53	41·9	35·74	28·77
1250°C. ...	25·69	33·1	20·43	14·16
1350°C. ...	21·73	19·7	13·45	10·06
Colour:				
1050°C. ...	Pink	White	White	White
1150°C. ...	Creamy white	"	"	"
1250°C. ...	Grey white	"	Creamy white	Creamy white
1350°C. ...	Grey white	"	"	"
Incipient vitrification above—	1350°C.	1350°C.	1250°C.	1250°C.

ILMENITE.

The majority of the samples of ilmenite received were too low in titanium dioxide to be of any commercial value for the production of "titanium white" paint; those shown hereunder, however, may possibly find a market, if available in sufficient quantity:—

			per cent.
2740	Mullalyup,	Titanium dioxide ...	47·34
1239	Coolgardie	" " ...	45·08
521	Nannup	" " ...	50·75

ALUNITE.

Further samples of alunite received from Campion indicate considerable quantities of alunite in that locality. A series of samples obtained from a hole put down near the centre of the western or larger lake (Chandler Lake, M.C. 38H) gave the following results:—

Lab. No.	295	296	297	298
Depth ...	0–12in.	12in.–24in.	24in.–36in.	36in.–48in.
	%	%	%	%
Potash, K_2O } As Alunite	6·85	6·80	6·52	7·00
Soda, Na_2O } As Alunite	·26	·26	·25	·26
Sulphur trioxide, SO_3 (Water soluble)	·24	1·21	·45	·42
Sulphur trioxide, SO_3 (Soda soluble)	24·63	24·45	23·44	25·17
Alunite ...	63·58	63·12	60·51	64·97

An independent sample taken at a depth of 5 feet 6 inches gave:—

No. 1713. Alunite, 65·41%. Potash, K_2O, 7·05%

Two samples taken from the south edge of the lake assayed:—

No. ...	1712	279
Depth ...	2ft. 6in.	5ft. 0in.
	%	%
Potash, K_2O ...	6·09	6·19
Alunite ...	56·56	57·49

A number of samples selected from those collected by Mr. A. G. D. Esson, of the Geological Survey, who estimates the area covered by alunite to be 421 acres, contained, after the removal of the water-soluble salts:—

No. ...	25	26	27	28
	%	%	%	%
Potash, K_2O ...	6·74	6·79	7·00	6·88
Soda, Na_2O ...	·68	·91	·85	·82
Sulphur trioxide (Soda soluble)	23·70	23·44	25·46	24·58
Water soluble salts ...	6·99	7·79	5·90	5·44

Whilst a series taken from a hole put down 20 chains from the western edge and 40 chains from the southern edge to a depth of 10 feet 9 inches, gave, after washing out the soluble salts:—

No. ...	328	329	330	331	332
Depth ...	0-15½in.	15½in.–45½in.	45½in.–49½in.	49½in.–117½in.	117½in.–129in.
Thickness ...	15½in.	30in.	4in.	68in.	11½in.
	%	%	%	%	%
Potash, K^2O ...	6·96	7·35	7·62	6·59	...
Soda, Na^2O ...	·99	·95	1·45	·57	...
Sulphur trioxide (Soda soluble)	25·29	26·68	26·79	22·74	8·49
Water soluble salts...	8·02	5·32	5·80	5·36	5·60

This deposit is of considerable economic importance to the State as a potential source of potash for agricultural and other purposes. The potash present is in an insoluble form in the raw mineral, but is rendered water soluble by calcination at 800° C. At that temperature the whole of the water and three-quarters of the sulphur trioxide are driven off, leaving the potash in the form of potassium sulphate, which can be recovered from the calcine by leaching with water and evaporating the solution.

A conservative estimate, formed as a result of a personal knowledge of the deposit in conjunction with the above figures, of the quantity of material available in the larger lake over an area of 300 acres to a depth of 5 feet, averaging 6.5 per cent. of potash, is 3¼ million tons, carrying 211,250 tons of potash (K_2O).

MANGANESE ORES.

Manganese ores have been submitted from several new localities, whilst a number of new developments in already known localities have been examined.

Two samples from apparently different deposits in the vicinity of Tenindewa gave the following figures:—

No. ...	2748	3021
Locality ...	1m. N.W. of Tenindewa.	Between Eradu and Tenindewa.
	%	%
Manganese dioxide, MnO_2	77·56	80·64
Manganese oxide, MnO ...	·30	3·22
Ferric oxide, Fe_2O_3 ...	5·97	4·80
Silica, SiO_2 ...	5·97	4·28
Equal to—		
Metallic manganese, Mn	49·14	53·45
Metallic iron, Fe ...	4·18	3·36
	Pyrolusite limonite, quartz.	Psilomelane, manganite, limonite, quartz.

A series of samples consisting of psilomelane and limonite from the Robinson Ranges, 20 miles south of Peak Hill, contained:—

No. ...	1007	1008	1009	1010
	%	%	%	%
Manganese dioxide, MnO_2 ...	82·28	82·66	81·87	81·25
Manganese oxide, MnO ...	2·71	4·07	3·36	2·74
Ferric oxide, Fe_2O_3 ...	4·45	1·61	4·53	4·76
Silica, SiO_2 ...	·57	·37	·64	·57
Equal to—				
Metallic manganese, Mn ...	54·09	55·38	54·33	53·46
Metallic iron, Fe ...	3·11	1·13	3·17	3·32

A number of samples from the workings on Mineral Lease 321H, at Coppermine Creek, a few miles east of the Fitzgerald River, assayed:—

No.	3061	3062	3063	3096
	%	%	%	%
Manganese, dioxide, MnO_2 ...	79·89	81·70	89·57	64·05
Manganese oxide, MnO ...	2·40	·61	·30	2·81
Ferric oxide, Fe_2O_3 ...	·10	1·01	·29	8·69
Silica, SiO_2	2·47	8·49	2·21	10·28
Equal to—				
Metallic manganese, Mn ...	52·34	52·10	56·83	42·65
Metallic iron, Fe	·07	·71	·20	6·08

No.	3097	3098	3099	3100	3101
	%	%	%	%	%
Manganese dioxide, MnO_2	79·39	44·49	48·72	68·43	73·50
Manganese oxide, MnO	1·23	1·61	1·03	1·87	·56
Ferric oxide, Fe_2O_3	4·91	18·64	28·90	8·19	3·59
Silica, SiO_2	5·17	17·20	4·90	5·22	7·71
Equal to—					
Metallic manganese, Mn	51·12	29·36	31·58	44·69	46·88
Metallic iron, Fe ...	3·44	13·05	20·23	5·73	2·51

These samples were taken from the outcrops of several different lodes, some of which are rather heavily contaminated with iron or silica, others remarkably free from them.

MAGNESITE.

Magnesite suitable for the manufacture of "Sorel Cement" and refractories, also as a source of carbon dioxide, Epsom salts and light magnesia has been received from York and Southern Cross. Analyses of the material from these localities showed—

No.	2009	1935
Locality	Southern Cross*	York
	%	%
Magnesia, MgO	42·98	47·62
Lime, CaO	·70	*Nil*
Ferric oxide, Fe_2O_3 ...	1·28	·30
Ferrous oxide, FeO ...	·14	*Nil*
Silica, SiO_2	6·66	·58
Alumina, Al_2O_3	·64	·42
Titanium dioxide, TiO_2 ...	·06	...
Carbon dioxide, CO_2 ...	46·05	51·35
Water (combined) H_2O+	·73	·24
Water (hygroscopic) H_2O-	1·13	·26
	100·37	100·77
Analyst ...	J. N. A. Grace	

*Bulk sample of 50lbs. weight.

COAL.

Three samples of coal from No. 1 Calyx Bore at Eradu proved to be of low grade—

No.	3096	3097	3098
Depth	170ft. 0in.–180ft. 3in.	181ft. 6in.–183ft. 0in.	188ft. 4in.–190ft. 3in.
Proximate analysis—	%	%	%
Moisture	13·66	10·67	7·78
Volatile matter ...	36·41	31·32	26·65
Fixed carbon ...	24·74	30·69	29·00
Ash	25·19	27·32	36·57
	100·00	100·00	100·00
Calorific value—			
B.T.U.	...	5493	...
Colour of Ash ...	Light brown	Dirty white	Brownish white

Four samples taken by the Inspector of Mines, Collie, of the coal in the Griffin Mine, Collie, and forwarded to this office in hermetically sealed tins, gave the following figures on analysis:—

No.	1758	1942	2108	2109
Proximate Analysis—	%	%	%	%
Water lost on drying for 24 hours in air	1·96	1·86	1·19	2·49
Water lost at 105°C.	18·57	18·25	18·88	17·90
Volatile hydrocarbons	34·10	33·09	34·17	33·48
Mixed carbon ...	41·94	42·53	41·85	43·02
Ash	3·43	4·27	3·91	3·11
	100·00	100·00	100·00	100·00
Calorific Value, B.T.U.	10041	9985	...	...

1758—At a vertical depth of 60 feet at a point 450 feet along the dip of the seam. Thickness of seam 8 feet.
1942—At a further distance of 18 feet from 1758.
2108—At a further distance of 24 feet from 1758.
2109—Taken from main drive at a distance of 513 feet. Height of coal worked, 6 feet 3 inches.

PEAT.

Analysis of a number of peats from Bayswater and Peel Estate indicated their unsuitability in most cases as domestic fuels owing to their high ash content—

Bayswater:

No.	1132	1133	1134	1135	1136
Proximate Analysis:	%	%	%	%	%
Moisture	8·55	10·99	7·16	9·51	14·48
Volatile matter ...	24·91	42·71	24·42	41·04	18·44
Fixed carbon ...	6·22	17·87	7·03	2·20	6·22
Ash	60·32	28·43	61·39	27·25	60·86
	100·00	100·00	100·00	100·00	100·00
Nitrogen	0·71	1·23	0·61	1·16	0·56
Calorific Value B.T.U.	Not determined	6362	N.D.	N.D.	N.D.

The Ash was composed of fresh-water sponge spicules, diatoms, quartz and kaolin.

1132 Killarney Lake, Main and Beechboro Roads.
1133 Killarney Swamp, Langley Road.
1134 Between Drake Street and Foyle Road.
1135 North of intersection Belmont branch and main Railway line.
1136 Swan Lake.

Peel Estate:

No.	2852	2853	2854
Proximate Analysis—	%	%	%
Moisture	12·46	9·40	5·39
Volatile matter ...	48·48	35·16	49·85
Fixed carbon ...	12·24	3·52	·58
Ash	26·82	51·92	44·18
	100·00	100·00	100·00
Calorific Value B.T.U. ...	5844	Not deter'mnd	Not deter'mnd

2852 Block 713, Group 39.
2803 Block 170, Group 71.
2854 Blocks 609 and 610 Group 71.

ROOFING TILES—POROSITY OF.

The figures obtained for the porosity of a local roofing tile by three different methods are of sufficient interest to warrant inclusion in this report.

The methods used were as hereunder:—

(1) The tile was dried for some time in an oven at a temperature of approximately 100°C., allowed to cool and weighed. It was then placed in a container and water added slowly, and allowed to remain submerged for 24 hours without any heating. It was then taken out and the surplus surface water removed and again weighed. The increase equalled the water absorbed.

(2) The tile was weighed without any preliminary steam drying, and then slowly immersed in water, the water was then brought to the boiling point and allowed to cool slowly to room temperature. It was again brought to the boil and again allowed to cool. This treatment was repeated several times and finally the tile was cooled down to about 75°C. The surplus water was then removed from the surface and the tile weighed.

(3) A piece of tile was weighed, then coated with plasticene and the bulk density determined. The specific gravity of the plasticene and of the powdered tile was then determined. The method adopted for the latter was to crush the tile through a 30-mesh screen, keeping it as coarse as possible; it was then placed in a beaker with distilled water and boiled; then cooled down to room temperature. This process was repeated several times. The powder was finally washed into a specific gravity bottle and the density determined. Two determinations of the powdered tile were made.

The following figures were obtained by the various methods—

	1.	2.	3.
Water absorbed per cent. of tile ...	13·11	17·89	19·75

The first method only gives an approximate figure for the pores immediately adjacent to the surface and does not indicate the maximum amount of rain water which would be taken up by a tile exposed on a roof. The second gives the total for the pore space in open communication with the surface, whilst the third is that for the total pore space of the tile and represents a porosity by volume of 35 per cent.

SANDSTONE, DONNYBROOK.

An examination was made of three samples of sandstones available for use in the new Roman Catholic Cathedral. They were all felspathic sandstones, the grain consisting chiefly of quartz and some felspar, the binding material being kaolin, iron hydrates and secondary silica. The following figures were obtained:—

No.	Quarry.	Sp. Gr.	Lbs. per cub. ft.	Porosity.		Size of grain.				Relative coarseness.
				Water absorbed % by weight.	Pore space % by volume.	Over 30 mesh	Over 60 mesh.	Over 90 mesh.	Under 90 mesh.	
549	No. 3	1·97	123	13·34	26·28	*Nil*	·28	23·16	76·56	147
550	No. 3x	2·01	125	11·13	22·37	·08	4·64	35·00	60·28	189
610	Goldfields	2·15	134	5·32	11·44	*Nil*	13·92	46·24	39·14	248

—	Compressive Strength. Tons per sq. ft.		Analysis.				
	Dry	Wet	Total insoluble.	Soluble alumina.	Iron oxide.	Carbon dioxide.	Opal silica.
549	171	144	92·48	4·70	·43	*Nil*	·24
550	760	244	93·48	3·79	·73	·02	·21
610	736	515	96·70	1·90	·23	·02	·24

549 No. 3 Quarry.—A light cream coloured stone of very fine grain and homogeneous structure.

550 No. 3x Quarry.—A cream coloured stone with innumerable bright buff bands of fine grain.

610 Goldfields Quarry.—Almost pure white stone of rather fine grain and homogeneous structure.

ASBESTOS.

A number of samples of asbestos (chrysotile) ore from Greenhill Reward Lease, Sherlock, were graded, after crushing through rolls, on the "standard testing machine." This consists of a nest of four shaking screens in a receptacle; the first screen is ½in. mesh, the second ¼in., the third 1/10th inch, and the fourth 1/16th inch. The sample (2lbs. weight) is placed in the top box and shaken for two minutes at 300 revolutions per minute, after which the residue in each box is weighed, and the total weight accounted for and stated in their proportions of 16 parts. This method, following American practice, enables a buyer to definitely state the grade of fibre he requires, hence, if the purchaser asks for a material testing 1, 3, 4, 5, 3, he expects to be supplied with a material containing 1oz. of fibre on the first box, 3ozs. on the second, 4ozs. on the third, 5ozs. on the fourth, and 3ozs. of fines, including rock meal.

An analysis of the soft fibre from Greenhill Reward Lease gave the following figures:—

No. 2523.—SiO_2, 44·88%; Al_2O_3, nil: Fe_2O_3, 1·37: FeO, ·14: MnO, ·01: MgO, 39·06: CaO, nil: Na_2O, ·04: K_2O, ·10: H_2O–, 1·75: H_2O+, 12·55: TiO_2, nil: CO_2, ·38: P_2O_5, trace: NiO, trace; Sp. Gr. 2·518.

Analyst—J. N. A. Grace.

FELSPARS.

Microcline.—A sample of microcline felspar suitable for pottery purposes was received from seven miles north of Dundas. This deposit is adjacent to the Esperance railway, and may pay to export when that railway is completed.

Albite.—Analyses were made of samples of albite from the deposits worked at Jacob's Well and Ubini; the figures obtained are as follow:—

1573—Albite, Block 10395, Jacob's Well.
3110—Albite, Lewis' M.L., Ubini.

No.	1513	3110
	%	%
SiO_2 ...	68·19	67·87
Al_2O_3 ...	19·94	20·59
Fe_2O_3 ...	·11	·06
MnO ...	*Nil*	·09
MgO ...	*Nil*	·11
CaO ...	·24	·41
Na_2O ...	10·77	10·98
K_2O ...	·66	·14
H_2O– ...	·04	·02
H_2O+ ...	·20	·19
TiO_2 ...	*Nil*	*Nil*
CO_2 ...	...	*Nil*
P_2O_5 ...	...	*Nil*
Cl ...	...	*Nil*
	100·15	100·46
		Sp. Gr. 2·61
Analysts—	J. N. A. Grace	H. P. Rowledge

SILVER LEAD ORES.

A number of lead ores carrying appreciable amounts of silver were received from various localities during the year, the most important being:—

Coorara, Ashburton—
812.—Quartz, limonite, cerussite, anglesite, galena and malachite. Silver, 24ozs. 12dwts. per ton.
813.—Quartz, limonite, galena, cerussite, anglesite and malachite. Silver, 22ozs. 2 dwts. per ton.

70 miles South of Wyndham, near Ord River—
2452.—Quartz, kaolin, cerussite, galena, anglesite and malachite. Silver, 121 ozs. per ton: Gold, 4 dwts. per ton. Lead, 19 per cent.; Copper, 4 per cent.

North-East of Hall's Creek, near Panton River—
2857.—Limonite, galena, cerussite, quartz, anglesite and gold. Silver, 23 ozs. 8 dwts. per ton: Gold, 22 ozs. 14 dwts. per ton. Lead, 37·87 per cent. Zinc, trace.

Whilst a specimen weighing just under 2 ozs. from between Dixon Range and Doughboy Hill (East Kimberley) consisting mainly of galena with a little quartz, kaolin, limonite, malachite, anglesite and cerussite, assayed, Lead, 73 per cent. Silver, 167 ozs. per ton.

TYPE METAL.

A sample of a parcel of supposed "type metal" offered for sale to the Government was found to be totally deficient in tin, a constituent which is present in all type metals in quantities ranging from 3 to 26 per cent. according to their use, whilst the antimony was far below that specified for alloys for that purpose. An analysis gave the following results:—

Lead, 95·44%: Antimony, 4·14%: Copper, 0·15%: Iron, 0·02%: Manganese, *Nil*: Tin, *Nil*: Zinc, *Nil*: Bismuth, trace. Analyst—W. W. Saw.

MINE DUST.

A sample of dust collected from the rafters of the dry crushing mill at the South Kalgurli G.M., Boulder, where the occurrence of silicosis is extremely rare, probably due to the fact that the dust is, to a large extent, innocuous owing to the large proportion of it being made up of silicates and carbonates with free quartz only as a minor constituent. has been examined with the following results:—

Grading Test.—Refuse 200 mesh. Nil.
The material was graded by careful washing, yielding—

	%
Between 40 and 20 microns diameter ...	41
„ 20 „ 10 „ „ ...	36
Under 10 microns diameter	23
	100

Analysis of the dust under 10 microns diameter.

	Whole Fraction.	Portion Insoluble in HCl + HNO_3 and Na_2CO_3 solution.
	%	%
SiO_2	43·58	42·68
Al_2O_3	16·00	15·02
Fe_2O_3	3·61	
FeO	7·77	
MgO	3·78	
CaO	5·52	·10
Na_2O	1·96	
K_2O	3·56	
CO_2	9·93	
FeS_2	1·50	
Undetermined (H_2O, etc.)	2·79	*8·27
	100·00	66·07

*Undetermined (mainly alkalis)

Microscopic examination of a section prepared from a specimen of the average ore treated in the mill revealed the presence of sericite, ankerite, albite, quartz, pyrite, leucoxene, biotite, chlorite and zircon.

An approximate mineral composition for the dust under 10 microns calculated from the above figures is:—

	Per cent.
Sericite	30.10
Quartz	18.99
Albite	16.57
Carbonates (mainly ankerite)	22.55
Chlorite	9.88
Pyrite	1.40
Zoisite	0.41

The approximate proportion of free quartz in the dust of 10 microns diameter and under is, therefore, 19 per cent.

An analysis of a sample of average ore from this mine, forwarded by the manager in August, gave the following results:—

	%
SiO_2	53·58
Al_2O_3	9·12
Fe_2O_3	·88
FeO	5·08
MnO	·30
MgO	2·12
CaO	4·39
Na_2O	1·92
K_2O	1·96
H_2O—	·07
H_2O+	·34
TiO_2	1·68
CO_2	7·66
P_2O_5	·16
FeS_2	11·05
As	·02
	100·33

Analysts:—D. G. Murray and H. P. Rowledge.

MISCELLANEOUS MINERAL NOTES.

Mimetite (vanadiferous chloro-arsenate of lead).—A concentrate of heavy minerals obtained by panning off a gold ore from Baumgarten's Find consists mainly of vanadiferous mimetite with a little gold, galena, and cerussite.

A partial analysis gave:—

	%
Lead oxide, PbO	27·36
Arsenic oxide, As_2O_5	13·72
Vanadic oxide, V_2O_5	3·72
Phosphoric oxide, P_2O_5	·72

Vanadinite (chloro-vanadate of lead).—A sample of mineral concentrates obtained at the Peak Hill State Battery from a crushing of ore from Baumgarten's Reward Lease was found to consist largely of vanadinite associated with limonite, magnetite, barytes, pyrite, ilmenite, quartz, cerussite, anglesite, rutile, and zircon.

Trona (sodium carbonate).—An efflorescence from Hillside Station consisted of a mixture of halite, trona, and thenardite, with a little magnetite, quartz, and felspar; this is the first recorded occurrence of trona in this State.

Cobaltite (sulph-arsenide of cobalt).—A greenstone schist from the Hammersley district consisting of chlorite, cobaltite, pyrite, quartz, and graphite assayed: cobalt, 10.07 per cent.; nickel, .90 per cent.; arsenic, 14.98 per cent.; sulphur, 8.19 per cent.; gold, 1 dwt. per ton; silver, 18 dwts. 15 grs. per ton; platinum, nil.

Chromite (chromite of iron and magnesium).—Chromite containing chromic oxide, 43.16 per cent.; ferrous oxide, FeO, 24.65 per cent., was received from 3 miles west of No. 43 Stock Well, Murra Munda.

Sillimanite (aluminium silicate).—A number of rounded white pebbles, with a silky fibrous appearance, up to ⅜in. in size, found in the tin wash at Greenbushes proved on examination to be sillimanite.

Fergusonite (tantalate and niobate of yttrium, uranium, etc.).—A sample of heavy minerals from Cooglegong consisted mainly of fergusonite, ranging in specific gravity from 6.0 to 6.8, associated with a fair quantity of cassiterite and a few pieces of columbite, monazite, and ilmenite. The approximate quantities of fergusonite and cassiterite were 89 per cent. and 10 per cent., respectively.

Tantalite (tantalate of iron).—Tantalite carrying about 70 per cent. tantalic oxide associated with quartz and albite and a little tin in a pegmatite from seven miles north of Dundas was received during the year.

During the year I spent a few days with Dr. Simpson in the vicinity of the York-Quairading railway line, where much information was gained in regard to the occurrence of minerals in that locality. Short visits to localities of mineral interest are invaluable to a mineralogist in that it assists materially the recognition of mineral samples sent in for determination, as it is most difficult to visualise the possibilities from a hand specimen, whilst at the same time it is possible to render assistance and advice to those in search of economic minerals.

The Government generously gave permission for the professional officers to attend the meetings of the Australasian Association for the Advancement of Science held in Perth during the year, which was greatly appreciated by the staff of this section, who have asked me to express their thanks, as it afforded them the opportunity of meeting and interchanging ideas with members of kindred professions from the other States of the Commonwealth.

I wish to place on record the loyal assistance given by all members of the staff of this section and my appreciation of the efforts made to deal with the work expeditiously. At the same time, it is pleasing to note the interest shown by them in their profession, the offices of presidents and secretaries of the two societies directly connected with the science of chemistry in the State being filled by members of the staff of the mineral section.

H. BOWLEY, A.A.C.I.,
Senior Mineralogist and Chemist.

SECTION III.—AGRICULTURE, WATER AND SEWERAGE.

(By A. J. Hoare, A.A.C.I.)

During the year 808 samples were received for examination by this section, the total number of estimations made being 4,300.

Owing to several of the officers being away on sick leave and one resigning, the staff of the section was at full strength for less than three months during the year, and the services of Mr. J. C. Hood, of the Food and Drug Section, were made available for about three months, so that the work could be carried out without undue delay.

Mr. Allsop, B.Sc., A.A.C.I., was appointed last November to fill the vacancy on the staff caused by the resignation of Mr. Orton, who received a more lucrative position at Melbourne in the Commonwealth service.

Owing to the large amount of routine work it was not found possible to carry on with the analyses of typical soils taken by officers of the Agricultural Department, as in the previous year.

The following list shows the sources of the samples dealt with:—

Agricultural Department	256
Metropolitan Water Supply and Sewerage	49
Department of Works and Labour	48
Lands Department	27
Health Department	3
Mines Department	7
Department of the North-West	4
State Saw Mills	1
Geological Survey	1
Royal Agricultural Society	32
Perth Public Hospital	1
Commonwealth Meteorological Bureau	135
State Mining Engineer	5
Council of Industrial Development	2
Controller of Group Settlements	3
Chemical Laboratory	57
Public Pay	165
Public Free	12
	808

Classified as—

Soils	119
Fertilisers	114
Wheats	49
Flours	14
Brans and Pollards	10
Limes and Limestone	10
Fodders	4
Fungicides and Insecticides	8
Gypsum	6
Apples	19
Bones	2
Waters	422
Sewage	27
Miscellaneous	4
	808

SOILS.

The number of samples received this year shows an increase of 71 over last year, the majority coming from the Agricultural Department. At the request of the Minister for Lands, 20 soil samples were taken from different parts of Herdsman Lake by officers of this section. These soils contained a doubtful amount of salt and required further leaching out of the soluble salts by the winter rains before they could be used for general cultivation, although there would probably be many crops or plants that would tolerate the amount of salts present in the soil.

Two soils were received from North Ejanding, No. 1 being a sand plain soil on which wheat forms a head with purple flag; the heads then turn purple and no grain is formed. No. 2 is a dark fine soil from the same property and occurs in patches up to a square chain in area. Water will not penetrate this soil, and even where the water stands on it in puddles it will not soak in more than ½in. Nothing germinates as the soil is too dry. Applications of stable manure have produced normal crops.

Lab. Nos. ...	2470 No. 1 Sand-plain	2471 No. 2 Dark fine soil.
	%	%
Roots	0·5	*Nil*
Stones	1·0	2·0
Fine soil	98·5	98·0
Moisture	·38	1·83
Colour (wet)	Pale brown	Dark brown
Nature	Sand	Sandy loam
Analyses of steam dried fine soil—		
	%	%
Apparent specific gravity	1·48	1·28
Loss on ignition	3·62	11·97
Total water soluble salts after gentle ignition	·031	·337
Sodium chloride—		
Calculated from chlorine	·015	·326
pH of 10% suspension	6·6	4·6
Reaction	neutral	weakly acid
Organic carbon	·676	3·120
Nitrogen	·045	·112
Hydrochloric acid soluble—		
Lime as carbonate	·036	...
Lime as sulphate, etc.	·018	·066
Phosphoric oxide, P_2O_5	·023	·068
Potash, K_2O	·019	·075
Mechanical analyses of steam dried soil—		
	%	%
Sand grade	67·8	40·2
Silt grade	24·0	36·9
Clay grade	8·2	22·9
Water holding capacity—		
Water absorbed by 100 parts of soil by weight	30·0	44·9
Percentage of water in saturated soil	23·0	31·0
Porosity—		
Percentage of water by volume in saturated soil	38·4	51·5

Analysts—B. L. Southern and F. F. Allsop.

It will be noticed that No. 2 soil is acid, and contains an excessive amount of salt. No fats or waxes could be detected in the soil or any other cause for the alleged failure of water to penetrate it.

Samples of fluffy soil were received from Corrigin, representing the first 5in. of two patches where malting occurred in the June planting. These soils were originally timbered with mallee and a small amount of salmon gum and morrell. They are remarkably dry and loose, and the rain appears unable to penetrate—

Lab. Nos. ...	2288	2289
Marks ...	No. 1	No. 2
	%	%
Roots ...	*Nil*	*Nil*
Stones	27	39
Fine soil	73	61
pH of 10 % suspension	5·0	5·1
Reaction	weekly acid	weekly acid
	%	%
Moisture	3·35	2·55
Sodium chloride (calculated from chlorine)	0·577	0·453
Loss on ignition	11·58	11·49
Total lime, CaO	·092	·099

Mechanical analyses—

	%	%
Sand grade	38·7	44·8
Silt grade	36·9	36·3
Clay grade	24·4	18·9
Analyst ...	F. F. Allsop.	

Both of these soils are acid and contain an excessive amount of salt, which would probably account for the malting trouble. As in the preceding case, no reason could be detected for the failure of the soil to absorb water.

FERTILISERS.

There was a slight increase in the number of artificial manures received this year, the majority being official samples taken by the Inspector of Fertilisers. With the exception of about 13, these complied with the guaranteed analyses as registered at the Agricultural Department. The following table shows some of the deficiencies:—

Lab. No.	Fertiliser.	Guaranteed analyses per cent.		Analysis of sample per cent.
482	Bonedust ...	Nitrogen	3·0	2·18
		Total P_2O_5	18·3	11·87
1270	Bonedust ...	Total P_2O_5	18·3	14·75
1476	Basic slag ...	Total P_2O_5	17·0	15·48
	Sieving test :			
	To pass 100 mesh sieve	80 at least		78·44 passed
	To stay on 60 mesh sieve	5 at most		7·27 retained

The majority of the samples that came below the guaranteed analyses were of local manufacture.

A sample of Moroccan phosphate taken from a shipment that arrived at Fremantle was sent in by the Department of Agriculture—

Lab. No. 1944.
Total phosphoric anhydride (P_2O_5) = 33·30 %, calculated to Tricalcium phosphate, $Ca_3(PO_4)_2$ = 72·73 %.
Analyst: B. L. Southern.

FUNGICIDES AND INSECTICIDES.

Amongst the samples received six were in the powder form for dusting trees and vines. They contained arsenate of lead, basic copper carbonate, sulphur, nicotine, and an inert powder. Some contained a single active ingredient and others were mixtures of the various active substances.

APPLES.

In the early part of the year 19 apples were received to determine the amount of arsenic present in the skin and calyxes. This action was necessary as a limit of not more than 1.43 parts per million, equivalent to 1/100th grain per lb. of arsenious oxide As_2O_3, had been fixed by the Ministry of Health, London, for all apples imported.

The samples received were of different varieties and had been sprayed several times during the year. The arsenious oxide found ranged from a trace to 0.18 parts per million for the whole fruit, and a trace to 1.1 parts per million for the skin and calyxes.

It being suggested that wiping the fruit would remove the arsenic, a further batch of four varieties that had been sprayed five times were received. These were tested with the following results:—

	Unwiped. As_2O_3	Wiped. As_2O_3
	Parts per million.	
Skin and calyxes ...	4·0 to 8·7	1·1 to 2·9
Whole fruit ...	0·6 to 1·3	0·18 to 0·47

Analys

ANIMAL BONES.

Two portions of bones, one (A) from a healthy cow reared on cultivated land, and the other (B) from an animal reared on bush country, were received from the Stock Department to ascertain if there was any difference in their composition. The results obtained were—

Lab. Nos.	483	484
Marks	A	B
	%	%
Total mineral matter ...	57·60	57·71
Phosphoric anhydride, P_2O_5	23·42	22·55
Calcium oxide, CaO ...	30·95	30·95

Analyst: J. C. Hood.

WATERS.

The samples received show an increase of about 150 over the previous year. As in the past of about 150 over the previous year. As in the past the majority are for stock and irrigation purposes. In some cases these are too saline and unfit for stock or irrigation, the extreme limits for cyclic salts being taken in the Department as 450 grains per gallon for horses, 700 grains for cattle, and 900 grains for sheep. For irrigation 150 grains per gallon of dissolved salts has usually been looked upon as the extreme limit, except in a climate where the rainfall is very high and the ground exceptionally well drained.

A fair amount of work has been carried out for the Advisory Committee on metropolitan water supplies, such as hygienic and complete mineral analyses, the hydrogen iron concentration by the colorimetric method of the water from the pipe head dams, mains and service taps, also the amount of free chlorine remaining in the water after treatment at the dams.

The quarterly hygienic analyses of the waters supplied for metropolitan use are still being carried out, also the monthly chemical analysis of one of the supplies in rotation. The chemical analyses of the waters supplied to the metropolitan areas show that they are good potable waters. A monthly hygienic analysis is also made of the water from the Mundaring reservoir and the Kalgoorlie reticulation.

Samples of rain water to be tested for salinity have shown an increase of 65 over last year. These are still obtained from Condon, Mundiwindi, Wiluna, Esperance and Perth. The highest figure for chlorine this year comes from Perth, 93.25 parts per million. These samples are in connection with a Commonwealth rain survey for salinity.

Samples were also received from the Department of Works and Labour of country town supplies, one being the Day Dawn water supply, Nallan Pump Station. This was a poor water for a town supply, the most objectionable features being the excessive amounts of nitrates and magnesium salts present. The Geraldton supply from the Wicherina reservoir proved to be a good potable water from a purely mineral point of view.

An artesian bore struck a water-bearing bed at a depth of about 1,460ft. at Broome, yielding 120,000 gallons a day, with a temperature of 103½°F., and having the following composition:—

Lab. No. 3217.
Broome No. 4 Bore, 1,460ft.
Parts per million.

Hygienic analysis:	
Free ammonia	0.01
Albuminoid ammonia	·05
Nitrogen as nitrites	nil
Nitrogen as nitrates	·488
Oxygen absorbed in 4 hours ..	·52

	Parts per million.	Grains per gallon.
Mineral analysis:		
Calcium carbonate	120	8.40
Calcium sulphate	139	9.73
Magnesium sulphate ..	4	.28
Magnesium chloride ..	157	10.99
Potassium chloride ..	65	4.55
Sodium chloride	1,196	83.72
Sodium nitrate	3	.21
Silica	3	.21
Iron and aluminium oxides	3	.21
	1,690	118.30
Total hardness	391	27.4
Total magnesium	41	2.9

Reaction faintly alkaline: pH, 8.0.

Analyst—J. Pericles.

An interesting water was received from Campion taken from a few inches below the surface of a large alunite lake (salina):—

	Lab. No. 1280. Parts per million.	Grains per gallon.
Aluminium sulphate	139	9.73
Calcium sulphate	4,137	289.59
Calcium chloride	205	14.35
Magnesium chloride	1,958	137.06
Sodium nitrate	3	.21
Sodium chloride	16,674	1,167.18
Potassium chloride	77	5.39
Silica	30	2.10
Iron	nil	nil
	23,223	1,625.61
Reaction, p H 4·0 equal to H_2SO_4	**5**	**·35**

Analyst—E. C. Orton.

An analysis of the water issuing from the old bore at Coffee Point was made and compared with one done on the water from the thermal baths at the Zoo. Both samples were taken at about the same time—

Lab. Nos.	1454	1651
Marks	Coffee Pt. bore	Zoo bore
Hygienic analyses:	Part per million.	
Free ammonia	0·38	·68
Albuminoid ammonia ...	·03	0·05
Nitrogen as nitrites ...	*Nil*	faint trace
Nitrogen as nitrates ...	·17	·13
Oxygen absorbed in 4 hrs.	·42	·33
Hydrogen sulphide ...	trace	*Nil*

	Parts per million	Grains per gallon	Parts per million	Grains per gallon
Mineral analyses:				
Iron carbonate ...	trace	trace	1	0·07
Calcium carbonate	47	3·29	47	3·29
Magnesium carbonate	28	1·96	35	2·45
Sodium carbonate	94	6·58	85	5·95
Potassium sulphate	2	·14	13	·91
Sodium sulphate ...	49	3·43	67	4·69
Sodium nitrite ...	*Nil*	*Nil*	faint tr.	faint tr.
Sodium nitrate ...	1	·07	1	·07
Sodium chloride ...	654	45·78	695	48·65
Silica	*Nil*	*Nil*	*Nil*	*Nil*
Total, salts ...	875	61·25	944	66·08
Extra carbon dioxide ...	56	3·92	89	6·23
Spectroscopic traces of—	Lithium		Lithium and barium	

Radioactivity:		
Emanation equal to grms. of radium per litre ...	$2 \cdot 69 \times 10^{-10}$	$3 \cdot 45 \times 10^{-10}$
pH on issuing	7·8	7·8
pH on standing ...	8·2	8·2
Reaction	alkaline	alkaline
Temperature	93·2°F	101·8°F

Analysts: J. Pericles and E. C. Orton.

Both waters are very similar, being warm muriated alkaline waters of low mineral content and comparatively moderate radioactivity. They are eminently suited for drinking and bathing. Both waters resemble those of the Ems Spa in Prussia and the Royat Spa in cent al France.

SEWAGE.

The number of samples received from the Perth and Fremantle treatment works shows a further decrease of 11 when compared with last year. As was suggested in last year's report, sewage treatment works should be under a more rigid chemical control, and not as at present a few samples taken every few months for testing.

CEREALS.

Flour.—Only 14 samples of flour were received for testing as to strength, gluten, etc. Of these 12 were from country flour mills, the remaining two coming from the Agricultural Department.

Bran and Pollard.—Owing to the complaints received by the Agricultural Department as to the inferior composition of some of the so-called brans and pollards on the market, several analyses were made and, as a result, a tentative regulation fixing a standard for the moisture, fibre and ash has been put into force by the Agricultural Department early this year. This should tend to improve the quality of the mill offals.

Wheat.—The Agricultural Department submitted 14 samples from Chapman and Merredin stud plots and from Kalgoorlie, which were for general milling test. Three samples were also received for a report on the effect produced upon the bushel weight by varying the percentage of water. Three varieties were submitted and the moisture content varied from 8 per cent. to 18 per cent. It was found that the bushel weight decreased in each case as the moisture content increased.

Royal Agricultural Society Wheat Exhibits.—The entries this year totalled 32 and as in previous years, after a preliminary judging on the general appearance and bushel weight, eight were rejected. The balance were milled in the experimental mill and prizes were finally awarded according to points assigned for the milling characteristics. An alteration in the manner of classing the wheats was made by the Society this year. In previous years wheats of different varieties competed against each other, but this year only wheats of the same variety competed against each other. This is a much fairer way to conduct the competition. The champion prize was awarded to Exhibit No. 24, a fine sample of Carrabin grown at Three Springs. In the chemical analysis the wet and dry gluten test was replaced by the crude protein estimations, the strength and protein figures were returned calculated on a 13.5 per cent. moisture basis. The milling investigations are usually carried out by Mr. R. G. Lapsley, B.Sc. (Agr.), A.A.C.I., but owing to his absence from the Department on sick leave, the major portion of the work on the Royal Show samples was carried out by Mr. B. L. Southern, A.A.C.I., who was also appointed to act as judge in conjunction with Mr. G. L. Sutton, Director of Agriculture, and Mr. E. W. Wilson, miller to the Peerless Roller Flour Milling Co. A list of prize winners and tabulated results are given below.

A. J. HOARE, A.A.C.I.,
Supervising Chemist Agriculture, Water Supply and Sewerage.

WHEATS MILLED FOR THE ROYAL AGRICULTURAL SHOW, 1926.

Lab. No.	Zone.	Class.	Variety.	No.	Grain. Moisture.	Grain. Protein.	Grain. Bushel weight.	Percentage of Products. Flour.	Percentage of Products. Bran.	Percentage of Products. Pollard.	Yield Marks.	Flour Analysis. Moisture.	Flour Analysis. Protein.	Flour Analysis. Protein marks.	Flour Analysis. Strength percentage absorption.	Flour Analysis. Marks.	Flour Analysis. Colour marks.	Flour Analysis. Total marks.	Pounds of Bread per ton of wheat.	Prize.	Exhibitor.
					%	% *	lbs.					%	% *		*						
2014	...	2	Nabawa ...	6	11·7	7·50	64·25	71·1	19·8	9·1	29·75	14·5	7·2	3·00	55·4	30·50	3	66·25	2,200	2nd prize	Davidson & Wood.
2020	...	...	Nabawa ...	12	11·7	9·60	65·25	70·5	20·6	8·9	28·25	14·4	8·7	3·25	54·3	29·25	3	63·75	2,166		
2035	...	...	Nabawa ...	27	11·7	11·40	64·25	71·5	19·8	8·7	30·75	14·5	10·1	3·75	54·6	29·50	3	67·00	2,200	1st prize	Harling, H. H. and H. G.
2040	...	...	Nabawa ...	32	12·2	9·50	64·25	69·7	21·1	9·2	26·25	14·9	8·6	3·25	54·9	30·00	4	63·50	2,150		
2021	...	3	Gluyas ...	13	11·3	9·00	65·00	70·2	20·3	9·5	27·50	14·6	8·2	3·25	54·2	29·25	4	64·00	2,156		
2036	...	...	Gluyas ...	28	11·7	11·20	65·50	70·2	20·3	9·5	27·50	14·6	10·1	3·75	54·7	29·75	4	65·00	2,163	1st prize	Harling, H. H. and H. G.
2038	...	...	Gluyas ...	30	11·9	9·20	64·50	70·2	20·5	9·3	27·50	14·9	8·3	3·25	54·6	29·50	4	64·25	2,160	2nd prize	Hopwood, B. W. G.
2018	1 ...	4	Merredin ...	10	12·1	10·30	66·00	70·0	20·9	9·1	27·00	15·0	9·2	3·50	52·9	28·00	4	62·50	2,131	2nd prize	Hammond, J. Deane.
2039	...	...	Merredin ...	31	11·8	9·10	65·00	70·5	20·2	9·3	28·25	14·2	8·3	3·25	53·4	28·50	4	64·00	2,154	1st prize	Hopwood, B. W. G.
2016	...	5	Florence ...	8	10·8	12·60	62·25	71·4	20·8	7·8	30·50	14·6	11·7	4·00	62·0	37·00	4	75·50	2,304		
2017	...	...	Carrabin ...	9	11·0	12·00	65·00	70·9	20·0	9·1	29·25	14·0	11·3	4·00	63·4	38·25	5	76·50	2,308	2nd prize	Hammond, J. Deane.
2019	...	...	Comeback ...	11	11·1	12·70	66·75	71·0	20·0	9·0	29·50	14·2	12·1	4·25	64·3	39·25	4	77·00	2,324	1st prize	do.
2022	...	6	Nabawa ...	14	11·0	10·80	64·00	69·2	21·5	9·3	25·00	14·0	10·1	3·75	55·3	30·25	5	64·00	2,140		
3031	...	...	Nabawa ...	23	11·1	10·50	64·75	70·3	20·8	8·9	27·75	14·3	9·6	3·50	55·3	30·25	5	66·50	2,174	2nd prize	Hebiton, J. K.
2037	...	...	Nabawa ...	29	11·2	11·30	64·00	69·8	21·3	8·9	26·50	13·8	10·1	3·75	56·4	31·50	5	66·75	2,175	1st prize	McLean, John.
2105	...	...	Nabawa ...	33	11·6	10·70	63·50	69·7	21·0	9·3	26·25	13·7	10·0	3·75	54·7	29·75	5	64·75	2,147		
2010	...	7	Gresley ...	1	11·6	11·50	66·50	68·9	22·3	8·8	24·25	14·2	10·3	3·75	53·4	28·50	5	61·50	2,105	2nd prize	Foat, F.
2023	...	...	Gresley ...	15	13·7	10·40	66·00	69·2	25·4	5·4	25·00	14·0	8·8	3·25	53·8	28·75	5	62·00	2,137	1st prize	Ackland, J. H.
2030	...	...	Gresley ...	22	12·1	12·90	65·25	66·4	26·3	7·3	18·00	13·8	11·1	4·00	56·7	31·75	5	58·75	1,982		
2024	2 ...	8	Gluyas ...	16	11·0	11·40	64·00	67·1	23·5	9·4	19·75	13·9	9·8	3·50	51·7	26·75	5	55·00	2,027	1st prize	Ackland, J. H.
2034	...	...	Gluyas ...	26	13·6	11·70	65·00	67·2	26·4	6·4	20·00	13·2	10·2	3·75	53·1	28·00	5	56·75	2,049		(Not Gluyas Early).
2026	...	9	Florence ...	18	11·7	10·30	66·00	71·4	20·3	8·3	30·50	13·0	9·8	3·50	60·9	36·00	5	75·00	2,288		
2032	...	...	Carrabin ...	24	11·9	12·20	66·75	75·2	19·1	5·7	40·00	12·5	11·3	4·00	63·3	38·25	5	87·25	2,445	1st prize & Champion	Hebiton, J. K.
2033	...	...	Comeback ...	25	11·9	12·90	67·00	73·0	19·1	7·9	35·50	14·0	11·8	4·00	63·4	38·25	4	82·75	2,375	2nd prize	do.
	3	Classes 10, 11 and 12.		No entries																	

* Calculated on a uniform 13·5 per cent. moisture basis.

DIVISION VIII.

REPORT OF THE CHIEF INSPECTOR OF EXPLOSIVES FOR THE YEAR 1926.

The Under Secretary for Mines.

I have the honour to submit for the information of the Hon. the Minister for Mines, in compliance with Section 45 of "The Explosives Act, 1895," a report on the working of the Department during the year 1926.

The following table shows the quantity of explosives imported into the State during the year:—

TABLE I.

Importations of Explosives into Western Australia during 1926.

	Quantity. lbs.
Gelignite	586,000
Gelatine Dynamite	380,000
Blasting Gelatine	103,000
Permitted Explosives	35,000
Blasting Powder	47,500
Pellet Powder	45,000
Fuse (coils)	204,000
Detonators (No.)	2,360,000

Table No. II. gives particulars with regard to the quantities of the different classes of explosives imported into the State during the past five years:—

TABLE II.

Comparison of Explosives imported into Western Australia during the past five years.

——	1922.	1923.	1924.	1925.	1926.
	lbs	lbs.	lbs.	lbs.	lbs.
Gelignite	520,000	997,000	1,439,000	893,650	586,000
Gelatine Dynamite	110,200	165,000	282,000	234,500	380,000
Blasting Gelatine	60,850	30,000	91,250	84,350	103,000
Permitted Explosives	65,000	2,500	50,000	7,500	35,000
Powder, Blasting	95,000	180,000	148,750	730,000	92,500
Powder, Sporting	700	...	...	...	...
Fuse (Coils)	213,600	368,640	365,400	335,880	204,000
Detonators (No.)	...	1,150,000	3,000,000	2,756,000	2,360,000

With regard to one shipment of explosives which arrived during the year under review it was found on opening the ship's magazine that the cases had shifted during the voyage, this being due to the space in the magazine being greatly in excess of that required to hold the consignment. This matter was taken up with H.M. Chief Inspector of Explosives at the Home Office, and as a result of representations made it is hoped that there will not be a recurrence of unsatisfactory storage of explosives on ships conveying consignments from England to Australia.

With the exception of the above, shipments were landed at Fremantle in a satisfactory condition.

On subjecting the samples taken from the shipments to the official tests all the consignments passed the tests with the exception of a batch of blasting gelatine from a shipment ex "Limerick," which was found to contain a number of cartridges from which the nitro-glycerine had exuded to such an extent that it was found in the folds of the wrappers, and in some cases had penetrated to the outside of the cartridge wrappers.

This batch was overhauled and the free nitro-glycerine removed by absorbing with Kiesulguhr, after which it was allowed to go into consumption, and no complaints were received in the Department concerning it.

The following licenses have been issued during the year under review for the storage and sale of explosives:—

TABLE III.

Licenses issued during 1926.

For Magazines on Government Reserves ...	42
For Magazines used by Government Departments	33
For Magazines erected on private property ...	49
Store Licenses for the Sale of Explosives—	
Mode (a)	91
Mode (b)	3
For Sale of Fireworks only	268
Licenses for the preparation and use of Explosives of Class IV.—Chlorate Mixtures ...	1
Licenses for the Importation of Explosives into the State of Western Australia ...	2

The following table shows the distribution and the relative percentage of explosives of the nitro compound class in the different industries where the explosives are used:—

TABLE IV.

Distribution and Consumption of Explosives during 1926.

——	lbs.	Percentage of Total.
Gold Mining	*800,100	*61·9
Agricultural and Land Clearing ...	369,400	28·5
Government Departments, including Railways, Public Works and Water Supplies	24,000	1·8
Quarrying	51,150	4·9
Lead Mining	17,250	1·3
Coal Mining	29,100	2·2
Tin Mining	1,500	·11

* Nitro Compounds only.

For comparatinve purposes the figures are given for the years 1925 and 1926 in Table No. V.:—

TABLE V.

Distribution and Consumption of Explosives.

——	1925.		1926.	
	lbs.	Percentage of Total.	lbs.	Percentage of Total.
Gold Mining	804,900	54·3	800,100	61·9
Agricultural and Land Clearing	529,650	35·7	369,400	28·5
Government Departments, including Railways, Public Works, and Water Supplies	44,000	2·9	24,000	1·8
Quarrying	52,100	3·5	51,150	4·9
Lead Mining	24,400	1·6	17,250	1·3
Copper Mining	700	·05	...	...
Coal Mining	24,200	1·6	29,100	2·2
Tin Mining	1,300	0·09	1,500	·11

Regular inspections have been made of licensed premises and magazines throughout the State during the year, the following centres having been visited: Perth and Fremantle (including all the Metropolitan Area), Northam, Merredin, Narembeen, Westonia, Southern Cross, Coolgardie, Norseman, Kalgoorlie, Menzies, Kookynie, Laverton, Leonora, Lawlers, Wiluna, Meekatharra, Nannine, Cue, Magnet, Sandstone, Youanmi, Yalgoo, Geraldton, Mullewa, Northampton, Moora, Bunbury, Busselton, Margaret River, Augusta, Greenbushes, Bridgetown, Donnybrook, Manjimup, Pemberton, York, Albany, Wagin, Dumbleyung, Lake Grace, Narrogin, Gnowangerup, Katanning, and Williams.

As a result of these visits 190 inspections were made and licensed premises generally were found to be maintained in accordance with the terms of the license and the Regulations made under the Act. In a few instances it was found necessary to call the attention of the licensees to minor defects and order repairs to magazines.

It is pleasing to note that it was not found necessary to take legal proceedings against any of the licensees for breaches of the Act and Regulations, but the following explosives were found to be unfit for consumption and were accordingly destroyed:—

TABLE VI.

Destruction of Explosives during 1926.

Date, 1926.	Place.	Kind and Quantity.	Remarks.
March 23rd ...	Busselton	5 lbs. Gelignite	Owing to exudation.
May 15th ...	Albany	100 Detonators	Owing to moisture.
May 19th ...	Dumbleyung	1 lb. Gelignite	Chemical Deterioration.
July 9th	Leonora	5 lbs. Gelignite	do. do.
July 10th ...	Perth	10 lbs. Gelignite	do. do.
July 10th ...	do.	100 Detonators	Owing to moisture.
July 19th ...	Fremantle	50 lbs. Gelignite	Chemical deterioration.
July 21st	Perth	100 lbs. Blasting Powder ...	Owing to moisture.
October 1st ...	Capel	40 lbs. Gelignite	do. do.
October 1st ...	do.	3 lbs. Gelignite	Chemical deterioration.
October 14th ...	Geraldton	300 lbs. Monobel Powder	Owing to moisture.
October 14th ...	do.	1 lb. Gelignite	Chemical deterioration.
October 21st ...	Cottesloe	6 plugs Gelignite	do. do.

The following tests and analyses were made with a view to ascertaining whether the explosives imported into this State comply with the requirements of the Act:—

Heat tests	448
Complete analyses	76
Fuse tests	1,423
Velocity of detonation	26
A.D.C. tests	6
Miscellaneous tests	84

No applications were received during the year to have placed on the authorised list of explosives any new explosives for importation or manufacture within the State.

During the year eight new reserves for explosives were declared, making the total number of reserves for explosives vested in the Hon. the Minister for Mines 59, with a total area of 3,294 acres.

The total revenue received by the Department during the year was £1,363, which is a very considerable decrease compared with that received by the Department during the previous year.

I desire to acknowledge the courtesy of the Commissioner of Police and his officers for the assistance rendered the Department during the year.

T. N. KIRTON,
Chief Inspector of Explosives.

27th April, 1927.

WESTERN AUSTRALIA.

DEPARTMENT OF MINES.

MINING STATISTICS,

1926.

U 6

MINING STATISTICS TO 31st DECEMBER, 1926.

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PART III.—ALL MINES.

APPENDIX.

EXPLANATIONS OF SIGNS AND ABBREVIATIONS.

Gf. Goldfield.
Mf. Mineral field.
D. District.
G.M.L. Gold Mining Lease.
M.L. Mineral Lease.
Loc. Location.
L.C. Lode Claim.
Q.C. Quartz Claim.
R.C. Reward Claim.
M.C. Mineral Claim.
M.R.C. Mineral Reward Claim
M.A. Machinery Area.
Mach. L. Machinery Lease.
P.A. Prospecting Area.
T.A. Tailings Area.
T.L. Tailings Lease.
W.R. Water Right.
S.L. Special License.
N.E.I. Not elsewhere included.

WESTERN AUSTRALIA.

SUMMARY OF MINERAL PRODUCTION.

GOLD AND OTHER MINERALS PRODUCED DURING 1926, AND THE ESTIMATED VALUE THEREOF, TOGETHER WITH A COMPARISON FOR PREVIOUS YEARS, AND THE TOTAL PRODUCTION TO DATE.

Description of Mineral.	1926.		1925.		1924.		1923.		Previously to 1923.		Total to date.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£		£		£		£
1. Antimony ... ... (Exported) statute tons	4½	85	...	...	...	...	...	...	89	1,743	93	1,828
2. Arsenical Ore ... ... (Exported) do.	*	347	*	1,045	*	777	*	686	3,594	9,350	...	12,205
3. Asbestos ... ... (Reported) do.	105	2,728	51	1,641	74	2,206	115	4,032	669	31,664	1,014	42,271
4. Bismuth ... ... (Exported) do.	...	...	...	...	...	...	...	...	11	844	11	844
5. Coal ... ... (Reported) do.	474,819	394,400	437,461	363,203	421,864	363,255	420,714	368,949	5,978,940	3,462,929	7,733,798	4,952,736
6. Copper { Ore ... ... (Exported) do.	...	...	1,201	18,200	2,795	40,676	3,394	48,907	72,734	879,236	80,124	987,019
Copper { Ingot and Matte (Exported) do.	1	84	...	...	...	...	1,057	16,193	12,357	801,786	13,415	818,063
7. Gadolinite ... ... (Reported) do.	...	...	...	...	...	...	...	...	1	112	1	112
8. Gold ... (Exported and Minted) fine ounces	437,343	1,857,716	441,252	1,874,320	485,035	2,060,298	504,512	2,143,028	34,840,368	147,992,477	36,708,510	155,927,839
9. Graphite ... ... (Exported) statute tons	...	...	...	...	...	...	...	...	*	696	...	696
10. Gypsum ... ... (Reported) do.	3,918	5,618	3,060	4,118	4,237	5,278	...	...	728	638	11,942	15,652
11. Ironstone ... ... (Reported) do.	...	...	...	...	...	...	...	...	57,830	36,695	57,830	36,695
12. Lead (Ore and Concentrates) (Exported) do.	...	...	...	...	...	...	...	...	44,032	508,748	44,032	508,748
13. Lead and Silver Lead (Ore and Concentrates) (Exported) do.	4,162	76,741	4,664	103,300	4,854	83,095	3,172	43,416	8,230	151,221	25,082	457,773
14. Lead (Pig) ... ... (Exported) do.	...	...	...	...	...	...	20	609	23,032	628,347	23,052	628,956
15. Limestone ... ... (Reported) do.	...	...	...	...	...	...	...	...	93,706	18,290	93,706	18,290
16. Magnesite ... ... (Exported) do.	...	...	...	...	...	...	2	8	804	1,518	806	1,526
17. Manganese ... ... (Exported) do.	82	503	...	...	20	160	22	200	18	152	142	1,015
18. Mica ... ... (Exported) do.	4	† 8,328	...	...	...	...	...	...	*	1,357	...	9,685
19. Molybdenite ... ... (Exported) do.	...	...	...	...	...	...	...	...	78	865	78	865
20. Pyritic Ore ... ... (Reported) do.	...	...	...	...	...	...	...	...	74,048	45,496	74,048	45,496
21. Silver ... ... (Exported) fine ounces	68,413	8,863	81,226	11,661	89,146	13,409	109,005	16,036	4,124,243	570,239	4,472,033	620,208
22. Tantalite ... ... (Exported) statute tons	24	5,751	5	1,010	...	...	5	688	*	18,092	...	25,541
23. Tin Ore ... ... (Exported) do.	67	10,450	108	15,392	87	12,008	131	15,095	15,434	1,494,971	15,827	1,547,916
24. Tungsten Ore { Scheelite ... (Exported) do.	...	...	...	...	...	...	...	...	21	2,507	21	2,507
Tungsten Ore { Wolfram ... (Exported) do.	...	...	...	...	...	...	...	...	15	1,441	15	1,441
25. Zinc ... ... (Exported) do.	...	...	...	...	...	...	...	...	184	5,437	184	5,437
Unenumerated ... ... (Exported)	8	250	...	...	...	...	...	103	...	6,988	...	7,341
TOTAL VALUES	...	2,371,864	...	2,393,890	...	2,581,162	...	2,657,950	...	156,673,839	...	166,678,705

* Weight not stated. † The value stated for Mica is that declared by the exporter at the time of shipment, but later information indicates that it is overstated.

The value of gold is calculated at the fixed price of £4·24773 per fine oz. Sales of gold by the Gold Producers' Association averaged £5·825 per fine oz. for the year 1920, £5·314 for the year 1921, £4·693 for the year 1922, £4·4244 for the year 1923, and £4·65107 for the year 1924. The amounts of £974,504, £590,428, £239,487, £89,158, and £195,629, should therefore be added to make up the actual total value of such gold.

AUSTRALASIAN MINERAL PRODUCTION.

COMPARATIVE TABLE SHOWING THE OUTPUT OF ALL MINERAL PRODUCTS FROM THE SEVERAL STATES OF AUSTRALIA AND THE DOMINION OF NEW ZEALAND DURING 1926.

Description of Mineral.		Western Australia.		New South Wales.		Queensland.		Victoria.		Tasmania		South Australia		New Zealand.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity	Value.	Quantity.	Value.	Quantity	Value.
			£		£		£		£		£		£		£
Alunite	... Statute tons	...	...	580	2,320	...	...	...	...	...	...	...	...	...	...
Antimony (Metal and Ore)	do.	4½	85	85	1,236	10	105	...	...	...	...	...	...	...	...
Arsenical Ore ...	do.	*	347	405	5,837	815	5,450	...	...	...	...	...	...	...	...
Asbestos	do.	105	2,728	4	20	...	...	...	...	...	...	...	...	...	...
Bismuth (Metal and Ore)	do.	...	...	8	773	...	...	...	...	...	...	...	...	...	...
Coal	do.	474,819	394,400	10,885,766	9,436,520	1,221,059	1,098,927	1,548,936	846,697	102,358	90,401	...	...	2,233,463	2,233,463
Copper (Ingot and Matte)	do.	1	84	357	22,473	1,216	73,591	...	...	6,915	454,854	231	14,681	...	...
Copper Ore	do.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gold	... Fine ounces	437,343	1,857,716	19,435	82,551	10,339	43,914	49,078	208,471	4,223	17,936	758	3,219	113,573	482,427
Gypsum ...	... Statute tons	3,918	5,618	817	1,287	...	...	10,217	7,613	...	...	65,613	57,411	...	...
Iron	do.	...	...	105,201	578,605	...	...	...	...	...	...	583,745	671,307	3,997	19,585
Iron Oxide	do.	...	...	3,251	1,958	...	...	...	...	...	...	...	...	...	...
Ironstone	do.	...	...	...	...	4,412	3,914	...	...	...	...	...	...	...	...
Lead and Silver Lead	do.	4,162	76,741	274,513	4,398,823	3,735	116,156	...	...	5,893	183,167	28	819	...	...
Limestone	do.	...	...	109,698	27,049	72,426	36,657	...	...	153,707	153,219	119,714	44,893	...	...
Magnesite	do.	...	...	10,263	14,375	...	...	94	281	...	...	226	565	...	...
Manganese Ore ...	do.	82	503	1,290	3,955	20	40	...	...	...	...	...	...	...	...
Molybdenite	do.	...	...	½	41	...	...	42	7,350	...	...	...	...	...	...
Osmiridium ...	... Ounces	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Phosphate Rock	... Statute tons	...	...	253	316	...	...	120	120	...	...	882	864	...	...
Platinum ...	... Fine ounces	...	...	397	6,910	...	...	...	...	...	...	...	...	31	313
Precious Stones		...	...	...	13,980	...	...	...	...	...	...	...	10,330	...	...
Tungsten Ores } Scheelite	Statute tons	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tungsten Ores } Wolfram	do.	...	...	...	...	½	48	...	...	83	5,265	...	...	9	475
Shale (Oil)	do.	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Silver	... Fine ounces	68,413	8,863	9,342	1,130	252,540	31,568	2,373	307	766,653	97,988	353	46	440,956	56,875
Tin (Ore and Ingot)	... Statute tons	67	10,450	1,134	326,474	1,058	174,147	29	5,075	1,096	322,526	...	...	...	...
Zinc (Spelter and Conc.)	do.	...	...	267,533	1,359,588	200	6,827	...	...	5,378	183,362	...	...	...	...
Other		...	14,329	...	3,764,795	...	17,397	...	3,092	...	...	...	228,218	...	529,373
Total Value ...		...	2,371,864	...	20,051,016	...	1,608,741	...	1,082,006	...	1,808,844	...	1,032,353	...	3,322,511

* Weight not stated.

PART I.—GOLD.

TABLE I.

Monthly Production of Gold, in Fine Ounces, showing the Quantity reported to the Mines Department during 1926.

Goldfield.	District.	January.		February.		March.		April.		May.		June.		July.	
		District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley ...	... ...	...	...	...	...	...	...	...	8·78	...	...	...	7·29	...	13·43
Pilbara	Marble Bar ...	...	11·34	...	...	143·07	156·64	251·75	300·93	391·01	442·57	92·40	139·16	...	38·93
Do.	Nullagine ...	11·34		...		13·57		49·18		51·56		46·76		38·93	
West Pilbara ...	... ...	...	...	...	2·97	...	5·21	...	1·92	...	1·34	...	·88	...	1·77
Ashburton ...	... ...	...	...	...	...	...	...	...	...	...	...	...	4·09	...	...
Gascoyne ...	... ...	...	...	...	...	...	5·87	...	...	...	...	...	...	...	...
Peak Hill ...	... ...	...	215·73	...	72·61	...	...	...	575·72	...	180·40	...	59·31	...	72·50
East Murchison...	Lawlers ...	6·55	194·14	63·56	117·82	57·26	331·97	178·50	470·54	22·56	523·93	20·74	476·35	26·43	668·60
Do.	Wiluna ...	55·31		...		221·93		79·01		448·35		433·93		572·78	
Do.	Black Range	132·28		54·26		52·78		213·03		53·02		21·68		69·39	
Murchison ...	Cue	292·26	2,436·68	273·38	2,368·72	267·02	2,356·56	382·05	3,611·99	302·83	2,576·79	386·92	2,918·52	254·64	3,267·33
Do.	Meekatharra...	2,106·34		1,980·81		1,969·27		1,946·65		1,920·39		1,940·87		2,727·31	
Do.	Day Dawn ...	7·96		26·25		...		213·84		100·17		460·30		47·40	
Do.	Mt. Magnet ...	30·12		88·28		120·27		1,069·45		253·40		130·43		237·98	
Yalgoo	... ...	...	379·01	...	254·86	...	913·78	...	445·67	...	546·32	...	487·70	...	496·63
Mt. Margaret ...	Mt. Morgans...	301·70	3,019·68	571·79	3,694·79	504·40	3,675·34	412·32	3,682·32	435·27	3,510·22	457·59	3,587·99	306·90	3,864·83
Do.	Mt. Malcolm...	2,624·87		2,978·50		3,025·94		2,967·47		2,950·69		3,010·81		3,402·10	
Do.	Mt. Margaret	93·11		144·50		145·00		302·53		124·26		119·59		155·83	
North Coolgardie	Menzies ...	180·61	184·75	330·65	330·65	110·71	139·93	437·29	442·59	54·46	54·46	13·16	40·20	88·77	278·50
Do.	Ularring ...	...		...		...		·75		...		22·63		60·78	
Do.	Niagara ...	4·14		...		5·65		4·55		...		4·41		...	
Do.	Yerilla ...	...		...		23·57		...		...		...		128·95	
Broad Arrow ...	... ...	...	111·58	...	207·99	...	193·51	...	...	...	17·12	...	178·05	...	85·84
N.E. Coolgardie...	Kanowna ...	335·64	352·35	430·55	453·41	524·06	550·49	439·81	462·60	184·14	186·61	596·59	607·91	378·26	396·52
Do.	Kurnalpi ...	16·71		22·86		26·43		22·79		2·47		11·32		18·26	
East Coolgardie ...	E. Coolgardie	22,850·83	22,853·12	25,574·03	25,578·85	26,593·49	26,598·56	28,020·68	28,020·68	27,349·79	27,370·34	27,496·43	27,536·41	25,565·78	25,576·12
Do.	Bulong ...	2·29		4·82		5·07		...		20·55		39·98		10·34	
Coolgardie ...	Coolgardie ...	378·63	716·30	217·20	221·88	352·10	389·74	490·24	509·47	191·67	301·99	145·93	510·03	424·58	490·36
Do.	Kunanalling	337·67		4·68		37·64		19·23		110·32		364·10		65·78	
Yilgarn ...	... ...	...	541·45	...	743·45	...	911·71	...	767·25	...	920·77	...	1,107·39	...	836·73
Dundas	... ...	...	412·33	...	283·23	...	1·25	...	5·04	...	125·11	...	376·95	...	8·17
Phillips River ...	... ...	...	1·14	...	1·68	...	·11	...	·31	...	7·45	...	...	...	...
State Generally ...		...	...	...	...	...	...	...	8·43	...	...	...	32·89	...	...
TOTAL	Fine Ounces ...	...	31,429·60	...	34,332·91	...	36,230·67	...	39,314·24	...	36,765·42	...	38,071·12	...	36,096·26
TOTAL	Sterling Value	£133,504		£145,837		£153,898		£166,996		£156,170		£161,716		£153,327	

TABLE I.—*Monthly Production of Gold in Fine Ounces*—continued.

Goldfield.	District.	August.		September.		October.		November.		December.		Total for 1926.	
		District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley ...	... ...	...	5·41	...	10·27	...	...	...	19·43	...	...	...	64·61
Pilbara	Marble Bar ...	90·86	120·96	1·17	66·69	586·55	586·55	393·65	423·19	...	89·28	1,950·46	2,376·24
Do. ...	Nullagine ...	30·10		65·52		...		29·54		89·28		425·78	
West Pilbara ...	... ...	...	3·48	...	1·07	...	2·31	...	7·56	...	·68	...	29·19
Ashburton ...	... ...	...	...	...	1·08	...	...	...	5·09	...	...	...	10·26
Gascoyne	... ...	...	...	...	...	...	...	...	...	...	79·34	...	85·21
Peak Hill ...	... ...	...	52·40	...	61·82	...	263·49	...	330·06	...	255·56	...	2,139·60
East Murchison ...	Lawlers	11·98		26·47		15·95		7·77		12·97		450·74	
Do. ...	Wiluna	165·04	498·61	176·03	233·72	11·49	36·43	756·37	959·90	221·39	813·55	3,141·63	5,335·56
Do. ...	Black Range ...	321·59		31·22		18·99		195·76		579·19		1,743·19	
Murchison ...	Cue	443·60		113·74		263·94		547·06		653·29		4,180·73	
Do. ...	Meekatharra ...	2,128·68	2,703·32	1,526·37	1,821·22	1,786·85	2,630·07	1,688·35	2,446·63	1,743·95	3,348·91	23,465·84	33,486·74
Do. ...	Day Dawn ...	96·22		91·18		237·18		117·95		106·88		1,505·33	
Do. ...	Mt. Magnet ...	1,034·82		89·93		342·10		93·27		844·79		4,334·84	
Yalgoo	... ...	...	329·00	...	664·44	...	626·07	...	324·70	...	914·00	...	6,382·18
Mt. Margaret ...	Mt. Morgans ...	354·29		397·86		341·69		436·88		463·38		4,984·07	
Do. ...	Mt. Malcolm ...	3,505·20	4,043·84	3,310·65	3,926·70	3,346·03	3,787·01	3,292·33	3,823·46	2,411·76	3,011·97	36,826·35	43,628·15
Do. ...	Mt. Margaret ...	184·35		218·19		99·29		94·25		136·83		1,817·73	
North Coolgardie...	Menzies	78·33		220·51		10·72		151·56		462·97		2,139·74	
Do. ...	Ularring	...	107·94	26·83	253·93	...	24·46	...	151·56	...	462·97	110·99	2,471·94
Do. ...	Niagara	...		6·59		13·74		...		...		39·08	
Do. ...	Yerilla	29·61		...		...		...		...		182·13	
Broad Arrow ...	... ...	...	40·41	...	3·61	...	221·62	...	393·01	...	7·75	...	1,460·49
N.E. Coolgardie ...	Kanowna ...	980·15	986·02	268·95	301·71	724·14	724·14	587·98	626·56	525·93	550·45	5,976·20	6,198·77
Do. ...	Kurnalpi ...	5·87		32·76		...		38·58		24·52		222·57	
East Coolgardie ...	East Coolgardie...	27,227·03	27,227·37	26,636·82	26,642·28	24,022·76	24,023·22	24,717·56	24,723·30	17,878·20	17,886·72	303,933·40	304,036·97
Do. ...	Bulong	·34		5·46		·46		5·74		8·52		103·57	
Coolgardie ...	Coolgardie ...	387·50	527·82	145·18	205·08	209·38	761·53	55·14	323·25	509·89	1,040·21	3,507·44	5,997·66
Do. ...	Kunanalling ...	140·32		59·90		552·15		268·11		530·32		2,490·22	
Yilgarn	... ...	...	1,329·81	...	1,162·58	...	1,112·64	...	1,374·68	...	983·76	...	11,792·22
Dundas	... ...	...	95·64	...	...	...	318·05	...	463·73	...	592·18	...	2,681·68
Pihllips River ...	... ...	...	1·80	...	...	...	...	...	...	...	6·84	...	19·33
State generally	... ...	...	34·36	...	...	...	...	...	...	...	57·71	...	133·39
TOTAL	**Fine Ounces ...**	...	**39,108·19**	...	**35,356·20**	...	**35,127·59**	...	**36,396·11**	...	**30,101·88**	...	**428,330·19**
TOTAL	**Sterling Value**	**£166,121**		**£150,184**		**£149,212**		**£154,601**		**£127,865**		**£1,819,431**	

The total gold yield is as shown at page 5, being the amount of gold exported and also that lodged at the Royal Mint, which total includes alluvial and other gold not reported to the Department.

TABLE II.

Total Yearly Production of Gold, in Fine Ounces, as reported to the Mines Department, to 31st December, 1926.

Goldfield.	District.	1926.		1925.		1924.		1923.		1922.		1921.	
		District.	Goldfield.	District.	Golddeld.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley	... ...	...	64·61	...	29·43	...	12·77	...	30·55	...	5·01	...	49·35
Pilbara	Marble Bar ...	1,950·46	2,376·24	2,404·98	2,502·10	1,858·12	2,134·38	2,388·05	2,543·62	2,779·45	3,100·16	2,556·95	2,626·57
Do.	Nullagine ...	425·78		97·12		276·26		155·57		320·71		69·62	
West Pilbara ...	... ...	...	29·19	...	34·95	...	76·45	...	64·22	...	94·33	...	67·10
Ashburton	... ...	...	10·26	...	10·63	...	3·18	...	9·24	...	13·57	...	22·31
Gascoyne	... ...	...	85·21	...	3·37	...	2·46	...	...	...	1·52	...	7·46
Peak Hill	... ...	...	2,139·60	...	1,635·65	...	2,113·13	...	1,699·82	...	2,159·89	...	1,078·53
East Murchison ...	Lawlers	450·74	5,335·56	1,254·51	5,398·50	2,453·98	4,896·94	4,302·94	11,016·41	4,650·83	13,050·62	3,008·81	18,762·26
Do.	Wiluna	3,141·63		2,137·66		1,083·97		3,697·11		5,385·30		4,092·30	
Do.	Black Range ...	1,743·19		2,006·33		1,358·99		3,016·36		3,014·49		11,661·15	
Murchison	Cue	4,180·73	33,486·74	2,338·71	29,439·22	1,912·68	24,425·20	4,155·09	27,037·53	4,840·68	36,304·33	7,186·83	41,256·53
Do.	Meekatharra ...	23,465·84		22,369·37		19,225·14		20,355·91		26,953·23		30,046·77	
Do.	Day Dawn ...	1,505·33		638·68		775·94		850·79		1,114·58		726·80	
Do.	Mt. Magnet ...	4,334·84		4,092·46		2,511·44		1,675·74		3,395·84		3,296·13	
Yalgoo	... ...	...	6,382·18	...	2,828·36	...	5,611·23	...	7,713·45	...	18,132·49	...	3,579·20
Mt. Margaret ...	Mt. Morgans ...	4,984·07	43,628·15	4,804·69	41,849·88	5,552·43	43,704·83	5,556·38	26,876·42	7,768·38	27,649·19	7,612·89	20,803·51
Do.	Mt. Malcolm ...	36,826·35		35,445·39		35,839·35		20,301·14		16,811·82		8,364·49	
Do.	Mt. Margaret ...	1,817·73		1,599·80		2,313·05		1,018·90		3,068·99		4,826·13	
North Coolgardie ...	Menzies	2,139·74	2,471·94	4,211·90	4,549·66	8,252·74	9,509·19	11,278·60	12,212·93	11,650·21	13,624·14	8,034·25	10,640·08
Do.	Ularring ...	110·99		...		210·98		219·18		1,401·44		1,605·06	
Do.	Niagara	39·08		188·83		197·30		269·14		197·17		345·17	
Do.	Yerilla	182·13		148·93		848·17		446·01		375·32		655·60	
Broad Arrow ...	... ...	...	1,460·49	...	8,242·38	...	2,660·61	...	2,740·98	...	3,628·56	...	8,875·01
N.E. Coolgardie ...	Kanowna ...	5,976·20	6,198·77	5,747·31	5,897·75	4,525·97	4,690·51	4,592·90	4,714·51	3,882·13	4,545·10	3,378·29	4,147·98
Do.	Kurnalpi ...	222·57		150·44		164·54		121·61		662·97		769·69	
East Coolgardie ...	East Coolgardie...	303,933·40	304,036·97	304,891·85	305,769·11	335,480·59	336,098·63	369,859·84	370,669·86	375,757·25	376,388·69	378,344·62	378,429·92
Do.	Bulong	103·57		877·26		618·04		810·02		631·44		85·30	
Coolgardie	Coolgardie ...	3,507·44	5,997·66	7,459·75	10,308·44	7,100·35	10,242·79	9,929·81	13,076·81	9,662·68	16,170·54	4,629·54	9,547·74
Do.	Kunanalling ...	2,490·22		2,848·69		3,142·44		3,147·00		6,507·86		4,918·20	
Yilgarn	... ...	...	11,792·22	...	13,296·97	...	8,451·00	...	8,375·97	...	12,793·95	...	19,241·50
Dundas	... ...	...	2,681·68	...	2,601·30	...	3,429·14	...	6,357·85	...	8,043·99	...	5,455·77
Phillips River ...	... ...	...	19·33	...	27·20	...	145·44	...	374·58	...	688·75	...	865·75
* Donnybrook ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...
State generally	... ...	...	133·39	...	108·33	...	...	...	157·74	...	144·45	...	99·85
TOTAL	Fine Ounces ...	...	428,330·19	...	434,533·23	...	458,207·88	...	495,672·49	...	536,539·28	...	525,556·42
	Sterling Value	£1,819,431		£1,845,780		£1,946,343		£2,105,483		£2,279,074		£2,232,422	

* Abolished 4th March, 1908.

TABLE II.—*Total Yearly Production of Gold, in Fine Ounces, etc.*—continued.

Goldfield.	District.	1920. District.	1920. Goldfield.	1919. District.	1919. Goldfield.	1918. District.	1918. Goldfield.	1917. District.	1917. Goldfield.	Previous to 1917. District.	Previous to 1917. Goldfield.	Total to December 31st, 1926. District.	Total to December 31st, 1926. Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley	... ...	...	...	...	150·73	...	15·08	...	82·25	...	17,772·29	...	18,212·07
Pilbara	Marble Bar ...	3,164·15	4,052·49	2,960·51	3,421·39	2,991·73	3,748·40	2,463·66	5,406·75	117,312·20	192,113·45	142,830·26	224,025·55
Do.	Nullagine ...	888·34		460·88		756·67		2,943·09		74,801·25		81,195·29	
West Pilbara ...	... ...	...	133·91	...	95·26	...	120·37	...	304·77	...	27,161·69	...	28,182·24
Ashburton	... ...	...	...	...	...	...	...	...	6·50	...	8,876·74	...	8,952·43
Gascoyne	... ...	...	...	...	...	...	...	...	...	...	676·54	...	776·56
Peak Hill	... ...	...	1,655·71	...	2,255·38	...	1,089·31	...	1,743·72	...	248,894·17	...	266,464·91
East Murchison ...	Lawlers	2,693·15	19,600·25	4,951·82	27,413·89	4,115·55	29,210·72	4,784·50	32,856·56	893,523·61	1,660,972·12	926,190·44	1,828,513·83
Do.	Wiluna	5,478·99		7,035·72		7,909·60		9,523·65		65,472·69		114,958·62	
Do.	Black Range ...	11,428·11		15,426·35		17,185·57		18,548·41		701,975·82		787,364·77	
Murchison	Cue	9,642·63	46,604·07	9,020·49	50,569·85	10,183·75	63,285·43	9,689·81	82,305·83	337,946·68	2,760,676·97	401,098·08	3,195,391·70
Do.	Meekatharra ...	28,163·45		35,436·80		44,119·86		44,269·00		764,109·87		1,058,515·24	
Do.	Day Dawn ...	4,671·54		2,383·58		4,176·83		23,746·93		1,274,215·52		1,314,806·52	
Do.	Mt. Magnet ...	4,126·45		3,728·98		4,804·99		4,600·09		384,404·90		420,971·86	
Yalgoo	... ...	...	2,965·43	...	4,788·38	...	4,397·89	...	5,812·74	...	106,576·47	...	168,787·82
Mt. Margaret ...	Mt. Morgans ...	5,560·87	77,335·84	5,302·34	88,151·93	5,294·03	85,346·97	6,314·21	101,874·54	492,362·57	2,633,420·79	551,112·86	3,190,642·05
Do.	Mt. Malcolm ...	42,800·83		49,506·74		46,368·64		59,488·04		1,447,824·18		1,799,576·97	
Do.	Mt. Margaret ...	28,974·14		33,342·85		33,684·30		36,072·29		693,234·04		839,952·22	
North Coolgardie ...	Menzies	11,468·50	12,024·18	20,859·22	23,019·41	30,345·06	36,829·91	30,725·13	34,795·55	895,411·54	1,871,005·50	1,034,376·89	2,030,682·49
Do.	Ularring	57·53		931·66		4,791·82		1,090·35		281,140·62		291,559·63	
Do.	Niagara	223·26		746·51		1,203·81		1,185·17		498,534·05		503,129·49	
Do.	Yerilla	274·89		482·02		489·22		1,794·90		195,919·29		201,616·48	
Broad Arrow ...	... ...	...	7,445·23	...	11,728·57	...	4,125·88	...	16,518·64	...	447,210·45	...	514,636·80
N.E. Coolgardie ...	Kanowna ...	1,248·14	1,738·80	5,250·96	5,472·08	3,439·60	3,700·25	5,912·39	5,933·17	675,405·04	704,134·37	719,358·93	751,173·29
Do.	Kurnalpi ...	490·66		221·12		260·65		20·78		28,729·33		31,814·36	
East Coolgardie ...	East Coolgardie	401,417·01	401,495·91	396,995·28	397,054·89	524,729·46	524,823·36	557,874·83	557,983·37	15,856,397·60	16,017,341·66	19,805,681·73	19,970,092·37
Do.	Bulong	78·90		59·61		93·90		108·54		160,944·06		164,410·64	
Coolgardie	Coolgardie ...	3,482·79	5,986·43	4,222·21	5,814·30	5,334·36	7,962·75	6,980·68	10,285·68	955,716·88	1,157,711·16	1,018,026·49	1,253,104·30
Do.	Kunanalling ...	2,503·64		1,592·09		2,628·39		3,305·00		201,994·28		235,077·81	
Yilgarn	... ...	...	37,636·51	...	54,002·74	...	70,765·88	...	78,244·77	...	757,966·42	...	1,072,567·93
Dundas	... ...	...	6,541·18	...	12,529·61	...	15,949·44	...	18,419·01	...	560,454·65	...	642,463·62
Phillips River ...	... ...	...	1,422·76	...	1,700·12	...	4,478·49	...	4,734·52	...	74,728·86	...	89,185·80
*Donnybrook ...	... ...	...	...	...	...	...	...	...	...	...	841·76	...	841·76
State generally	... ...	...	20·67	...	46·41	...	195·43	...	111·41	...	7,353·86	...	8,371·54
TOTAL	Fine Ounces ...	...	626,659·37	...	688,214·94	...	856,045·56	...	957,419·78	...	29,255,889·92	...	35,263,069·06
TOTAL	Sterling Value ...	£2,661,880		£2,923,351		£3,636,250		£4,066,861		£124,271,121		£149,787,996	

* Abolished 4th March, 1908.

TABLE III.

GENERAL RETURN.

RETURN SHOWING, FOR THE RESPECTIVE GOLDFIELDS AND DISTRICTS, THE AREA IN SQUARE MILES, LEASES IN FORCE, PARTICULARS OF PLANT, MEN EMPLOYED AND DIGGERS, ALLUVIAL, DOLLIED, AND SPECIMEN GOLD AND ORE TREATED, WITH GOLD AND SILVER YIELD, IN FINE OUNCES, AS REPORTED TO THE MINES DEPARTMENT FOR THE YEAR 1926.

Goldfield.	District.	Date of Proclamation of Goldfield.				Area in Square Miles.		Leases in force, 31-12-1926.		Particulars of Plant.					Average Number of Men engaged in Gold Mining.		
										Milling.		Cyaniding.			Men employed.		
		Proclamation gazetted.	To take effect from.	Latest Amendment of Boundaries gazetted.	To take effect from.	Goldfield.	District.	No.	Area in Acres.	Stamps.	Other Mills.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	Above Ground.	Under Ground.	Diggers.
Kimberley	... ...	20-5-86	20-5-86	31-10-02	1-11-02	33,833	...	...	...	...	...	...	...	...	...	...	4
West Kimberley ...	... ...	19-3-20	1-3-20	...	...	98,600	...	...	...	...	...	...	...	...	...	...	...
Pilbara	Marble Bar ...	1-10-88	1-10-88	1-3-07	1-3-07	32,696	25,809	11	91	45	4	10	...	...	10	22	10
	Nullagine ...						6,887	2	12	18	...	7	...	...	4	2	1
West Pilbara	... ...	20-9-95	1-11-95	1-3-07	1-3-07	10,843	...	2	30	10	...	...	...	...	...	1	2
Ashburton	... ...	11-12-90	11-12-90	18-10-01	14-10-01	14,230	...	...	...	...	...	...	...	...	...	...	2
Gascoyne	... ...	25-6-97	15-4-97	...	...	5,313	...	...	...	...	...	...	...	...	...	...	2
Peak Hill	... ...	19-3-97	1-4-97	13-11-14	1-12-14	23,650	...	9	55	10	...	9	...	...	16	19	5
East Murchison ...	Lawlers ...	28-6-95	28-6-95	2-2-20	2-2-20	26,058	6,691	8	155	30	4	18	...	...	18	6	3
	Wiluna ...						10,496	6	89	23	...	6	...	...	80	65	...
	Black Range						8,871	48	986	25	...	8	...	...	24	25	2
Murchison	Cue	24-9-91	24-9-91	28-11-13	1-1-14	25,474	8,593	10	137	50	2	25	2	...	64	26	...
	Meekatharra						12,250	20	310	70	9	11	...	...	56	148	12
	Day Dawn ...						896	6	64	3	...	...	...	...	25	9	...
	Mt. Magnet ...						3,735	16	151	25	2	11	...	...	43	45	2
Yalgoo	... ...	8-2-95	23-1-95	30-7-15	9-8-15	23,230	...	14	166	30	4	28	...	...	56	58	1
Mt. Margaret	Mt. Morgans	12-3-97	1-4-97	2-2-20	2-2-20	59,918	14,007	7	111	25	3	10	5	1	44	30	...
	Mt. Malcolm						6,018	24	529	70	4	7	4	1	153	241	...
	Mt. Margaret						39,893	7	134	30	5	16	1	...	35	6	...
North Coolgardie ...	Menzies ...	28-6-95	28-6-95	7-9-17	17-9-17	13,746	6,805	16	270	55	12	18	4	1	26	16	1
	Ularring ...						3,093	2	48	20	1	...	...	...	2	1	...
	Niagara ...						688	4	42	15	4	...	...	...	8	5	...
	Yerilla ...						3,160	2	17	20	1	5	...	...	7	6	...
Broad Arrow	... ...	17-11-96	20-11-96	8-6-06	1-7-06	1,038	...	13	218	35	16	9	7	2	66	55	6
North-East Coolgardie ...	Kanowna ...	20-3-96	15-4-96	27-3-08	1-4-08	20,604	1,094	12	162	50	2	2	...	...	35	36	3
	Kurnalpi ...						19,510	3	72	5	1	2	...	...	13	8	1
East Coolgardie ...	East Coolgardie	21-9-94	1-10-94	27-3-08	1-4-08	1,800	810	87	1,302	265	196	75	133	61	986	1,219	23
	Bulong ...						990	3	57	5	...	3	...	...	30	11	3
Coolgardie	Coolgardie ...	6-4-94	6-4-94	1-3-07	1-3-07	11,702	9,384	14	250	58	6	40	4	...	99	90	17
	Kunanalling						2,318	10	133	25	4	9	...	...	30	29	...
Yilgarn	... ...	1-10-88	1-10-88	28-1-16	1-2-16	17,700	...	33	619	110	10	27	8	4	110	69	...
Dundas	... ...	31-8-93	31-8-93	1-3-07	1-3-07	11,430	...	8	90	25	...	10	...	...	40	36	...
Phillips River	... ...	21-9-00	14-9-00	28-1-16	1-2-16	5,078	...	6	88	30	...	4	...	...	9	3	1
State generally ...	... ...	...	...	...	...	...	...	11	192	...	2	...	...	...	10	1	...
	Total	...	...	...	...	**436,943**	...	**414**	**6,580**	**1,182**	**292**	**370**	**168**	**70**	**2,099**	**2,288**	**101**

TABLE III.—*Return showing for the respective Goldfields and Districts, etc.*—continued.

Goldfield.	District.	1926 Gold and Silver Yield—Districts.						1926 Gold and Silver Yield—Goldfields.					
		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 ...	...	...	...	...	...	...	...	64·61	...	...	...	64·61	...
Pilbara	Marble Bar ...	99·12	14·10	1,130·50	1,837·24	1,950·46	...	107·96	14·10	2,326·50	2,254·18	2,376·24	...
Do.	Nullagine ...	8·84	...	1,196·00	416·94	425·78	...						
West Pilbara ...	...	...	...	...	...	...	...	29·19	...	...	...	29·19	...
Ashburton ...	...	...	...	...	...	...	...	10·26	...	...	...	10·26	...
Gascoyne	...	...	...	...	...	...	...	85·21	...	...	...	85·21	...
Peak Hill ...	...	...	...	...	...	...	...	...	17·97	2,178·50	2,121·63	2,139·60	...
East Murchison ...	Lawlers ...	...	3·27	878·50	447·47	450·74	...	5·62	449·42	5,535·75	4,880·52	5,335·56	5·00
Do.	Wiluna ...	2·09	27·96	3,003·75	3,111·58	3,141·63	5·00						
Do.	Black Range ...	3·53	418·19	1,653·50	1,321·47	1,743·19	...						
Murchison ...	Cue	34·20	29·10	6,044·55	4,117·43	4,180·73	1·00	374·17	935·27	57,694·97	32,177·30	33,486·74	1·00
Do.	Meekatharra ...	322·89	23·57	46,952·00	23,119·38	23,465·84	...						
Do.	Day Dawn ...	9·43	554·35	970·50	941·55	1,505·33	...						
Do.	Mt. Magnet ...	7·65	328·25	3,727·92	3,998·94	4,334·84	...						
Yalgoo	...	...	...	...	...	...	...	10·95	9·62	9,605·75	6,361·61	6,382·18	333·18
Mt. Margaret ...	Mt. Morgans ...	39·14	8·10	14,177·50	4,936·83	4,984·07	...	143·45	70·23	118,804·27	43,414·47	43,628·15	3,404·91
Do.	Mt. Malcolm ...	100·66	16·82	103,724·00	36,708·87	36,826·35	3,404·91						
Do.	Mt. Margaret...	3·65	45·31	902·77	1,768·77	1,817·73	...						
North Coolgardie...	Menzies ...	1·40	105·24	788·00	2,033·10	2,139·74	...	12·54	115·79	1,224·10	2,343·61	2,471·94	...
Do.	Ularring ...	...	10·55	...	100·44	110·99	...						
Do.	Niagara ...	11·14	...	9·35	27·94	39·08	...						
Do.	Yerilla ...	...	...	426·75	182·13	182·13	...						
Broad Arrow ...	...	...	...	...	...	...	...	60·10	369·87	978·54	1,030·52	1,460·49	...
N.E. Coolgardie ...	Kanowna ...	77·85	254·50	7,641·85	5,643·85	5,976·20	...	127·07	268·92	8,019·85	5,802·78	6,198·77	...
Do.	Kurnalpi ...	49·22	14·42	378·00	158·93	222·57	...						
East Coolgardie ...	East Coolgardie	352·10	267·60	543,804·39	303,313·70	303,933·40	40,518·07	380·19	270·82	543,842·39	303,385·96	304,036·97	40,518·07
Do.	Bulong ...	28·09	3·22	38·00	72·26	103·57	...						
Coolgardie ...	Coolgardie ...	283·86	4·71	5,447·74	3,218·87	3,507·44	...	419·95	51·19	8,450·49	5,526·52	5,997·66	...
Do.	Kunanalling ...	136·09	46·48	3,002·75	2,307·65	2,490·22	...						
Yilgarn	...	...	...	...	...	...	...	...	...	32,165·25	11,792·22	11,792·22	...
Dundas	...	...	...	...	...	...	...	20·97	14·38	2,111·25	2,646·33	2,681·68	...
Phillips River ...	...	...	...	...	...	...	...	6·23	...	17·00	13·10	19·33	...
State generally ...	...	...	...	...	...	...	...	8·43	57·71	...	67·25	133·39	·58
Total for 1926 ...		...	...	...	...	...	...	**1,866·90**	**2,645·29**	**792,954·61**	**423,818·00**	**428,330·19**	**44,262·74**

TABLE III.—*Return showing for the respective Goldfields and Districts, etc.*—continued.

Goldfield.	District.	Total Gold and Silver Yield—Districts.						Total Gold and Silver Yield—Goldfields.					
		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	...	...	...	...	...	...	...	4,084·82	...	17,597·50	14,127·25	18,212·07	...
Pilbara	Marble Bar ...	12,526·46	3,727·97	84,283·53	126,575·83	142,830·26	613·91	19,320·06	4,212·03	126,438·77	200,493·46	224,025·55	642·58
Do.	Nullagine ...	6,793·60	484·06	42,155·24	73,917·63	81,195·29	28·67						
West Pilbara ...	...	...	...	...	...	...	...	5,798·36	275·00	19,302·71	22,108·88	28,182·24	1,331·07
Ashburton	...	...	...	...	...	...	...	8,636·79	315·64	...	...	8,952·43	7,787·69
Gascoyne	...	...	...	...	...	...	...	416·85	21·88	356·70	337·83	776·56	...
Peak Hill	...	...	...	...	...	...	...	2,289·75	4,204·03	525,191·01	259,971·13	266,464·91	2,287·63
East Murchison ...	Lawlers ...	5,614·49	7,251·08	2,040,021·86	913,324·87	926,190·44	25,997·48	7,226·57	23,906·91	3,455,775·00	1,797,380·35	1,828,513·83	42,735·05
Do.	Wiluna ...	99·46	228·83	219,394·25	114,630·33	114,958·62	237·00						
Do.	Black Range ...	1,512·62	16,427·00	1,196,358·89	769,425·15	787,364·77	16,500·57						
Murchison	Cue	1,302·85	5,793·22	486,616·67	394,002·01	401,098·08	513·68	17,461·74	45,178·11	4,577,453·62	3,132,751·85	3,195,391·70	175,927·20
Do.	Meekatharra ...	11,821·86	13,464·95	1,562,561·24	1,033,228·43	1,058,515·24	5,028·90						
Do.	Day Dawn ...	2,448·58	9,903·37	1,973,247·33	1,302,454·57	1,314,806·52	169,210·44						
Do.	Mt. Magnet ...	1,888·45	16,016·57	555,028·38	403,066·84	420,971·86	1,174·18						
Yalgoo	...	...	...	...	...	...	...	1,589·49	1,872·68	232,934·05	165,325·65	168,787·82	1,022·61
Mt. Margaret ...	Mt. Morgans ...	1,805·12	3,804·85	1,019,449·20	545,502·89	551,112·86	5,775·05	8,052·18	19,447·17	6,183,003·01	3,163,142·70	3,190,642·05	153,788·97
Do.	Mt. Malcolm ...	2,797·07	7,581·87	3,533,512·11	1,789,198·03	1,799,576·97	91,166·05						
Do.	Mt. Margaret...	3,449·99	8,060·45	1,630,041·70	828,441·78	839,952·22	56,847·87						
North Coolgardie ...	Menzies ...	1,143·27	3,978·83	1,238,463·58	1,029,254·79	1,034,376·89	19,224·48	3,938·43	14,332·20	2,655,569·11	2,012,411·86	2,030,682·49	30,863·99
Do.	Ularring ...	22·17	1,162·61	298,568·88	290,374·85	291,559·63	5,973·05						
Do.	Niagara ...	1,525·78	1,618·39	899,327·36	499,985·32	503,129·49	5,603·42						
Do.	Yerilla ...	1,247·21	7,572·37	219,209·29	192,796·90	201,616·48	63·04						
Broad Arrow ...	...	...	...	...	...	...	...	19,517·47	15,898·88	865,325·48	479,220·45	514,636·80	2,184·96
N.E. Coolgardie ...	Kanowna ...	104,570·34	11,570·92	968,029·65	603,217·67	719,358·93	2,522·12	116,679·15	17,706·57	974,252·06	616,787·57	751,173·29	2,533·34
Do.	Kurnalpi ...	12,108·81	6,135·65	6,222·41	13,569·90	31,814·36	11·22						
East Coolgardie ...	East Coolgardie	28,016·57	34,614·04	31,469,149·84	19,743,051·12	19,805,681·73	2,115,698·66	54,770·27	49,775·97	31,624,842·27	19,865,546·13	19,970,092·37	2,115,711·58
Do.	Bulong ...	26,753·70	15,161·93	155,692·43	122,495·01	164,410·64	12·92						
Coolgardie	Coolgardie ...	9,532·62	11,278·54	1,586,434·64	997,215·33	1,018,026·49	891·44	10,578·91	71,806·22	1,875,040·93	1,224,719·17	1,253,104·30	940·11
Do.	Kunanalling ...	1,046·29	6,527·68	288,606·29	227,503·84	235,077·81	48·67						
Yilgarn	...	...	...	...	...	...	...	92·80	1,497·00	2,334,390·76	1,070,978·13	1,072,567·93	32,288·71
Dundas	...	...	...	...	...	...	...	2,053·00	14,043·67	912,041·81	626,366·95	642,463·62	36,392·90
Phillips River ...	...	...	...	...	...	...	...	478·86	781·93	92,456·20	87,925·01	89,185·80	15,688·17
Donnybrook † ...	...	...	...	...	...	...	...	23·24	...	1,653·30	818·52	841·76	...
State generally ...	...	...	...	...	...	...	...	154·45	351·80	27·00	7,865·29	8,371·54	30,876·54
Total to 31st December, 1926 ...		...	...	...	...	...	...	**283,163·19**	**231,627·69**	**56,473,651·29**	**34,748,278·18**	**35,263,069·06**	**2,653,003·10**

* By-product in the treatment of auriferous ore except Ashburton and State generally. † Abolished 4th March, 1908.

TABLE IV.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1926, AND THE TOTAL PRODUCTION TO DATE.

Kimberley Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926					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.
Hall's Creek...	...	Voided leases	...	...	...	...	...	...	...	423·00	477·76	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	94·55	62·68	...
Mt. Dockerell	...	Voided leases	...	...	...	...	...	...	...	44·00	435·93	...
Ruby Creek	...	Voided leases	...	...	...	...	...	...	...	12,633·50	9,435·13	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	151·00	127·28	...
The Brockman	...	Voided leases	...	...	...	...	...	...	...	1,352·75	1,404 40	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	2,462·00	1,820·33	...
The Mary ...	...	Voided leases	...	...	...	...	...	...	...	399·00	210·03	...
The Panton	...	Voided leases	...	...	...	...	...	...	...	34·70	138·70	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	3·00	15·01	...
	From Goldfields generally;— Reported by Banks and Gold Dealers		64·61	...	...	...	...	4,084·82	...	...	...	...
		Total	**64·61**	...	...	...	...	**4,084·82**	...	**17,597·50**	**14,127·25**	...

Pilbara Goldfield.

MARBLE BAR DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom	Silver.
Bamboo Creek	850	Federation	...	...	41·00	215·54	...	...	...	53·00	281·64	...
Do. ...	819	Forrest Abbey	...	...	46·50	49·69	...	...	...	178·00	188·83	...
Do. ...	707	Kitchener	...	...	192·00	146·55	...	...	...	3,959·00	7,951·82	...
Do. ...	740	(Mount Prophecy)	...	...	...	...	...	...	1·11	1,040·50	1,898·07	...
Do. ...	740, 794 ...	Mount Prophecy leases ...	...	...	227·50	349·54	...	...	...	1,847·50	2,823·32	...
Do. ...	794	(Perseverance)	...	...	...	...	...	...	...	290·50	584·21	...
Do. ...	817	Prince Charlie	...	...	75·00	141·93	...	...	...	308·25	949·09	...
Do. ...	...	Voided leases	...	...	...	...	...	...	508·66	15,328·60	23,515·49	...
Do. ...	...	Sundry claims ...	...	...	8·00	5·19	...	...	307·83	1,203·35	1,509·48	...

Boodalyerrie...	...	Voided leases	...	...	...	...	...	...	292·07	120·25	587·86	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	7·16	...	...	...
Breen's Find	...	Voided leases	...	...	...	...	...	...	...	14·00	66·82	...
Elsie ...	...	Voided leases	...	...	...	...	...	...	...	178·00	352·06	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	10·25	58·01	...
Lalla Rookh...	(786), (R.C. 112)	Haig	...	...	...	...	...	...	4·78	3,059·00	1,984·16	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	224·50	2,186·65	574·01
Do ...	...	Sundry claims	...	...	...	11·78	...	...	...	6,992·00	6,892·82	...
Marble Bar ...	844	Anglo French	...	...	68·00	102·95	...	...	...	234·50	270·76	...
Do ...	(841)	Franklin	...	...	...	...	...	...	...	92·50	84·19	...
Do. ...	852	Great Oversight	...	...	13·00	48·66	...	...	...	13·00	48·66	...
Do. ...	805	Homeward Bound East ...	...	...	52·00	88·89	...	...	...	760·50	951·68	...
Do. ...	845	Outward Bound	...	...	306·00	311·54	...	...	...	695·00	753·88	...
Do. ...	851	Viking	...	...	34·50	45·52	...	...	...	34·50	45·52	...
Do. ...	...	Voided leases	...	...	...	...	...	...	181·87	21,509·45	27,316·19	...
Do. ...	...	Sundry claims	...	...	67·00	102·72	...	38·68	149·23	5,257·14	5,879·78	...
North Pole ...	...	Voided leases	...	...	...	...	...	...	...	474·00	340·75	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	50·50	69·56	...
North Shaw	...	Voided leases	...	...	...	...	...	7·53	...	762·45	861·28	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	567·06	...	...	...
Sharks ...	...	Sundry claims	...	...	...	...	...	145·08	19·37	24·50	93·14	...
Shaw River	...	Voided leases	...	...	...	...	...	...	...	101·00	49·63	...
Talga Talga	...	Voided leases	...	...	...	...	...	...	83·83	574·50	975·98	...
Do. ...	...	Sundry claims	...	...	...	...	...	50·26	68·99	204·65	520·25	...
Tambourah ...	...	Voided leases	...	...	...	...	...	...	73·90	1,438·50	1,739·44	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	171·69	639·25	797·44	...
Warrawoona	...	Voided leases	...	...	...	...	...	...	16·99	10,072·80	18,136·84	...
Do. ...	...	Sundry claims	...	...	...	...	...	44·30	403·70	1,127·04	2,163·74	...
Western Shaw	...	Voided leases	...	...	...	...	...	...	...	1,222·50	957·80	...
Do. ...	...	Sundry claims	...	...	...	...	...	12·52	67·47	...	...	...
Wyman's Well	...	Voided leases	...	...	...	...	...	...	42·86	757·79	1,113·33	...
Do. ...	...	Sundry claims	...	...	...	...	...	·93	39·41	355·86	592·18	...
Yandicoogina	...	Voided leases	...	...	...	...	...	...	140·76	2,733·20	5,824·23	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	238·35	103·75	120·34	...
	From District generally :—											
	Sundry Parcels treated at :											
	State Battery, Bamboo Creek		...	...	...	88·98	...	...	...	...	3,212·36	39·90
	State Battery, Marble Bar		...	...	...	127·76	...	...	...	...	621·64	...
	Various Works		...	...	...	...	...	...	...	237·95	1,204·91	...
	Reported by Banks and Gold Dealers		99·12	14·10	...	...	...	12,227·16	340·88	...	...	...
		Total	99·12	14·10	1,130·50	1,837·24	...	12,526·46	3,727·97	84,283·53	126,575·83	613·91

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

PILBARA GOLDFIELD—continued.

NULLAGINE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease	Total for 1926.					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
Eastern Creek	219L	Shamrock	...	...	...	...	...	...	...	89·00	109·15	11·77
Do. ...	...	Voided leases	...	...	...	...	...	...	8·19	4,482·00	8,854·88	...
Do. ...	...	Sundry claims	...	...	12·00	35·43	...	...	3·77	461·50	751·47	16·90
Elsie ...	...	Voided leases	...	...	...	...	...	...	...	408·25	1,323·85	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	24·00	27·48	...
McPhee's Creek	...	Voided leases	...	...	...	...	...	...	...	113·00	137·92	...
Middle Creek	218L	Barton	...	...	637·00	169·77	...	...	...	637·00	169·77	...
Do ...	...	Voided leases	...	...	...	...	...	...	...	6,211·90	8,433·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	286·00	408·82	...
Mosquito Creek	...	Voided leases	...	...	...	...	...	1·07	21·42	7,259·80	12,464·00	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	166·47	2,188·94	3,116·77	...
Nullagine ...	...	Voided leases	...	...	...	...	...	...	13·96	7,453·25	11,335·12	...
Do. ...	...	Sundry claims	8·84	...	...	...	...	165·69	210·96	3,984·75	9,336·03	...
20-Mile Sandy	...	Voided leases	...	...	...	...	...	...	3·20	5,093·70	7,786·99	...
Do. ...	...	Sundry claims	...	...	547·00	211·74	...	33·10	20·55	3,349·65	4,066·82	...
	From District generally:—											
	Sundry Parcels treated at:											
	Doherty's Works	...	...	...	...	...	...	...	...	...	1,177·32	...
	Fremantle Trading Co., Ltd., Works ...	...	...	...	...	...	...	...	...	...	8·29	...
	State Battery, 20-Mile Sandy.	...	...	...	...	...	...	...	...	62·00	1,767·60	...
	Various Works	...	...	...	...	...	...	...	...	50·50	2,641·67	...
	Reported by Banks and Gold Dealers ...	...	...	...	...	...	...	6,593·74	35·54	...	...	...
	Total		8·84	...	1,196·00	416·94	...	6,793·60	484·06	42,155·24	73,917·63	28·67

West Pilbara Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
Croydon ...	...	Voided leases	...	...	...	...	...	...	...	8·00	5·44	...
Hong Kong ...	...	Voided leases	...	...	...	...	...	...	...	331·00	442·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	21·40	·02	9·00	3·15	...
Lower Nicol...	...	Voided leases	...	...	...	...	...	...	1·10	653·20	402·22	...
Do. ...	...	Sundry claims...	...	...	...	...	...	10·44	2·71	10·00	11·51	...

Mallina ...	...	Voided leases	...	...	...	...	...	...	...	141·60	128·44	...
Nicol ...	...	Voided leases	...	...	...	...	...	...	...	30·00	11·47	...
Pilbara ...	...	Voided leases	...	...	...	...	...	...	48·12	267·00	413·59	...
Do. ...	...	Sundry claims	...	...	...	...	...	1·11	86·24	163·00	249·86	...
Roebourne ...	M.L. 183, M.L. 167	Carlow Castle:—Roebourne Copper Mines, Ltd.	...	...	...	...	...	...	...	...	21·12	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	113·36	577·87	350·74
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	108·60	93·85	96·53
Station Peak	165	(Belladonna)	...	...	...	...	...	...	17·93	913·00	262·93	...
Do. ...	...	Voided leases	...	...	...	...	...	117·74	23·44	9,993·00	11,084·49	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	37·50	48·19	...
Towranna ...	...	Voided leases	...	...	...	...	...	...	2·62	3,965·80	5,187·51	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	22·00	12·35	...
Upper Nicol...	...	Sundry claims	...	...	...	...	...	...	...	6·50	2·57	...
Weerianna ...	...	Voided leases	...	...	...	...	...	...	...	2,436·15	3,079·81	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	64·00	62·90	...
Whim Creek	...	Voided leases	...	...	...	...	...	...	...	...	...	883·80
	From Goldfields generally:— Reported by Banks and Gold Dealers		29·19	...	...	...	...	5,587·67	92·82	...	7·16	...
		Total	**29·19**	...	...	...	...	**5,798·36**	**275·00**	**19,302·71**	**22,108·88**	**1,331·07**

Ashburton Goldfield.

Mt. Mortimer	...	Sundry claims	10·26	...	...	...	...	364·63	315·64	...	...	74·47
Uaroo ...	...	Voided leases	...	...	...	...	...	...	...	...	...	7,713·22
	From Goldfields generally:— Reported by Banks and Gold Dealers		...	...	...	...	...	8,272·16	...	...	...	...
		Total	**10·26**	...	...	...	...	**8,636·79**	**315·64**	...	...	**7,787·69**

Gascoyne Goldfield.

Bangemall ...	...	Voided leases	...	...	...	...	...	...	6·22	350·70	313·82	...
Do. ...	...	Sundry claims	85·21	...	...	...	...	85·21	15·66	6·00	24·01	...
	From Goldfields generally:— Reported by Banks and Gold Dealers		...	...	...	...	...	331·64	...	...	...	...
		Total	**85·21**	...	...	...	...	**416·85**	**21·88**	**356·70**	**337·83**	...

Table IV.—*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 1926.					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 ...	...	Voided leases	...	...	...	...	...	60·86	30·91	4,725·25	2,019·78	...
Do. ...	...	Sundry claims	...	...	...	...	...	235·35	23·51	1,093·75	506·79	...
Horseshoe ...	...	Voided leases	...	...	...	...	...	...	1,962·66	728·38	1,973·46	2·00
Do. ...	...	Sundry claims	...	...	...	...	...	15·70	648·12	16·05	45·14	...
Mt. Fraser ...	...	Voided leases	...	...	...	...	...	...	...	389·50	320·96	...
	Do. ...	Sundry claims	...	...	...	...	...	...	...	145·25	120·91	...
Peak Hill ...	459P	Atlantic	...	...	182·00	75·34	...	...	...	645·50	745·24	...
Do. ...	(493P)	Atlantic North	...	...	269·25	159·94	...	...	...	269·25	159·94	...
Do. ...	448P	Evening Star	...	17·97	178·25	171·86	...	...	17·97	2,116·50	3,784·83	...
Do. ...	491P	Independent	...	...	65·50	73·54	...	...	...	191·75	304·12	...
Do. ...	5P, 306P ...	No. 1 North leases	...	...	547·00	341·55	...	...	61·10	4,846·75	3,724·89	·04
Do. ...	492P	North Star	...	...	370·50	60·89	...	...	...	592·50	118·85	...
Do. ...	(1P), (2P), (4P), 5P, (6P), (8P), (9P), (13P), (15P), (16P), (26P), (27P), (28P), (29P), (35P), (36P), (43P), (53P), (54P), (63P), (146P), (152P), (190P), (213P), (222P), (239P), (248P), (252P), (262P), (274P), 306P, (313P)	(Peak Hill Goldfields, Ltd.)	...	...	...	...	...	...	191·46	462,057·01	223,273·59	2,285·59
Do. ...	496P	Wembly	...	...	170·25	88·89	...	...	...	170·25	88·89	...
Do. ...	497P	Wowser	...	...	86·25	8·73	...	...	...	86·25	8·73	...
Do. ...	...	Voided leases	...	...	...	...	...	...	543·06	21,712·62	7,385·66	...
Do. ...	...	Sundry claims	...	...	270·50	104·47	...	30·07	251·84	20,371·50	5,773·52	...
Ravelstone ...	...	Voided leases	...	...	...	...	...	...	101·64	4,219·85	3,117·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	553·60	283·17	...
Wilgeena ...	...	Voided leases	...	...	...	...	...	...	23·54	128·50	146·79	...
Wilthorpe ...	...	Voided leases	...	...	...	...	...	...	...	47·00	20·93	...
Yowerina ...	495P	Baumgarten's Reward	...	...	19·50	36·46	...	...	...	19·50	36·46	...
Do. ...	...	Sundry claims	...	...	19·50	83·65	...	...	...	19·50	83·65	...

From Goldfield generally :—												
Sundry Parcels treated at :												
Purcell's Works			...	...	...	681·50	...	...	...	...	2,873·70	...
State Battery, Egerton			...	...	...	...	...	...	...	...	294·87	...
State Battery, Peak Hill			...	...	...	234·81	...	...	3·05	15·00	2,438·61	...
Various Works			...	...	...	...	...	...	...	30·00	319·97	...
Reported by Banks and Gold Dealers			...	...	...	...	...	1,947·77	345·17	...	...	...
Total			...	**17·97**	**2,178·50**	**2,121·63**	...	**2,289·75**	**4,204·03**	**525,191·01**	**259,971·13**	**2,287·63**

East Murchison Goldfield.

LAWLERS DISTRICT.

Bronzewing ...	...	Voided leases	...	...	...	...	...	...	...	468·00	318·03	1·94
Cork Tree ...	...	Voided leases	...	...	...	...	...	...	29·90	3,767·00	3,292·87	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	25·50	13·00	9·32	...
Kathleen Valley	(1231)	Roderick Dhu	...	...	...	...	...	...	...	59·00	26·78	...
Do. ...	382	(Yellow Aster)	...	...	...	...	...	...	...	37,605·00	27,051·42	...
Do. ...	382	(Yellow Aster)	...	...	...	...	...	...	...	1,714·00	949·04	...
Do. ...	382, (1197) ...	(Yellow Aster leases)	...	...	...	4·77	...	...	...	3,555·00	2,819·91	...
Do. ...	382	(Yellow Aster : Yellow Aster G.M. Co., N.L.)	...	...	...	...	...	...	...	10,359·75	5,425·26	...
Do. ...	...	Voided leases	...	...	...	...	...	...	141·57	23,291·50	11,350·24	...
Do. ...	...	Sundry claims	...	...	22·00	4·57	...	...	478·40	1,527·75	884·23	...
Lake Darlot...	...	Voided leases	...	...	...	...	...	...	4,448·42	65,385·30	48,740·44	...
Do. ...	...	Sundry claims	...	...	...	...	...	1·16	474·45	3,972·64	3,387·61	2·60
Lawlers ...	(22), (37), 58, (62), (70), (155), (156), (157), (158), (376), (377), (381), (385), (390), (426), (427), (459), (474), (500), (508), (509), (510), (511), (512), (552), (562), (563), (573), (811), (840)	(East Murchison United, Ltd.) ...	...	...	...	...	...	...	...	291,797·00	155,594·26	900·48
Do. ...	(22), (37), 58, (62), (70), (155), (156), (157), (158), (376), (377), (381), (385), (399), (426), (427), (459), (474), (500), (508), (509), (510), (511), (512), (552), (562), (563), (573), (811), (840)	(London and Western Australian Exploration Co., Ltd.)	...	...	...	...	...	....	...	179,563·00	40,438·14	2,560·31

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST MURCHISON GOLDFIELD—*continued.*

LAWLERS DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926. Alluvial.	Total for 1926. Dollied and Specimens.	Total for 1926. Ore treated.	Total for 1926. Gold therefrom.	Total for 1926. Silver.	Total Production. Alluvial	Total Production. Dollied and Specimens.	Total Production. Ore treated.	Total Production. Gold therefrom.	Total Production. Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Lawlers ...	(22), (37), 58, (62), (70), (155), (156), (157), (158), (376), (377), (385), (459), (508), (509), (562), (563), (811), (840), 918, (1053), (1106), (1109), (1110), (1123), (1160)	(Northern Mines Ltd.)	...	...	...	...	...	...	...	398,856·50	102,005·52	8,356·89
Do. ...	1234	Vivien Gem	...	...	547·00	59·78	...	...	...	547·00	59·78	...
Do. ...	58, (62), (918), (1178)	Waroonga G.M. Co., Ltd.	...	3·27	147·00	12·07	...	...	3·27	55,416·00	13,455·56	...
Do. ...	(62), (562), (563)...	(Waroonga South leases) ...	...	...	...	...	...	...	...	42,150·00	14,329·48	...
Do. ...	58	(Woronga: London and Western Australian Exploration Co., Ltd.)	...	...	...	...	...	...	...	2,438·50	2,755·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	687·39	311,849·22	161,852·88	2,533·25
Do. ...	...	Sundry Claims	...	...	12·50	3·58	...	14·81	261·04	11,551·98	7,115·54	268·34
New England	...	Voided leases	...	...	...	...	...	...	57·54	899·00	720·25	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·32	554·50	465·23	...
Sir Samuel ...	1230	Canberra	...	...	...	...	...	...	...	19·00	14·80	...
Do. ...	1225	Combine	...	...	...	...	...	...	...	13·00	7·74	...
Do. ...	1228	Vanguard	...	...	86·00	85·10	...	...	...	249·00	152·50	...
Do. ...	1232	Westralia	...	...	64·00	31·49	...	...	...	286·00	152·02	...
Do. ...	...	Voided leases	...	...	...	...	...	...	13·49	266,065·50	138,811·99	10,225·58
Do. ...	...	Sundry claims	...	...	...	...	...	...	21·37	4,330·00	2,976·19	...
Wiluna ...	542, [6J], 548, [7J], (550), ([8J]), (906), ([11J]), (930), [(13J]), (931), ([14J]), (932), ([15J]), (937), ([17J]), (938), ([18J]), (943), ([21J]), (944), ([22J]), (952), ([26J])	(Gwalia Consolidated, Ltd.)	...	...	...	...	...	...	...	210,230·32	74,536·14	69·03
Do. ...	870, [10J] ...	(Moonlight)	...	...	...	...	...	...	...	1,856·00	787·66	...

Do. ...	917, [12J] ...	(Squib)	...	...	...	...	...	...	...	276·50	67·00	...
Do. ...	...	Voided leases	...	...	...	...	...	...	537·27	104,086·75	62,811·02	124·00
Do. ...	...	Sundry claims	...	...	...	...	...	5·30	...	2,841·15	1,516·76	...
	From District generally :—											
	Sundry Parcels treated at:											
	Great Eastern Battery		...	...	...	194·39	...	...	...	...	6,201·33	151·37
	Lawlers Public Pattery (Retreatment Works)...		...	...	...	...	...	...	...	...	1,439·37	...
	Queen Works		...	...	...	...	...	...	...	...	1,275·11	39·36
	State Battery, Lake Darlot		...	...	...	...	...	...	...	315·00	1,097·09	...
	State Battery, Sir Samuel		...	...	...	51·72	...	...	...	23·50	1,777·49	...
	State Battery, Wiluna		...	...	...	...	...	...	...	390·00	2,047·17	20·00
	Western Machinery Co., Ltd.		...	...	...	...	...	...	...	80·00	37·25	...
	Various Works		...	...	...	...	...	...	...	1,619·50	14,563·26	744·33
	Reported by Banks and Gold Dealers		...	...	...	...	...	5,593·22	67·15	...	5·74	...
		Total	...	3·27	878·50	447·47	...	5,614·49	7,251·08	2,040,021·86	913,324·87	25,997·48

WILUNA DISTRICT.

Collavilla ...	...	Voided Leases	...	...	...	...	...	...	...	1,518·00	496·28	...
Do. ...	...	Sundry Claims	...	...	...	...	...	...	...	30·00	21·47	...
Corboy's Find	350J	Corboy's Reward	...	...	217·00	147·21	...	...	...	325·00	224·01	...
Do. ...	359J	Corboy's Reward North ...	...	...	831·00	436·83	...	...	...	931·00	519·49	...
Do. ...	367J	Laughing Jack	...	...	42·00	16·11	...	...	...	103·00	31·76	...
Do. ...	340J	Wandilla	...	...	...	...	...	...	...	25·00	22·11	...
Do. ...	355J	Waratah	...	...	42·50	31·27	...	...	...	42·50	31·27	...
Do. ...	357J	Waratah South	...	...	190·50	126·30	...	...	...	190·50	126·30	...
Do. ...	...	Sundry claims	...	...	246·00	69·13	...	...	...	246·00	69·13	...
Gum Creek ...	...	Voided leases	...	...	...	...	...	...	...	1,334·50	579·16	...
Mt. Keith ...	...	Voided leases	...	...	...	...	...	...	8·29	8,279·50	6,882·05	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	78·26	1,595·25	976·93	...
New England	353J	Toscana	...	1·25	415·00	623·14	5·00	...	1·25	524·00	1,047·17	5·00
Do. ...	...	Voided leases	...	...	...	...	...	...	...	952·00	309·11	...
Do. ...	...	Sundry claims	...	...	22·00	21·87	...	...	...	137·00	122·49	...
Wiluna ...	91J, [940] ...	(Adelaide)	...	...	...	...	...	...	...	401·00	33·29	...
Do. ...	352J	Black Adder	...	...	111·50	129·74	...	...	...	442·50	597·64	...
Do. ...	231J	Brilliant	...	...	269·75	45·41	...	...	...	1,048·00	344·72	...
Do. ...	373J	Brilliant North	...	...	62·00	210·25	...	...	...	119·75	370·85	...
Do. ...	(370J)	Bulletin North	...	...	...	...	...	...	...	50·25	15·09	...
Do. ...	369J	Cromarty Hope	...	...	68·50	77·25	...	...	...	253·50	174·15	...
Do. ...	6J, [542], 7J, [548], (8J), ([550]), (11J), (13J), (14J), (15J), (17J), (18J), (21J), (22J), (24J), (25J), (26J), (39J), (161J), (163J)	(Gwalia Consolidated, Ltd.)	...	...	...	...	...	...	...	29,774·50	10,780·42	20·29
Do. ...	119J	(Happy Jack)	...	...	...	...	...	...	...	743·00	236·41	...
Do. ...	(372J)	Hawk's Nest	...	...	...	...	...	...	...	36·75	25·70	...
Do. ...	371J	Little Bulletin	...	...	30·75	18·32	...	...	...	30·75	18·32	...
Do. ...	10J, [870] ...	(Moonlight)	...	...	...	...	...	...	...	5,181·00	1,078·40	...

TABLE IV.—*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 1926. Alluvial.	Total for 1926. Dollied and Specimens.	Total for 1926. Ore treated	Total for 1926. Gold therefrom.	Total for 1926. Silver.	Total Production. Alluvial	Total Production. Dollied and Specimens.	Total Production. Ore treated	Total Production. Gold therefrom.	Total Production. Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs
Wiluna ...	10J, [870], 37J, 91J, 109J, (123J)	Moonlight leases	...	...	...	...	...	...	...	28,741·25	11,966·35	...
Do. ...	377J	Mother of Gwalia	...	...	15·75	27·10	...	...	...	15·75	27·10	...
Do, ...	333J	Neb	...	...	...	...	...	...	...	754·75	257·16	...
Do. ...	(288J)	Ullina	...	...	...	...	...	...	...	117·50	66·68	...
Do. ...	275J	W.A.	...	...	20·50	9·00	...	...	...	173·25	136·10	...
Do. ...	6J, [542], 7J, [548], (8J), ([550]), (11J), (13J), (14J), (15J), (17J), (21J), (161J), (163J), (193J), (194J), (256J), (257J)	Western Machinery Co., Ltd. ...	...	...	...	...	...	...	...	69,555·50	33,178·75	...
Do. ...	12J, [917], (23J), ([946]), (28J), ([954]), (30J), ([959]), (33J), ([967]), (36J), ([975]), (43J), ([1018]), (76J), ([1090]), (113J), 119J, (124J), (137J) 266J	Wiluna G.M.'s Ltd.	...	...	81·00	6·14	...	...	...	31,150·75	14,659·20	...
Do. ...	...	Voided leases	...	...	...	...	...	...	27·92	23,735·50	10,867·44	...
Do. ...	...	Sundry claims	2·09	26·71	338·00	372·60	...	89·68	110·19	10,633·75	5,295·70	·33
	From District generally :— Sundry Parcels treated at :											
		State Battery, Mt. Keith	...	...	...	...	...	...	...	...	781·64	12·68
		State Battery, Wiluna	...	...	...	743·91	...	...	...	202·00	12,260·49	198·70
		Reported by Banks and Gold Dealers	...	...	...	...	...	9·78	2·92	...	...	...
		Total	**2·09**	**27·96**	**3,003·75**	**3,111·58**	**5·00**	**99·46**	**228·83**	**219,394·25**	**114,630·33**	**237·00**

BLACK RANGE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926. Alluvial.	Total for 1926. Dollied and Specimens.	Total for 1926. Ore treated	Total for 1926. Gold therefrom.	Total for 1926. Silver.	Total Production. Alluvial	Total Production. Dollied and Specimens.	Total Production. Ore treated	Total Production. Gold therefrom.	Total Production. Silver.
Barrambie ...	...	Voided leases	...	...	...	...	...	...	...	455·50	1,862·24	...
Do. ...	...	Sundry claims	3·53	56·38	8·00	48·30	...	3·53	133·52	158·05	494·37	...
Bellchambers	...	Sundry claims	...	...	104·00	20·19	...	...	...	159·00	59·81	...
Birrigrin ...	...	Voided leases	...	...	...	...	...	...	820·68	12,018·16	15,040·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	34·52	744·50	678·89	...

Curran's Find	...	Voided leases ...	...	...	...	...	...	18·24	222·89	7,038·50	3,001·02	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	29·38	1,188·50	430·37	...
Errolls ...	...	Voided leases ...	...	...	...	...	...	14·17	132·04	72·00	426·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	6·53	399·11	228·00	327·90	...
Hancock's ...	949B	Comedy King ...	...	...	93·00	140·76	...	...	...	93·00	140·76	...
Do. ...	...	Voided leases ...	...	...	...	...	...	...	6,523·59	31,359·75	32,496·84	55·72
Do. ...	...	Sundry claims	...	...	...	...	...	4·21	119·02	2,808·50	1,430·65	...
Maninga Marley	203B	(Havilah) ...	...	...	...	...	...	...	...	1,507·50	2,315·74	...
Do. ...	203B	(Havilah) ...	...	...	...	...	...	...	...	638·00	716·05	...
Do. ...	203B, (243B), (249B), (254B), (287B), (288B), (289B), (305B), (350B), (504B)	(Havilah G.M. Co., N.L.)	...	...	...	...	...	...	...	36,508·00	20,052·80	22·55
Do ...	203B, (243B), (287B), (289B), (350B)	(Havilah G.M. Co., N.L.)	...	...	...	...	...	...	...	6,026·00	5,029·69	...
Do. ...	203B, (243B), (249B), (254B), (287B), (288B), (289B), (305B),	(Havilah leases) ...	...	...	...	...	...	...	...	2,240·00	2,432·48	...
Do. ...	203B, 345B ...	Havilah leases ...	...	...	234·00	222·34	...	...	...	566·00	632·04	...
Do. ...	203B, (243B), (289B)	(Havilah leases: Tailings Treatment, Ltd.)	...	...	...	...	...	...	...	371·00	2,086·50	...
Do. ...	...	Voided leases ...	...	...	...	...	...	...	195·20	11,977·23	14,442·35	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	158·16	853·50	669·68	...
Montagu ...	...	Voided leases ...	...	...	...	...	...	...	94·39	9,133·40	7,223·46	...
Do. ...	...	Sundry claims	...	...	25·00	70·03	...	...	45·67	819·50	541·79	...
Nungarra ...	...	Voided leases ...	...	...	...	...	...	25·94	952·34	9,000·75	4,813·99	...
Do. ...	...	Sundry claims	...	...	...	...	...	46·67	1,455·98	3,601·90	2,212·33	...
Sandstone ...	(944B)	Black Range ...	...	...	...	...	...	...	...	101·00	98·59	...
Do. ...	946B	Nous Verrons ...	...	...	73·00	50·29	...	...	...	185·50	155·51	...
Do. ...	951B	Oroya East ...	...	60·87	...	...	...	...	60·87	...	...	...
Do. ...	(885B)	(Oroya East) ...	...	...	...	...	...	...	17·77	508·15	860·92	...
Do. ...	(885B)	Oroya East: Black Range G.M. Co., N.L.	...	300·94	...	...	...	...	347·35	179·50	215·76	...
Do. ...	947B	Waratah ...	...	...	...	...	...	...	...	26·55	44·14	...
Do. ...	...	Voided leases ...	...	...	...	...	...	4·75	3,185·47	687,752·77	441,284·06	11,754·22
Do. ...	...	Sundry claims	...	...	16·00	24·31	...	33·72	1,358·39	5,370·65	3,254·82	...
Youanmi ...	...	Voided leases ...	...	...	...	...	...	·36	126·92	358,978·78	176,882·54	4,608·55
Do. ...	...	Sundry claims	...	...	1,080·50	187·88	...	1·07	2·31	3,430·75	834·48	...
	From District generally:—											
	Sundry Parcels treated at:											
	State Battery, Sandstone	...	...	...	20·00	320·87	...	...	...	222·00	16,425·21	59·53
	State Battery, Youanmi ...	...	...	...	...	236·50	...	...	...	...	4,145·46	...
	Various Works ...	...	...	...	...	...	...	...	...	37·00	5,664·78	...
	Reported by Banks and Gold Dealers	...	...	...	...	...	...	1,353·43	11·43	...	...	...
		Total ...	**3·53**	**418·19**	**1,653·50**	**1,321·47**	...	**1,512·62**	**16,427·00**	**1,196,358·89**	**769,425·15**	**16,500·57**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

Murchison Goldfield.

CUE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926. Alluvial.	Total for 1926. Dollied and Specimens.	Total for 1926. Ore treated.	Total for 1926. Gold therefrom.	Total for 1926. Silver.	Total Production. Alluvial	Total Production. Dollied and Specimens.	Total Production. Ore treated.	Total Production. Gold therefrom.	Total Production. Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Barrambie ...	...	Voided leases	...	...	...	...	...	...	22·49	16,903·92	14,338·52	125·60
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	70·50	35·81	...
Cuddingwarra	1860	Big Bell	...	...	...	...	...	...	...	64,448·36	10,965·90	85·29
Do. ...	...	Voided leases	...	...	...	...	...	10·59	124·53	35,855·75	43,796·59	15·42
Do. ...	...	Sundry claims	2·43	9·29	33·30	74·08	...	2·43	91·39	903·73	1,303·52	...
Cue	(203), (1148) ...	(Cue Consolidated G.M.'s, Ltd.) ...	...	...	...	...	...	...	...	23,427·50	18,382·10	...
Do. ...	(203)	Cue No. 1	...	...	...	...	...	...	...	7,781·75	12,961·68	20·40
Do. ...	2049	Gem of Cue Extended	...	...	71·75	100·59	...	...	...	71·75	100·59	...
Do. ...	2046	Monte Carlo Bank	...	...	39·75	6·98	...	...	...	39·75	6·98	...
Do. ...	(2039)	Monte Carlo Bank	6·54	8·87	54·70	44·19	...	6·54	8·87	434·20	114·52	...
Do. ...	(2403)	Primrose	...	...	65·50	34·80	...	...	...	276·25	243·68	...
Do. ...	...	Voided leases	...	...	...	...	...	34·72	535·34	249,034·17	183,969·15	46·23
Do. ...	...	Sundry claims	20·83	8·20	229·10	200·63	...	71·37	613·00	18,411·99	11,240·24	...
Eelya ...	...	Voided leases	...	...	...	...	...	...	8·78	971·00	1,778·94	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	101·86	595·15	630·47	...
Errolls ...	...	Voided leases	...	...	...	...	...	...	20·25	14,098·50	8,902·24	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	227·00	92·86	...
Mindoolah ...	...	Voided leases	...	...	...	...	...	3·07	...	7,935·50	4,773·33	42·97
Do. ...	...	Sundry claims	...	...	...	...	...	...	9·81	1,017·00	1,130·39	...
Reedy's Find	1977	Emu: Mararoa G.M. Co., N.L. ...	...	...	...	...	...	...	...	555·50	280·88	...
Do. ...	1981	Emu North: Mararoa G.M. Co., N.L.	...	...	4,637·00	2,203·05	1·00	...	...	8,068·00	3,541·67	5·00
Do. ...	...	Voided leases	...	...	...	...	...	...	214·65	1,346·75	6,107·35	...
Do. ...	...	Sundry claims	...	2·74	54·20	277·18	...	169·59	89·74	505·50	672·27	...
Tuckabianna...	2048	Buttercup	...	...	282·75	61·79	...	...	...	282·75	61·79	...
Do. ...	...	Voided leases	...	...	...	...	...	...	162·70	3,020·00	4,302·51	...
Do. ...	...	Sundry claims	·62	...	377·50	304·99	...	24·06	102·14	876·25	605·39	...
Tuckanarra ...	(2042)	Lady Lucy	...	...	...	...	...	...	...	8·00	2·02	...
Do. ...	...	Voided leases	...	...	...	...	...	14·65	3,061·77	17,992·40	20,706·27	172·77
Do. ...	...	Sundry claims	2·80	...	199·00	114·91	...	99·95	618·36	4,013·73	7,687·89	...

		From District generally :—										
		Sundry Parcels treated at :										
		Cue No. 1 Works	...	...	...	...	...	...	...	1,870·50	6,684·54	...
		State Battery, Cue	...	...	...	665·51	...	...	...	...	2,512·47	...
		State Battery, Tuckanarra	...	...	...	28·73	...	...	...	518·50	3,954·23	...
		Triplicate Works	...	...	...	...	...	...	...	...	3,546·56	...
		Various Works	...	...	...	...	...	...	...	5,055·02	18,568·66	...
		Reported by Banks and Gold Dealers	·98	...	...	...	...	865·88	7·54	...	...	...
		Total	34·20	29·10	6,044·55	4,117·43	1·00	1,302·85	5,793·22	486,616·67	394,002·01	513·68

MEEKATHARRA DISTRICT.

Abbotts ...	...	Voided leases	...	...	...	...	...	...	26·45	35,210·60	37,124·40	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	·49	68·60	99·08	...
Burnakura ...	...	Voided leases	...	...	...	...	...	...	3,239·43	38,480·95	30,579·03	26·90
Do. ...	...	Sundry claims	...	...	...	...	...	12·51	81·11	144·50	118·98	...
Chesterfield ...	...	Voided leases	...	...	...	...	...	29·02	409·15	6,756·26	7,445·01	·80
Do. ...	...	Sundry claims	...	...	...	...	...	...	41·63	435·60	487·80	...
Gabanintha ...	...	Voided leases	...	...	...	...	...	...	16·93	21,918·00	13,447·58	815·57
Do. ...	...	Sundry claims	...	...	9·00	47·50	...	13·05	74·38	1,072·50	772·33	...
Garden Gully	...	Voided leases	...	...	...	...	...	26·36	74·91	29,854·06	21,435·37	1,102·59
Do. ...	...	Sundry claims	...	...	36·00	21·61	...	...	5·38	430·10	472·26	...
Gum Creek ...	...	Voided leases	...	...	...	...	...	25·27	88·12	3,639·08	3,359·56	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	338·00	278·36	...
Holden's Find	1291N	Waterloo	...	...	...	...	...	...	...	14,256·00	4,949·09	...
Do. ...	...	Voided leases	...	...	...	...	...	...	18·00	1,487·00	1,154·88	...
Do. ...	...	Sundry claims	...	...	24·25	22·41	...	164·95	44·63	230·25	195·97	...
Jillawarra ...	...	Voided leases	...	...	...	...	...	...	1,134·68	1,499·55	2,801·53	...
Do. ...	...	Sundry claims	...	...	...	...	...	169·94	142·95	23·50	53·81	...
Meeka Pools...	...	Voided leases	...	...	...	...	...	...	...	111·58	82·27	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	2·84	211·72	184·83	...
Meekatharra...	(597N)	Commodore	...	...	...	...	...	...	...	165·50	120·86	...
Do. ...	(597N)	(Commodore)	...	...	...	...	...	...	...	498·00	1,268·71	...
Do. ...	(597N), (915N), (1041N), (1365N)	(Commodore G.M. Co., N.L.) ...	...	...	...	...	...	...	...	40,527·00	16,121·38	3·32
Do. ...	1501N	Empire	...	...	38·00	106·26	...	...	39·89	380·75	913·28	...
Do. ...	477N	(Fenian)	...	...	...	...	...	...	...	8,831·75	18,289·22	...
Do. ...	477N, 814N ...	Fenian leases	...	...	...	67·97	...	...	...	313,485·94	254,989·70	...
Do. ...	(1331N)	Gwalia	...	...	...	...	...	...	132·98	4,327·25	9,660·97	...
Do. ...	(1326)	Gwalia Extended	...	...	11·00	53·41	...	...	...	136·00	394·16	...
Do. ...	1466N	Haveluck	...	...	57·75	44·80	...	...	...	628·00	986·55	...
Do. ...	1528N	Haveluck North	...	...	33·75	20·79	...	...	...	58·75	68·08	...
Do. ...	475N	(Ingliston Consols Extended) ...	...	...	...	...	...	...	...	1,536·25	4,248·25	·30
Do. ...	475N, 515N, 729N, 822N	Ingliston Consols Extended leases	...	...	46,145·00	21,777·87	...	...	...	450,690·22	235,645·57	...
Do. ...	1531N	Ingliston G.M. Co., N.L.	...	...	89·50	123·42	...	...	...	222·75	332·03	...
Do. ...	533N	Marmont	...	...	10·75	90·72	...	...	...	55,126·10	39,906·03	...

TABLE IV.—*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 1926.					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.
Meekatharra...	580N	(Marmont Extended)	...	...	...	...	...	...	...	43·00	38·03	...
Do. ...	580N, (888N) ...	(Marmont Extended leases) ...	...	...	...	...	...	...	...	152·00	129·61	...
Do. ...	(597N), (915N), (1041N), (1365N)	(New Commodore G.M. Co., N.L.) ...	...	...	...	...	...	...	...	127·10	76·78	...
Do. ...	1530N	United	...	...	150·25	140·07	...	...	...	224·25	290·15	...
Do. ...	...	Voided leases	...	...	...	...	...	3·88	465·44	307,617·04	165,532·72	2,451·42
Do. ...	...	Sundry claims	...	23·57	14·50	16·37	...	187·56	216·61	7,987·45	4,037·38	...
Mistletoe ...	1502N	Munarra	...	...	234·25	93·17	...	...	993·40	309·00	268·66	...
Do. ...	...	Voided leases	...	...	...	...	...	4·15	...	...	...	...
Do. ...	...	Sundry claims	...	...	...	...	...	113·64	63·65	...	...	...
Mt. Maitland	...	Sundry claims	...	...	..	...	...	...	...	41·25	96·25	...
Munara Gully	...	Voided leases	...	...	...	...	...	...	...	13,167·75	6,489·65	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	11·62	90·50	66·31	...
Nannine ...	166N	Nannine	...	...	...	...	...	...	218·15	267·00	772·96	...
Do. ...	(16N), (25N), 166N	(Nannine leases)	...	...	...	...	...	...	8·71	23,649·60	24,385·66	127·60
Do. ...	...	Voided leases	...	...	...	...	...	34·02	372·54	68,097·02	43,048·73	39·85
Do. ...	...	Sundry claims	...	...	...	...	...	74·53	418·05	2,482·45	1,991·28	...
Quinns ...	...	Voided leases	...	...	...	...	...	7·30	1,186·50	18,931·16	8,886·79	90·70
Do. ...	...	Sundry claims	1·43	...	...	...	...	15·07	1,172·91	1,671·50	1,458·18	...
Ruby Well ...	...	Voided leases	...	...	...	...	...	...	...	7,443·00	3,988·36	...
Do. ...	...	Sundry claims	297·54	...	...	...	...	998·30	389·32	261·00	341·66	...
Stake Well ...	...	Voided leases	...	...	...	...	...	...	200·12	21,362·00	9,566·18	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	31·79	286·50	301·26	...
Star of the East	...	Voided leases	...	...	...	...	...	...	...	27,244·00	20,305·40	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	127·62	94·97	...
Yaloginda ...	...	Voided leases	...	...	...	...	...	...	1,591·82	25,776·02	13,256·35	8·68
Do. ...	...	Sundry claims	...	...	98·00	138·68	...	13·82	536·58	2,234·17	1,918·37	...

	From District generally :—											
	Sundry Parcels treated at :											
	Ruby Well Battery		...	...	...	...	...	...	...	...	699·32	...
	State Battery, Meekatharra		...	...	...	354·33	...	...	...	14·00	11,900·33	19·00
	State Battery, Quinns		...	...	...	...	...	...	...	...	618·79	...
	Tumbulgum Sand Syndicate Works		...	...	...	...	...	...	...	...	205·95	...
	Various Works		...	...	...	...	...	...	...	172·75	4,475·42	342·17
	Reported by Banks and Gold Dealers		23·92	...	...	...	...	9,928·49	13·79	...	...	...
	Total		**322·89**	**23·57**	**46,952·00**	**23,119·38**	...	**11,821·86**	**13,464·95**	**1,562,561·24**	**1,033,228·43**	**5,028·90**

DAY DAWN DISTRICT.

Day Dawn ...	(557D) ...	Great Fingall No. 2	...	...	...	...	...	...	...	468·75	345·03	...
Do. ...	1D, 170D, 210D ...	Great Fingall leases	...	...	117·00	268·28	...	...	...	117·00	268·28	...
Do. ...	1D	(Great Fingall No. 1)	...	...	...	...	...	...	...	...	5·93	...
Do. ...	1D, (2D), (86D), (87D), (99D), (119D), (129D), (158D), (159D), 170D, (185D), (191D), (209D), 210D, (211D), (212D), (213D), (224D), (225D), (249D), (424D), (453D), (455D), (467D)	(Great Fingall Consolidated, Ltd.) ...	...	...	...	...	...	...	18·19	1,865,708·45	1,185,412·46	169,210·20
Do. ...	1D	(London, Australian, and General Exploration Co., Ltd.)	...	...	...	...	...	...	...	32·00	10·24	...
Do. ...	569D	South Fingall	...	...	359·00	138·99	...	...	...	1,135·75	541·95	...
Do. ...	...	Voided leases	...	...	...	...	...	160·64	545·37	45,558·63	30,974·34	·24
Do. ...	...	Sundry claims	9·25	4·03	437·50	212·95	...	33·99	304·36	4,505·66	2,828·69	...
Jasper Hill ...	...	Voided leases	...	...	...	...	...	4·90	1,210·23	16,080·75	9,369·47	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	401·27	358·50	468·44	...
Lake Austin (Island)	536D	Eureka	...	...	...	...	...	...	1,271·01	57·25	892·61	...
Do. ...	...	Voided leases	...	...	...	...	...	601·92	1,591·39	29,954·12	45,477·99	...
Do. ...	...	Sundry claims	...	...	33·00	23·68	...	36·49	567·57	929·64	568·48	...
Mainland ...	571D	Mainland Consols	...	550·32	24·00	297·65	...	...	590·51	24·00	297·65	...
Do. ...	...	Voided leases	...	...	...	...	...	·41	2,706·26	7,272·13	23,129·51	...
Do. ...	...	Sundry claims	...	...	...	...	...	3·24	677·12	103·95	164·86	...
	From District generally :—											
	Sundry Parcels treated at :											
	Neptune Works		...	...	...	...	...	...	...	...	160·57	...
	Various Works		...	...	...	...	...	...	16·61	940·75	1,537·30	...
	Reported by Banks and Gold Dealers		·18	...	...	...	...	1,606·99	3·48	...	·77	...
	Total		**9·43**	**554·35**	**970·50**	**941·55**	...	**2,448·58**	**9,903·37**	**1,973,247·33**	**1,302,454·57**	**169,210·44**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MOUNT MAGNET DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926.					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.
Lennonville ...	964M	(Empress)	...	...	...	...	...	...	...	1,649·00	7,361·81	...
Do. ...	964M	Empress	...	...	...	50·88	...	...	...	75·00	454·53	...
Do. ...	964M, (1078M), (1079M), (1115M), (1116M), (1117M)	(Empress leases)	...	...	...	...	...	...	...	4,813·00	3,171·33	...
Do. ...	...	Voided leases	...	...	...	...	...	...	3,196·79	134,931·23	113,240·12	458·82
Do. ...	...	Sundry claims	3·35	...	30·00	13·60	...	16·86	98·01	2,879·92	2,416·22	...
Mt. Magnet ...	1221M	Broken Bond	...	...	140·75	422·98	...	...	...	140·75	422·98	...
Do. ...	(1222M)	Christmas Gift	...	...	13·00	233·23	...	...	...	13·00	233·23	...
Do. ...	1215M	Hill 60	...	...	2,377·00	901·00	...	...	...	2,652·00	973·92	...
Do. ...	1156M	Leap Year	...	...	122·00	84·17	...	...	...	1,633·75	1,283·42	...
Do. ...	1201M	Neptune	...	...	40·00	60·26	...	...	...	312·75	451·87	...
Do. ...	1075M	New Haveluck	...	...	...	18·11	...	...	15·77	2,105·00	1,005·29	...
Do. ...	1225M	Poverty Pot	...	...	20·00	360·25	...	...	...	20·00	360·25	...
Do. ...	1216M	Revenue	...	...	11·00	40·17	...	...	...	44·75	631·31	...
Do. ...	(1209M)	Royal Consols	...	...	...	...	...	...	...	204·00	48·04	...
Do. ...	1220M	Rubicon	...	...	63·00	33·92	...	...	...	63·00	33·92	...
Do. ...	1224M	Saturn	...	41·00	162·00	166·31	...	...	41·00	162·00	166·31	...
Do. ...	...	Voided leases	...	...	...	...	...	27·83	8,409·19	368,288·11	208,926·12	714·36
Do. ...	...	Sundry claims	...	16·79	599·27	703·52	...	1·82	1,254·21	23,599·75	15,795·59	...
Mount Magnet, East	...	Voided leases	...	...	...	...	...	63·29	764·53	5,522·28	2,811·75	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	37·22	214·50	144·10	...
Moyagee ...	1217M	Moyagee	...	...	127·90	579·74	...	...	...	127·90	579·74	...
Do. ...	...	Voided leases	...	...	...	...	...	...	5·08	4,571·45	6,696·48	...
Do. ...	...	Sundry claims	2·83	...	3·50	27·20	...	2·83	111·10	661·73	762·65	...
Paynesville ...	1196M	Elsie	...	233·61	...	...	...	...	1,434·45	·25	101·95	...
Do. ...	...	Voided leases	...	...	...	...	...	...	178·89	39·02	69·52	...
Do. ...	...	Sundry claims	...	36·85	18·50	36·88	...	...	469·98	135·67	860·91	...
Youanmi ...	...	Sundry claims	...	...	...	...	...	...	...	33·00	44·58	...

		From District generally :—										
		Sundry Parcels treated at:										
		Fremantle Trading Co., Ltd., Works	...	...	...	...	...	...	...	...	143·80	...
		Long Reef Cyanide Works	...	...	...	49·87	...	...	...	...	253·65	...
		Morning Star Battery	...	...	...	...	...	...	...	...	874·80	...
		State Battery, Boogardie	...	...	...	216·85	...	...	...	92·51	16,917·93	...
		Various Works	...	...	...	...	...	...	...	43·06	15,828·72	1·00
		Reported by Banks and Gold Dealers	1·47	...	...	...	...	1,775·82	·35	...	...	...
		Total	**7·65**	**328·25**	**3,727·92**	**3,998·94**	...	**1,888·45**	**16,016·57**	**555,028·38**	**403,066·84**	**1,174·18**

Yalgoo Goldfield.

Adavale	...	Sundry claims	...	...	...	...	...	...	...	10·00	12·56	...
Bilberatha	...	Voided leases	...	...	...	...	...	...	...	554·00	200·07	...
Do.	...	Sundry claims	...	...	7·25	14·78	...	...	2·90	24·25	100·68	...
Carlaminda	...	Voided leases	...	...	...	...	...	...	...	947·32	524·72	3·30
Do.	...	Sundry claims	...	...	...	...	...	...	...	114·00	71·96	...
Field's Find	907	Brown's Reward	...	...	1,402·00	1,505·76	...	...	...	4,059·25	3,407·37	...
Do.	902	Field's Find Extended	...	...	...	...	...	...	10·38	31·50	31·35	...
Do.	(968)	Hayes Gold Mine	...	...	...	...	...	...	5·08	38·00	30·85	...
Do.	984	Mt. Guthrie	...	...	71·00	23·22	...	...	...	71·00	23·22	...
Do.	...	Voided leases	...	...	...	...	...	...	204·26	36,169·05	26,802·83	...
Do.	...	Sundry claims	...	...	245·00	180·58	...	5·77	163·59	944·00	788·69	...
Goodingnow	878	Carnation	...	...	41·50	52·42	...	...	...	2,983·00	4,767·47	...
Do.	980	Lake View	...	...	168·00	222·64	...	...	...	168·00	222·64	...
Do.	(606)	(Lake View)	...	...	...	...	...	...	...	163·00	185·46	...
Do.	(606)	Lake View: Payne's Find Development Co., N.L.	...	...	...	...	...	...	15·58	10,203·50	10,374·44	...
Do.	974	Princess Mary	...	...	...	...	...	...	...	38·00	36·01	...
Do.	(973)	Sweet William	...	...	59·00	69·78	...	...	...	371·00	771·77	...
Do.	...	Voided leases	...	...	...	...	...	146·70	257·15	14,942·06	17,968·59	...
Do.	...	Sundry claims	...	...	...	...	...	148·00	80·76	3,309·00	1,845·53	...
Gullewa	...	Voided leases	...	...	...	...	...	...	·78	23,074·50	15,137·98	...
Do.	...	Sundry claims	...	·44	8·50	8·90	...	...	15·20	703·75	582·34	...
Kirkalucka	...	Sundry claims	...	...	...	...	...	...	...	8·80	4·01	...
Messenger's Patch	880, 897	Brilliant G.M. Co., N.L.	...	...	6,739·00	3,493·58	333·18	...	...	7,618·00	4,040·36	333·18
Do.	(952)	Golden Monarch	...	...	...	...	...	...	·44	4·50	·81	...
Do.	880	(Gnow's Nest)	...	...	...	...	...	...	...	10,938·00	9,827·20	158·06
Do.	880, 897	(Gnow's Nest G.Ms., Ltd.)	...	...	...	...	...	...	...	6,175·00	6,709·40	363·97
Do.	...	Voided leases	...	...	...	...	...	...	321·36	587·26	382·29	...
Do.	...	Sundry claims	...	9·18	...	...	...	463·12	324·29	438·55	280·85	...
Mt. Farmer	...	Voided leases	...	...	...	...	...	...	...	64·00	40·19	...
Do.	...	Sundry claims	...	...	...	...	...	...	...	5·00	6·22	...
Mt. Gibson	...	Voided leases	...	...	...	...	...	...	6·44	434·50	803·57	...
Do.	...	Sundry claims	...	...	...	...	...	...	...	76·00	40·84	...
Ninghan	...	Voided leases	...	...	...	...	...	...	...	10·00	1·41	...
Do.	...	Sundry claims	...	...	...	...	...	...	...	5·00	17·89	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

YALGOO GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926. Alluvial.	Total for 1926. Dollied and Specimens.	Total for 1926. Ore treated.	Total for 1926. Gold therefrom.	Total for 1926. Silver.	Total Production. Alluvial	Total Production. Dollied and Specimens.	Total Production. Ore treated.	Total Production. Gold therefrom.	Total Production. Silver
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.	Fine ozs.	Fine ozs.
Noongal ...	953	Revival	...	...	93·00	87·69	...	...	...	1,145·00	673·30	...
Do. ...	...	Voided leases	...	...	...	...	...	...	15·86	3,086·95	1,847·66	...
Do. ...	...	Sundry claims	...	...	143·00	101·66	...	11·55	64·97	623·75	380·53	...
Nyounda ...	...	Voided leases	...	...	...	...	...	...	217·63	416·00	183·91	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·28	44·00	33·24	...
Pinyalling ...	...	Voided leases	...	...	...	...	...	...	1·36	2,281·60	902·03	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	2·59	160·50	132·57	...
Rothsay ...	...	Voided leases	...	...	...	...	...	...	...	9,360·25	3,560·38	...
Do. ...	...	Sundry claims	...	...	360·25	224·31	...	...	...	1,544·25	762·74	...
Wadgingarra...	...	Voided leases	...	...	...	...	...	...	...	541·61	600·91	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	71·50	38·21	...
Warda Warra	982	Western Queen	...	...	20·00	6·44	...	...	...	20·00	6·44	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	15·50	14·88	...
Do. ...	...	Sundry claims	...	...	61·00	43·30	...	...	...	127·00	96·70	...
Warriedar ...	...	Voided leases	...	...	...	...	...	...	...	12,122·00	4,313·13	7·30
Do. ...	...	Sundry claims	...	...	187·25	70·93	...	...	2·84	1,889·85	709·92	...
Yalgoo ...	...	Voided leases	...	...	...	...	...	...	3·23	6,314·50	9,965·18	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	19·89	856·50	518·75	...
Yuin ...	976	Royal Standard	...	...	...	79·70	...	...	...	...	79·70	...
Do. ...	...	Voided leases	...	...	...	...	...	...	127·12	66,048·50	27,188·08	130·13
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·70	279·50	59·20	...
	From Goldfield generally :—											
	Sundry Parcels treated at :											
		Field's Find Extended Treatment Works ...	...	...	...	...	...	...	...	...	152·40	...
		Goodingnow (Payne's Find) State Battery ...	...	...	...	12·27	...	...	...	38·50	1,946·28	...
		State Battery Warriedar	...	...	...	163·65	...	...	...	...	3,474·56	...
		Yuanmi G.M.'s, Ltd.. Works	...	...	...	...	...	...	...	...	310·93	26·67
		Various Works	...	...	...	...	...	9·42	...	664·00	1,332·45	...
		Reported by Banks and Gold Dealers	10·95	...	...	...	...	804·93	...	...	...	...
		Total	**10·95**	**9·62**	**9,605·75**	**6,361·61**	**333·18**	**1,589·49**	**1,872·68**	**232,934·05**	**165,325·65**	**1,022·61**

Mount Margaret Goldfield.

MOUNT MORGANS DISTRICT.

Australia United	...	Voided leases	...	...	...	...	...	...	1,911·63	15,913·69	23,305·76	1·76
Do. ...	...	Sundry claims	...	...	...	...	...	...	580·98	799·25	2,072·62	...
Eucalyptus ...	...	Sundry claims	...	...	77·50	101·64	...	...	...	88·50	107·04	...
Federation Well	...	Voided leases	...	...	...	...	...	...	...	1,248·50	1,782·71	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	108·07	64·68	...
Korong ...	...	Voided leases	...	...	...	...	...	17·95	72·23	2,722·00	3,473·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	34·97	279·28	232·89	...
Linden ...	346F, [1024R] ...	Great Carbine	...	...	...	...	...	...	...	136·50	41·07	...
Do. ...	341F, [903R], 343F, [985R]	Torquay leases	...	...	600·00	214·35	...	...	...	6,223·53	3,806·97	·68
Do. ...	...	Voided leases	...	...	...	...	...	...	...	26,124·75	12,939·25	...
Do. ...	...	Sundry claims	...	...	102·50	182·04	...	...	...	1,159·25	910·39	...
Mt. Margaret	...	Voided leases	...	...	...	...	...	·37	...	6,412·89	4,290·53	12·55
Do ...	...	Sundry claims	...	...	...	...	...	16·61	62·05	366·10	289·21	...
Mt. Morgans	5F, (10F), (19F), (22F),(32F), (73F)	(Westralia Mt. Morgans G.M.Co. Ltd.)	...	...	...	...	...	...	...	575,148·00	294,758·28	5,552·63
Do. ...	7F, (20F), (21F) ...	(Westralia Mt. Morgans G.M. Co., Ltd.)	...	...	...	...	...	...	...	18,261·00	8,127·69	...
Do. ...	5F, (6F), 7F, (10F), (19F) (20F), (22F), (32F), 301F	Westralia Mt. Morgans Mines, N.L. ...	...	...	13,295·00	4,330·16	...	...	...	186,798·82	51,362·70	...
Do. ...	...	Voided leases	...	...	...	...	...	...	76·56	38,923·75	22,769·63	77·86
Do. ...	...	Sundry claims	2·06	...	...	...	...	8·67	22·66	1,392·29	1,704·22	...
Murrin Murrin	...	Voided leases	...	...	...	...	...	10·43	222·93	128,706·22	101,163·09	29·60
Do. ...	...	Sundry claims	...	8·10	102·50	36·51	...	...	245·90	1,595·05	1,654·86	...
Redcastle ...	...	Voided leases	...	...	...	...	...	4·49	436·54	2,509·95	2,169·63	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	103·58	139·00	163·01	...
Yundamindera	...	Voided leases	...	...	...	...	...	...	...	2,553·50	2,093·61	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	2·35	787·60	491·70	...
	From District generally:—											
	Sundry Parcels treated at:											
	Battlesville Battery		...	...	...	...	...	...	...	126·00	370·00	15·94
	Hainault Sulphide Plant, Kalgoorlie		...	...	...	...	...	...	...	127·21	83·91	...
	Mt. Morven Cyanide Works		...	...	...	...	...	...	...	...	129·48	...
	State Battery, Linden		...	...	...	72·13	...	...	...	10·00	1,981·34	...
	Westralia Mt. Morgans Works		...	...	...	...	...	...	...	...	153·10	...
	Various Works		...	...	...	...	...	...	...	788·50	3,010·07	84·03
	Reported by Banks and Gold Dealers		37·08	...	...	...	...	1,746·60	32·47	...	...	...
	Total		39·14	8·10	14·177·50	4,936·83	...	1,805·12	3,804·85	1,019,449·20	545,502·89	5,775·05

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

MT. MARGARET GOLDFIELD—*continued.*

MOUNT MALCOLM DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926.					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
Cardina ...	...	Voided leases	...	...	...	...	...	13·87	1,591·66	1,631·74	3,613·33	...
Do. ...	...	Sundry claims	1·21	2·33	...	...	...	3·40	24·70	60·00	89·52	...
Diorite King	...	Voided leases	...	...	...	...	...	...	845·23	34,659·03	31,744·34	24·05
Do. ...	...	Sundry claims	...	...	...	...	...	9·06	148·62	2,664·80	3,189·00	...
Dodger's Well	...	Voided leases	...	...	...	...	...	...	57·90	1,299·30	1,927·94	...
Do. ...	...	Sundry claims	·95	...	...	...	...	·95	3·37	798·75	665·13	...
Lake Darlot...	...	Voided leases	...	...	...	...	...	...	...	1,048·11	450·52	...
Do. ...	...	Sundry claims	63·04	...	20·00	2·04	...	63·04	5·52	599·20	146·05	...
Leonora ...	198c	(Eastern)	...	...	...	...	...	...	...	302·00	321·72	...
Do. ...	190c, 198c 207c, 352c, 353c, 380c, 446c, 447c, (450c), (476c), 489c, 490c, 504c, (523c), 741c, 742, 807c, 809c, 811c, 812c, (813c), (814c), 980c, (981c), 1082c, (1225c), (1226c), (1227c), (1228c), (1229c), (1230c), (1231c), (1232c) 1259c, (1291c) (1292c), 1341, 1342, (1343c), (1344c), (1345c), (1346c), (1347c)	Sons of Gwalia, Ltd	...	...	103,627·00	36,569·02	3,404·91	...	...	2,968,356·67	1,392,593·57	89,442·06
Do. ...	198c, 1082c ...	(Sons of Gwalia South G.M.Co.,N.L.)	...	...	...	...	...	...	...	631·00	903·61	...
Do. ...	198c, 1082c, (1257c), (1258c), 1259c, (1284c), (1285c), (1300c), (1301c)	(Sons of Gwalia South G.M.'s, Ltd. ...	...	...	...	...	...	...	...	98,239·00	5,193·99	8·66
Do. ...	198c, 1082c, 1259c	(Sons of Gwalia South G.M.'s, Ltd.) ...	...	...	...	...	...	...	...	9,909·00	3,169·89	...
Do. ...	(263c)	(Trump)	...	...	...	...	...	...	...	562·50	2,393·40	...

Do. ...	(263c)	Trump: Gwalia Central GM.'s, Ltd.	...	...	...	...	...	...	...	1,541·00	3,220·24	...
Do. ...	(263c), (774c), (793c)	(Trump leases)	...	...	...	...	...	...	...	21,794·45	16,002·07	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,852·57	138,837·00	66,251·69	10·71
Do. ...	...	Sundry claims	6·55	10·36	8·00	11·90	...	30·31	329·78	10,695·05	9,399·76	...
Mt. Malcolm ...	...	Voided leases	...	...	...	...	...	...	47·07	62,301·78	47,425·54	...
Do. ...	...	Sundry claims	...	...	12·75	5·23	...	5·75	26·50	3,073·65	2,121·73	...
Mertondale ...	...	Voided leases	...	...	...	...	...	...	...	88,663·00	60,840·00	1,497·58
Do. ...	...	Sundry claims	...	...	...	...	...	1·45	63·04	1,092·46	1,538·97	...
Mt. Clifford ...	1329c	Victory No. 1	...	...	51·00	28·63	...	...	249·29	2,475·46	7,854·66	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,364·45	3,381·50	7,339·23	...
Do. ...	...	Sundry claims	28·44	2·28	5·25	16·66	...	47·71	273·83	1,042·75	1,641·91	...
Pig Well ...	1547c	Starlight	...	...	...	...	...	...	...	12·00	3·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	13,575·32	14,673·13	63·68
Do. ...	...	Sundry claims	...	...	...	...	...	...	34·61	2,738·40	1,160·33	...
Randwick ...	...	Voided leases	...	...	...	...	...	...	239·49	8,065·15	8,671·57	...
Do. ...	...	Sundry claims	...	...	...	...	...	66·57	159·37	1,282·14	944·20	...
Webster's Find	...	Voided leases	...	...	...	...	...	30·30	...	21,760·00	13,970·17	...
Do. ...	...	Sundry claims	·47	·79	...	...	...	36·84	16·52	1,397·80	939·58	...
Wilson's Creek	...	Voided leases	...	...	...	...	...	...	...	333·50	168·27	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	4·24	5·00	19·04	...
Wilson's Patch	...	Voided leases	...	...	...	...	...	...	99·38	27,395·10	12,638·18	1·05
Do. ...	...	Sundry claims	...	1·06	...	...	...	4·68	13·73	814·00	1,086·36	...
	From District generally:—											
	Sundry Parcels treated at:											
	Fremantle Trading Co., Ltd., Works		...	...	...	...	...	...	...	...	1·42	...
	State Battery, Leonora		...	...	...	75·39	...	...	...	103·00	11,334·80	98·14
	Various Works		...	...	...	...	...	...	...	371·50	7,149·72	20·12
	Reported by Banks and Gold Dealers		...	...	...	...	...	2,483·14	131·00	...	...	...
		Total	**100·66**	**16·82**	**103,724·00**	**36,708·87**	**3,404·91**	**2,797·07**	**7,581·87**	**3,533,512·11**	**1,789,198·03**	**91,166·05**

MOUNT MARGARET DISTRICT.

Burtville ...	2138T ...	Nil Desperandum	...	...	15·75	188·18	...	...	...	565·62	1,697·42	...
Do. ...	...	Voided leases	...	...	...	...	...	2·29	413·80	66,801·18	103,935·19	275·27
Do. ...	...	Sundry claims	...	11·44	...	...	...	...	133·54	3,261·90	2,942·79	...
Duketon ...	...	Voided leases	...	...	...	...	...	3·54	3,213·21	31,485·42	22,318·21	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	65·43	238·50	370·38	...
Eagle's Nest	...	Voided leases	...	...	...	...	...	...	145·34	331·00	1,215·78	...
Do. ...	...	Sundry claims	·59	33·87	...	...	...	11·45	428·41	147·50	133·96	...
Erlistoun ...	2113T	Baneygo North	...	...	...	...	...	...	...	587·00	182·55	...
Do. ...	2141T, 2145T ...	King of Creation leases ...	...	...	855·00	401·19	...	...	...	855·00	401·19	...
Do. ...	...	Voided leases	...	...	...	...	...	...	11·66	27,012·07	18,461·35	...
Do. ...	...	Sundry claims	...	...	...	...	...	1,179·43	116·81	2,189·24	1,964·86	...

TABLE IV.—*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 1926.					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.
Euro	...	Voided leases	...	...	...	...	...	...	65·14	91,556·25	37,582·89	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	46·52	259·50	370·57	...
Laverton ...	(2083T)	Beria Main Reef	...	...	...	...	...	...	...	1,205·50	192·85	...
Do. ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T)	(Kalgoorlie and Boulder Firewood Co., Ltd.)	...	...	...	...	...	...	...	71,802·00	25,003·11	3,364·01
Do. ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T)	(Lancefield G.M. Co., Ltd.)	...	...	...	...	...	...	...	102,179·78	39,402·81	...
Do. ...	**715T, 806T, (1206T),** (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T),	(Lancefield G.M.'s Co., Ltd.) ...	...	...	...	...	...	...	...	153,829·00	58,842·47	5,824·39
Do. ...	715T, 806T, (1206T), (1207T), (1483T), (1523T), (1524T), (1525T), (1542T), (1544T), (1548T),	(Lancefield G.M. Co., Ltd.)	...	...	...	...	...	...	...	260,749·00	103,535·54	21,612·29
Do. ...	715T, 806T, (1206T), (1523T), (1524T), (1525T), (1542T), (2050T), (2051T)	Lancefield G.M.'s, Ltd.	...	...	·27	1,000·57	...	...	...	352,730·05	131,132·23	21,081·58
Do. ...	2200T	Pinnacles	...	...	...	...	...	...	...	18·00	5·93	...
Do. ...	...	Voided leases	...	...	...	...	...	17·66	2,024·11	456,060·24	260,674·99	4,674·69
Do. ...	...	Sundry claims	3·06	...	11·75	18·41	...	209·18	1,396·48	5,196·45	4,984·22	...
Mt. Barnicoat	...	Voided leases	...	...	...	...	...	...	...	652·00	359·12	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	23·00	23·37	...
Mt. Shenton	...	Voided leases	...	...	...	...	...	...	...	15·00	26·65	...
Quartz Hill ...	...	Voided leases	...	...	...	...	...	...	...	10·00	3·86	...
Red Hill ...	...	Sundry claims	...	...	...	...	...	...	...	27·00	13·76	...

		From District generally :—										
		Sundry Parcels treated at :										
		Brown Hill Consols Works, Kalgoorlie ...	...	...	...	...	...	...	...	...	13·70	...
		Mulga Queen Works	...	...	...	...	...	...	...	6·00	181·20	...
		State Battery, Laverton	...	...	20·00	160·20	...	...	...	97·50	2,865·39	15·64
		Various Works	...	...	...	...	...	...	...	151·00	9,603·44	...
		Reported by Banks and Gold Dealers	...	...	...	...	...	2,026·44	...	...	...	...
		Total	**3·65**	**45·31**	**902·77**	**1,768·77**	...	**3,449·99**	**8,060·45**	**1,630,041·70**	**828,441·78**	**56,847·87**

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale ...	5217z	(Gladsome)	...	...	...	...	...	...	...	10,879·50	8,678·16	95·29
Do. ...	5217z, (5333z), (5380z), 5476z	Gladsome leases	...	...	...	...	...	...	...	64,875·00	50,329·09	1,410·36
Do. ...	5410z	Lake View	...	...	87·25	8·09	...	...	10·04	1,135·65	295·85	...
Do. ...	...	Voided leases	...	...	...	...	...	...	409·70	147,111·07	119,022·33	3,839·28
Do. ...	...	Sundry claims	...	...	12·00	1·59	...	...	34·99	918·94	632·03	...
Goongarrie ...	...	Voided leases	...	...	...	...	...	·94	1,027·51	27,198·29	17,428·84	...
Do. ...	...	Sundry claims	1·04	88·37	49·00	175·85	...	38·81	769·75	1,370·27	1,683·47	...
Menzies ...	(5489z)	Crusoe	...	5·00	...	...	...	...	21·51	200·05	621·90	...
Do. ...	5423z	Lady Shenton	...	...	...	...	...	...	...	5,289·58	4,207·03	...
Do. ...	(4931z), (4934z), (4935z), (4936z), (5074z), (5075z), (5260z), (5261z), (5315z)	Menzies Consolidated G.M.'s, Ltd.) ...	...	...	...	607·25	...	...	...	515,822·46	272,226·99	78·67
Do. ...	5504z	Scandinavia	...	...	40·00	27·97	...	...	...	40·00	27·97	...
Do. ...	5484z	Warrior	...	...	127·00	60·45	...	...	...	983·00	466·97	...
Do. ...	...	Voided leases	...	...	...	...	...	45·42	1,049·04	373,305·96	423,936·52	11,263·06
Do. ...	...	Sundry claims	·36	10·68	218·75	781·31	...	44·48	372·98	20,428·39	15,397·59	776·49
Mt. Ida ...	5503z	Adventure	...	1·19	...	...	...	...	1·19	...	...	...
Do. ...	5500z, 5501z, 5502z	Elsie May leases	...	...	5·00	1·85	...	...	...	5·00	1·85	...
Do. ...	5480z, 5481z ...	Unexpected leases	...	...	60·00	71·08	...	...	...	765·00	402·57	...
Do. ...	5481z	(Unexpected South)	...	...	...	...	...	...	...	36·00	29·45	...
Do. ...	...	Voided leases	...	...	...	...	...	...	77·07	57,882·37	68,229·23	106·63
Do. ...	...	Sundry claims	...	...	189·00	108·44	...	43·79	9·57	5,583·00	3,196·79	...
		From District generally :—										
		Sundry Parcels treated at :										
		Balkis Battery	...	...	...	...	...	...	...	65·75	4,648·28	...
		Boddington's Cyanide Works	...	...	...	...	...	...	...	...	1,069·35	...
		Crusoe Wedderburn Cyanide Works	...	...	...	...	...	...	...	...	1,497·89	...
		Fremantle Trading Co., Ltd., Works	...	...	...	...	...	...	...	...	212·98	...
		Gidney's Cyanide Works	...	...	...	...	...	...	...	...	906·97	585·27
		Lady Harriet Battery	...	...	...	189·22	...	...	...	279·50	4,702·21	30·00
		Menzies Mining & Exploration Corporation, Ltd.	...	...	...	...	...	...	...	639·50	732·04	...
		Mt. Ida State Battery	...	...	...	...	...	...	...	1,842·25	5,028·57	...
		Various Works	...	...	...	...	...	...	...	1,807·05	23,641·87	1,039·43
		Reported by Banks and Gold Dealers	...	...	...	...	...	969·83	195·48	...	...	...
		Total	**1·40**	**105·24**	**788·00**	**2,033·10**	...	**1,143·27**	**3,978·83**	**1,238,463·58**	**1,029,254·79**	**19,224·48**

TABLE IV.—*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 1926. Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Total Production. 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 ...	...	Voided leases	...	...	...	...	...	2·93	138·99	155,644·73	123,063·43	5,403·14
Do. ...	...	Sundry claims	...	...	...	...	...	...	30·12	5,999·15	3,219·41	...
Diemel's Find	...	Sundry claims	...	...	...	...	...	...	7·37	102·50	119·13	...
Mulline ...	...	Voided leases	...	...	...	...	...	...	274·09	98,230·72	98,844·73	530·75
Do. ...	...	Sundry claims	...	10·55	...	·75	...	...	53·82	7,122·60	5,061·70	·69
Mulwarrie ...	...	Voided leases	...	...	...	...	...	...	56·84	18,440·68	25,625·54	38·47
Do. ...	...	Sundry claims	...	...	...	...	...	...	21·45	2,099·07	1,888·49	...
Ularring ...	...	Voided leases	...	...	...	...	...	...	563·34	9,429·60	13,647·97	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	143·00	113·15	...
	From District generally:—											
	Sundry Parcels treated at:											
	Hannan's Central Battery, Kalgoorlie		...	...	...	...	...	...	...	18·40	4·66	...
	State Battery, Mulline		...	...	...	99·69	...	...	...	538·50	13,310·97	...
	State Battery, Mulwarrie		...	...	...	...	...	...	...	613·18	4,821·30	...
	Various Works		...	...	...	...	...	...	15·82	186·75	654·37	...
	Reported by Banks and Gold Dealers		...	...	...	...	...	19·24	·77	...	...	...
		Total	...	**10·55**	...	**100·44**	...	**22·17**	**1,162·61**	**298,568·88**	**290,374·85**	**5,973·05**

NIAGARA DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926. Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Total Production. Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
Desdemona ...	...	Voided leases	...	...	...	...	...	...	5·73	9,585·25	7,471·39	12·04
Do. ...	...	Sundry claims	...	...	...	...	...	...	8·99	1,331·70	634·19	...
Kookynie ...	780G	Cosmo	...	...	...	...	...	...	3·27	66·99	217·78	...
Do. ...	(769G)	(Two D's)	...	...	...	...	...	...	...	100·00	14·01	...
Do. ...	(769G), (770G), (771G)	Two D's leases	...	...	...	...	...	...	...	950·00	590·26	...
Do. ...	...	Voided leases	...	...	...	...	...	...	264·29	734,280·94	388,565·03	5,375·97
Do. ...	...	Sundry claims	8·49	...	...	...	...	39·08	93·85	4,931·85	4,438·09	...
Niagara ...	...	Voided leases	...	...	...	...	...	...	104·54	84,472·50	51,887·97	...
Do. ...	...	Sundry claims	2·65	...	...	...	...	23·29	70·23	9,880·41	6,084·35	...
Tampa ...	...	Voided leases	...	...	...	...	...	...	35·94	49,285·87	22,246·08	174·24
Do. ...	...	Sundry claims	...	...	9·35	18·15	...	28·21	244·17	3,221·35	1,912·63	...

		From District generally :—										
		Sundry parcels treated at :										
		Grafter Battery	...	...	...	...	...	...	...	98·00	448·91	...
		Hainault Sulphide Plant, Kalgoorlie	...	...	...	...	...	...	...	...	9·03	...
		Lubra Queen G.M. Co., N. L. Works	...	...	...	...	...	...	...	...	153·47	...
		State Battery, Niagara	...	...	...	9·79	...	...	...	671·50	8,955·70	...
		Various Works	...	...	...	...	...	...	...	451·00	6,356·43	41·17
		Reported by Banks and Gold Dealers	...	...	...	...	...	1,435·20	787·38	...	...	...
		Total	**11·14**	...	**9·35**	**27·94**	...	**1,525·78**	**1,618·39**	**899,327·36**	**499,985·32**	**5,603·42**

YERILLA DISTRICT.

Edjudina ...	1078R	Ace of Hearts	...	...	32·50	17·48	...	...	...	32·50	17·48	...
Do. ...	1062R	Martin	...	...	...	...	...	...	...	121·25	98·66	...
Do. ...	1011R	Neta	...	...	...	...	...	...	...	156·75	102·56	...
Do. ...	(1010R), 1011R ...	(Neta leases)	...	...	...	...	...	...	...	407·00	340·01	...
Do. ...	1077R	New Glengarry	...	...	62·75	21·26	...	...	...	62·75	21·26	...
Do. ...	...	Voided leases	...	...	...	...	...	...	18·44	32,203·20	41,731·77	37·79
Do. ...	...	Sundry claims	...	...	115·25	58·10	...	...	21·26	3,868·83	3,215·64	...
Eucalyptus ...	...	Voided leases	...	...	...	...	...	...	2,864·77	1,351·35	3,020·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	367·50	362·50	381·82	...
Linden ...	1024R, [346F] ...	Great Carbine	...	...	...	...	...	...	...	67·75	20·30	...
Do. ...	903R, [341F], 985R, [343F]	Torquay leases	...	...	...	...	...	...	...	325·68	107·45	...
Do. ...	903R, [341F], (904R), 985R, [343F], (992R)	(Westralia United Goldfields, Ltd.)	...	...	...	...	...	...	...	1,995·00	1,452·42	...
Do. ...	...	Voided leases	...	...	...	...	...	7·53	553·16	17,179·60	22,098·74	...
Do. ...	...	Sundry claims	...	...	...	...	...	77·81	35·11	6,493·25	4,798·42	...
Mt. Celia ...	...	Voided leases	...	...	...	...	...	...	...	14·00	5·39	...
Mt. Howe ...	...	Sundry claims	...	...	...	...	...	...	...	5·00	11·13	...
Mt. Remarkable	...	Voided leases	...	...	...	...	...	...	17·74	528·72	415·09	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	4·00	1·32	...
Pingin ...	...	Voided leases	...	...	...	...	...	...	46·99	14,637·80	10,306·68	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	99·36	3,422·35	2,297·51	...
Yarri ...	...	Voided leases	...	...	...	...	...	6·30	87·08	37,835·25	19,760·20	2·00
Do. ...	...	Sundry claims	...	...	216·25	61·72	...	·87	5·31	6,454·35	3,298·46	...
Yerilla ...	...	Voided leases	...	...	...	...	...	...	3,089·51	15,619·21	12,313·06	13·93
Do. ...	...	Sundry claims	...	...	...	...	...	19·30	15·88	2,401·00	1,338·07	...
Yilgangie ...	...	Voided leases	...	...	...	...	...	...	...	218·75	295·45	...
Do. ...	...	Sundry claims	...	...	...	...	...	121·67	29·83	40·50	65·53	...
Yundamindera	...	Voided leases	...	...	...	...	...	...	80·47	69,067·85	46,004·87	5·82
Do. ...	...	Sundry claims	...	...	...	...	...	...	85·22	3,151·25	2,740·75	...

Table IV.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH COOLGARDIE GOLDFIELD—*continued.*

YERILLA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926. Alluvial.					Total Production. Alluvial.				
			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.
		Fcom District generally :—										
		Sundry parcels treated at:										
		Battles Ville Battery	...	...	...	...	...	...	...	...	621·83	...
		Fremantle Trading Co., Ltd., Works	...	...	...	...	...	...	...	...	4·92	...
		Neta Battery	...	...	...	1·68	...	...	...	...	327·37	...
		State Battery, Linden	...	...	...	...	...	...	...	72·00	4,030·90	...
		State Battery, Yarri	...	...	...	21·89	...	...	...	251·50	5,016·74	3·50
		State Battery, Yerilla	...	...	...	...	...	2·17	...	72·00	1,257·22	...
		Various Works	...	...	...	...	...	...	...	786·35	5,277·20	...
		Reported by Banks and Gold Dealers	...	...	...	...	...	1,011·56	154·74	...	...	...
		Total	...	...	**426·75**	**182·13**	..	**1,247·21**	**7,572·37**	**219,209·29**	**192,796·90**	**63·04**

Broad Arrow Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	1926 Alluvial.	1926 Dollied and Specimens.	1926 Ore treated	1926 Gold therefrom.	1926 Silver	Total Alluvial.	Total Dollied and Specimens.	Total Ore treated.	Total Gold therefrom.	Total Silver.
Bardoc ...	1833w	Zoroastrian	...	...	...	...	...	...	23·25	22·45	106·77	...
Do. ...	...	Voided leases	...	...	...	...	...	...	1,863·68	73,236·55	51,823·64	203·60
Do. ...	...	Sundry claims	...	...	...	...	...	53·82	578·02	3,537·58	3,071·74	...
Black Flag ...	...	Voided leases	...	...	...	...	...	27·81	373·99	40,332·13	24,451·48	...
Do. ...	...	Sundry claims	...	...	...	...	...	710·99	180·49	2,181·08	2,063·02	...
Broad Arrow	(1938w)	New Mexico	...	...	95·50	33·05	...	...	...	131·63	40·17	...
Do. ...	1771w	North Duke	...	...	...	...	...	...	1,533·79	153·30	592·36	...
Do. ...	1933w	Oversight Tara United	...	313·58	54·29	210·16	...	...	384·78	145·29	306·54	...
Do. ...	...	Voided leases	...	...	...	...	...	54·85	6,915·18	119,452·61	102,225·93	18·85
Do. ...	...	Sundry claims	...	...	28·75	29·50	...	987·53	1,289·23	9,430·20	7,098·75	...
Canegrass ...	...	Voided leases	...	...	...	...	...	...	...	89·10	133·13	...
Do. ...	...	Sundry claims	...	17·26	13·00	146·20	...	...	218·84	39·00	268·29	...
Carnage ...	...	Voided leases	...	...	...	...	...	...	...	138·00	251·97	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	81·00	57·26	...
Paddington ...	...	Voided leases	...	...	...	...	...	5,557·72	257·75	175,109·58	82,198·30	18·96
Do. ...	...	Sundry claims	...	...	10·50	2·82	...	1,714·16	2·13	10,491·18	6,691·11	...
Siberia ...	1336w, 1339w ...	Associated Northern Blocks (W.A.), Ltd.	...	...	...	...	...	...	...	7,927·61	6,416·16	...
Do. ...	1399w, (1424w), (1429w), (1442w), (1655w)	(Associated Northern Blocks (W.A.), Ltd.)	...	...	...	...	...	...	...	247,585·84	91,053·70	1,664·70
Do. ...	1935w	Exchequer	...	...	35·00	69·10	...	...	...	120·50	202·61	...
Do. ...	1371w	Gimblet South	...	...	...	...	...	...	...	72,401·22	12,191·04	...

Do. ...	1399w	(Gimblet South Extended) ...	...	...	...	...	...	...	...	525·00	835·44	...
Do. ...	1399w, (1424w), (1429w), (1442w)	(Gimblet South Extended leases)	...	...	...	...	...	...	...	215·00	39·98	...
Do. ...	1289w	Lady Evelyn	...	...	...	...	...	...	...	902·00	1,577·19	...
Do. ...	1289w, (1308w) ...	(Lady Evelyn leases)	...	...	...	...	...	...	25·26	5,376·25	5,267·70	...
Do. ...	(1929w)	Mopoke	...	...	216·00	24·44	...	...	...	586·00	79·73	...
Do. ...	1906w	Orinda	...	...	160·50	121·44	...	...	...	1,895·00	1,628·30	...
Do. ...	1914w	Renown	...	23·35	10·50	15·03	...	...	529·85	125·00	270·87	...
Do. ...	1375w	(Siberia Consols)	...	...	...	...	...	...	41·58	1,013·50	3,136·03	...
Do. ...	1375w	Siberia Consols	...	...	50·00	38·80	...	...	46·30	659·75	1,342·39	...
Do. ...	1375w, (1610w), (1720w)	(Siberia Consols G.M. Co., N.L.) ...	...	...	...	...	...	...	39·23	352·50	598·52	...
Do. ...	1336w	(Slippery Gimblet)	...	...	...	...	...	...	...	26,110·50	8,217·79	...
Do. ...	1336w, (1338w), (1419w)	(Slippery Gimblet leases: Associated Northern Blocks (W.A.), Ltd.)	...	...	...	...	...	...	...	6,897·00	2,528·10	...
Do. ...	1936w	Wentworth	...	...	232·50	134·14	...	...	...	555·50	282·74	...
Do. ...	(1939w)	Windstorm	...	...	72·00	12·23	...	...	...	94·50	27·97	...
Do. ...	...	Voided leases	...	...	...	...	...	...	789·17	25,021·42	14,646·22	...
Do. ...	...	Sundry claims	...	15·68	...	...	...	238·08	782·57	14,355·79	9,524·76	...
Smithfield ...	...	Voided leases	...	...	...	...	...	...	...	1,027·00	200·90	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	23·79	82·00	185·24	...
	From Goldfield generally:—											
	Sundry Parcels treated at:											
	Brown Hill Consols Works, Kalgoorlie ...		...	...	...	...	...	...	...	38·99	15·32	...
	Fremantle Trading Co., Ltd., Works		...	...	...	...	...	...	...	...	80·10	...
	Hannans Central Works, Kalgoorlie		...	...	...	...	...	...	...	8·70	15·47	...
	Hainault Sulphide Plant, Kalgoorlie		...	...	...	...	...	...	...	...	9·57	...
	Pole Works		...	...	...	...	...	...	...	...	356·07	...
	Regan's Carnage Battery		...	...	...	...	...	...	...	27·00	598·81	...
	State Battery, Ora Banda		...	...	...	193·61	...	...	...	72·05	2,565·17	...
	State Battery, Siberia		...	...	...	...	...	...	...	40·00	1,102·96	...
	Zoroastrian Works		...	...	...	...	...	...	...	116·50	1,082·23	...
	Various Works		...	...	...	...	...	2,271·17	...	16,622·68	31,760·91	278·85
	Reported by Banks and Gold Dealers		60·10	...	...	...	...	7,901·34	...	...	...	...
		Total	**60·10**	**369·87**	**978·54**	**1,030·52**	...	**19,517·47**	**15,898·88**	**865,325·48**	**479,220·45**	**2,184·96**

North-East Coolgardie Goldfield.

KANOWNA DISTRICT.

Black Swan	...	Voided leases	...	...	...	...	...	...	...	160·00	141·76	...
Gambier ...	...	Voided leases	...	...	...	...	...	...	38·73	12,729·00	6,638·30	·07
Do. ...	...	Sundry claims	...	...	...	...	...	24·70	245·94	858·75	750·42	...
Gindalbie ...	...	Voided leases	...	...	...	...	...	...	19·94	43,613·28	39,438·75	38·31
Do. ...	...	Sundry claims	...	...	10·50	9·64	...	...	674·82	1,061·77	1,240·06	...
Gordon ...	1467x	Sirdar	...	194·18	569·50	1,000·51	...	...	194·18	569·50	1,000·51	...
Do. ...	...	Voided leases	...	...	...	...	...	...	282·64	46,428·23	13,630·96	...
Do. ...	...	Sundry claims	...	44·76	36·00	6·14	...	...	99·41	666·50	583·94	...
Kanowna ...	1461x	Golden Eagle: North White Feather G.M.'s, Ltd.	...	15·56	66·00	75·01	...	...	15·56	66·00	75·01	...
Do. ...	1389x	Golden Valley	...	...	195·00	186·21	...	...	...	6,817·13	5,219·71	...
Do. ...	1465x	Golden Valley Main Reef ...	...	...	1,150·00	1,208·37	...	...	...	1,150·00	1,208·37	...
Do. ...	1464x	Golden Valley West	...	...	605·00	298·10	...	...	...	605·00	298·10	...
Do. ...	(1019x)	(Kanowna)	...	...	...	...	...	5·84	691·94	9,588·50	14,544·42	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH-EAST COOLGARDIE GOLDFIELD—*continued.*

KANOWNA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926.					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.
Kanowna ...	1299x	(Kanowna Consol)	...	...	...	...	...	...	...	713·50	129·30	...
Do. ...	1299x	(Kanowna Consol)	...	...	...	...	...	...	...	339·00	207·36	...
Do. ...	1299x, (1300x) ...	(Kanowna Consol leases) ...	...	...	...	...	...	...	6·76	312·00	261·31	...
Do. ...	1299x, 1379x ...	(Kanowna Consol leases) ...	...	...	...	...	...	...	...	4,584·00	2,096·11	...
Do. ...	(1019x)	Kanowna Red Hill G.M. Co., N.L. ...	...	...	2,136·00	1,628·12	...	...	...	14,831·00	11,976·32	...
Do. ...	1466x	Kanowna Red Hill G.M., Co., N.L....	...	...	2,306·00	969·02	...	...	...	2,306·00	969·02	...
Do. ...	12x, 13x, (14x), (15x), (18x), (19x), (72x), (855x), (974x), (1035x), (1103x), (1263x), (1278x), 1438x	North White Feather G.M.'s, Ltd. ...	...	...	...	...	...	...	...	56,060·27	25,299·82	...
Do. ...	1299x, 1379x, (1432x)	Orion Gold Mines, Ltd.	...	...	330·00	132·18	...	...	...	510·00	192·68	...
Do. ...	12x, 13x, (14x), (15x), (855x), (1001x), (1012x), (1103x), (1107x), (1108x), (1109x)	(White Feather Main Reefs, Ltd.) ...	...	...	...	...	...	...	...	123,327·56	82,334·52	1,675·68
Do. ...	(9x), (10x), 12x, 13x, (72x), (83x), (201x), (855x), (1001x), (1012x), (1108x), (1249x)	(White Feather Main Reefs (1906), Ltd.)	...	...	...	...	...	...	20·45	24,393·00	9,138·31	...
Do. ...	...	Voided leases	...	...	...	...	...	8·47	3,701·82	433,982·59	223,839·62	806·56
Do. ...	...	Sundry claims	...	...	237·85	130·55	...	88·95	1,853·36	14,802·27	7,870·46	1·50
Mulgarrie ...	...	Voided leases	...	...	...	...	...	...	1,216·63	6,902·26	4,197·98	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	13·29	1,184·00	596·64	...
Six Mile ...	...	Voided leases	...	...	...	...	...	...	1,595·63	559·00	767·72	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	31·44	141·50	103·37	...
	From District generally:— Sundry Parcels treated at											
	Lady Pratt Works		...	...	...	...	...	...	...	31·00	281·01	...
	Old Cement Works (Martin's Battery) ...		...	...	...	...	...	...	...	10,893·78	15,561·14	...
	Various Works		...	...	...	...	...	330·42	867·52	147,843·26	132,539·98	...
	Reported by Banks and Gold Dealers		77·85	...	...	...	...	104,111·96	·86	...	84·69	...
		Total	**77·85**	**254·50**	**7,641·85**	**5,643·85**	...	**104,570·34**	**11,570·92**	**968,029·65**	**603,217·67**	**2,522·12**

KURNALPI DISTRICT.

Jubilee ...	...	Voided leases	...	...	...	...	...	...	145·13	1,821·25	1,408·51	...
Do. ...	...	Sundry claims	...	...	...	...	...	25·57	...	46·00	28·91	...
Kurnalpi ...	...	Voided leases	...	...	...	...	...	371·18	3,100·64	2,925·01	2,778·07	6·27
Do. ...	...	Sundry claims	...	14·42	343·00	147·61	...	280·63	203·63	1,104·50	587·94	...
Mulgabbie ...	...	Voided leases	...	...	...	...	...	...	1,138·12	84·65	7,429·71	4·95
Do. ...	...	Sundry claims	...	...	...	...	...	6·50	1,528·51	139·50	955·10	...
		From District generally :—										
		Sundry Parcels treated at :										
		Success Battery	...	...	35·00	11·32	...	...	...	45·00	188·51	...
		Various Works	...	...	...	...	...	...	...	56·50	193·15	...
		Reported by Banks and Gold Dealers	49·22	...	...	...	...	11,424·93	19·62	...	...	...
		Total	**49·22**	**14·42**	**378·00**	**158·93**	...	**12,108·81**	**6,135·65**	**6,222·41**	**13,569·90**	**11·22**

East Coolgardie Goldfield.

EAST COOLGARDIE DISTRICT.

Binduli ...	...	Voided leases	...	...	...	...	...	...	...	34·10	224·30	...
Do. ...	...	Sundry claims	...	...	2·11	1·24	...	...	...	566·51	528·43	...
Boorara ...	5386E	Elsie May	...	...	·62	31·20	...	...	77·51	9·12	106·77	...
Do. ...	...	Voided leases	...	...	...	...	...	...	381·56	306,642·45	171,638·36	408·36
Do. ...	...	Sundry claims	...	...	26·55	24·92	...	·49	53·46	865·51	933·15	...
Boulder ...	392E	(Acrobat : Paringa Consolidated Mines, Ltd.)	...	...	...	...	...	...	...	10·25	37·15	...
Do. ...	392E	(Acrobat : Paringa Mines (1909), Ltd.)	...	...	...	...	...	...	...	17,035·57	7,856·69	...
Do. ...	38E, 71E, 72E ...	Associated G.M.'s of W.A. (New), Ltd.	...	...	57,669·55	23,649·62	1,017·52	...	...	57,669·55	23,649·62	1,017·52
Do. ...	38E, 71E, 72E, (101E)	(Associated G.M.'s of W.A., Ltd.) ...	...	...	...	...	...	...	8·49	2,204,190·28	1,159,144·86	35,284·05
Do. ...	49E, (4211E) ...	Associated Northern Blocks (W.A.), Ltd.	...	...	2,206·94	2,525·55	...	...	538·31	425,764·12	513,059·69	4,844·50
Do. ...	24E	Blue Gap	...	...	139·80	87·98	...	...	...	139·80	87·98	...
Do. ...	(682E), 902E, 923E, 986E, (1064E), 1124E, 1196E, 4075E	(Boulder Deep Levels, Ltd.) ...	...	...	...	...	...	...	...	3,043·00	1,778·10	26·71
Do. ...	902E, 923E, 986E, 1124E, 1196E, 4075E	Boulder Deep Levels (1907), Ltd.) ...	...	...	...	...	...	...	...	787·50	210·30	...
Do. ...	66E	Boulder Perseverance, Ltd.	...	...	61,750·03	52,027·93	9,366·19	...	...	156,904·86	134,293·70	28,283·82
Do. ...	281E	(Brookman Bros. Boulder G.M. Co., Ltd.)		...	...	...	...	...	...	8,655·00	8,417·00	...
Do. ...	24E, (888E), (949E)	Central and West Boulder G.M.'s, Ltd.	...	...	...	...	...	...	...	70,895·31	36,261·65	...
Do. ...	352E	(Chaffers G.M. Co., Ltd.)	...	...	...	...	...	...	...	4,256·00	1,299·03	161·50
Do. ...	352E, 873E, 4334E	(Chaffers G.M. Co., Ltd.)	...	...	...	...	...	...	...	111,111·00	44,796·77	...
Do. ...	352E, 873E, 4334E	(Chaffers G.M. Co. (1913), Ltd.) ...	...	...	...	...	...	...	...	13,350·00	3,334·91	129·57
Do. ...	1621E	(Croesus Proprietary G.M. Co.) ...	...	...	...	...	...	...	...	79·00	45·87	...
Do. ...	5345E	Enterprise	...	...	719·35	368·50	...	...	...	2,676·85	1,270·76	...
Do. ...	(35E)	Eureka	...	...	...	...	...	...	107·98	6,762·93	5,934·19	...

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

EAST COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926.					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.
Boulder ...	351E, 1001E, 1020E, 1085E, 1113E, 1219E, 1326E, 1397E	Golden Horseshoe Estates Co., Ltd. ...	...	...	38,920·00	19,132·87	9,439·02	...	...	4,808,872·00	2,948,527·61	700,003·37
Do. ...	(750E)	(Golden Link Consolidated G.M.'s, Ltd.)	...	...	...	...	...	...	...	10,729·00	6,096·80	...
Do. ...	2325E, 2326E ...	(Golden Link Consolidated G.M.'s, Ltd.)	...	...	...	...	...	...	...	1,525·00	733·48	...
Do. ...	(750E), (1621E)	(Golden Links, Ltd.)	...	...	...	...	...	...	...	87,115·02	43,504·60	19·06
Do. ...	873E	(Great Boulder Main Reefs, Ltd.) ...	...	...	...	...	...	...	...	143,292·39	119,541·14	761·98
Do. ...	66E	(Great Boulder Perseverance G.M., Ltd.)	...	...	...	...	...	...	...	3,306,942·88	1,841,159·00	203,821·43
Do. ...	16E, 51E, 61E, 102E, 280E, 1109E, (4361E)	Great Boulder Proprietary G.M.'s, Ltd.	...	...	100,943·10	49,144·08	7,953·00	...	...	3,896,156·01	3,293,331·83	377,560·10
Do. ...	902E, 1124E ...	(Great Boulder South G.M. Co., Ltd.)	...	...	...	...	...	...	...	437·00	122·11	...
Do. ...	3643E	(Hainault G.M., Ltd.)	...	...	...	...	...	...	...	517,345·70	184,570·02	113·30
Do. ...	(6E)	(Hannans Block 45, Ltd.)	...	...	...	...	...	...	...	2,343·55	3,226·69	...
Do. ...	(131E), (245E), (269E), (743E), (794E), (969E)	(Hannan's Central G.M.'s, Ltd.) ...	...	...	...	...	...	...	...	6,098·00	3,360·33	...
Do. ...	(739E)	(Hannan's Croesus G.M. Co., Ltd.) ...	...	...	...	...	...	...	...	4,256·75	4,416·90	...
Do. ...	1004E	(Hannan's North Croesus G.M. Co., Ltd.)	...	...	...	...	...	...	...	5·00	13·21	...
Do. ...	15E, 60E, 902E, 923E, 986E, 1116E, 1124E, 1196E, 4075E	(Hannan's Star Consolidated, Ltd.) ...	...	...	...	...	...	...	...	360·00	175·59	...
Do. ...	15E, 60E, 1116E	(Hannan's Star G.M. Co., Ltd.) ...	...	...	...	...	...	...	...	85,652·75	40,438·85	2,142·59
Do. ...	15E, 60E, 1116E	(Hannan's Star, Ltd.)	...	...	...	...	...	...	...	13,470·50	4,716·66	191·22
Do. ...	4317E, (4318E), (4442E)	(Idaho leases)	...	...	...	...	...	...	4,847·57	128,727·26	63,546·75	...
Do. ...	4317E	Idaho	...	170·69	32·25	95·58	...	...	997·14	326·67	570·39	6·20
Do. ...	946E, (4370E), (4531E)	(Ironsides North leases) ...	...	...	...	...	...	...	...	71,677·81	128,290·00	...
Do. ...	946E	Ironsides North	...	...	...	3·26	...	...	...	4·95	345·99	...
Do. ...	946E	(Ironsides North G.M. Co., N.L.) ...	...	...	...	...	...	...	...	1,348·00	807·48	...
Do. ...	31E, 1357E, 1413E, 1507E, 4399E, 4445E, 4476E	(Ivanhoe Gold Corporation, Ltd.) ...	...	...	...	...	...	...	...	4,296,179·00	2,571,681·86	447,123·[illegible]

Do. ...	1507E, (2899E), (3712E), (3713E)	(Ivanhoe Junction G.M. Co., N.L.) ...	...	...	...	...	...	...	...	1,764·00	121·43	...
Do. ...	(6E), (131E), (245E), (269E), (301E), (739E), (743E), (794E), (969E)	(Kalgoorlie Amalgamated, Ltd.) ...	...	...	...	...	...	...	...	32,589·00	8,859·95	...
Do. ...	(6E), (131E), (245E), (269E), (301E), (739E), (743E), (794E), (969E)	(Kalgoorlie Amalgamated (New), Ltd.)	...	...	...	...	...	...	...	27,145·00	6,265·27	...
Do. ...	(6E), (131E), (245E), (269E), (301E), (739E), (743E), (794E), (969E)	(Kalgoorlie Amalgamated (1909), Ltd.)	...	...	...	...	...	...	...	7,940·50	1,568·40	...
Do. ...	1004E	(Kalgurli Golden Eagle) ...	...	...	...	...	...	...	...	4,891·50	1,289·65	...
Do. ...	1004E	(Kalgurli Golden Eagle: Golden Links, Ltd.)	...	...	...	...	...	...	...	193·00	31·63	...
Do. ...	22E, 34E ...	(Kaglurli G.M.'s, Ltd.)	...	...	...	...	...	...	...	1,683,548·41	1,072,090·59	188·24
Do. ...	(73E, (74E) ...	(Kalgoorlie Mint and Iron King Gold Estates, Ltd.)	...	...	...	...	...	...	...	3,020·00	1,762·00	...
Do. ...	(73E), (74E) ...	(Kalgoorlie Mint and Iron King G.M.'s, Ltd.)	...	...	...	...	...	...	...	3,647·00	7,454·80	...
Do. ...	15E, 25E, 31E, 32E, 60E, 352E, 873E, 902E, 923E, 986E, 1116E, 1124E, 1196E, 1357E, 1413E, 1507E, 2325E, 2326E, 4075E, 4334E, 4399E, 4445E, 4476E, 4493E	Lake View and Star, Ltd.	...	...	142,736·00	72,643·45	12,742·34	...	...	274,134·37	139,918·97	31,816·31
Do. ...	15E, 25E, 32E, 60E, 352E, 873E, 902E, 923E, 986E, 1116E, 1124E, 1196E, 2325E, 4075E, 4334E, (4432E), (4433E), (4434E), 4493	(Lake View and Star, Ltd.)	...	...	...	...	...	...	...	1,764,864·70	630,551·50	56,537·86
Do. ...	25E, 32E, 2325E, 2326E	(Lake View Consols, Ltd.)	...	...	...	...	...	...	...	1,179,303·55	1,016,875·27	38,491·89
Do. ...	5159E	Lake View South	...	...	254·00	266·34	...	...	...	1,519·82	983·10	...
Do. ...	(5346E)	Main Ore Channel	...	...	...	...	...	...	...	211·54	57·05	...
Do. ...	(33E), (35E), (975E)	(North New Boulder G.Ms., Ltd.) ...	...	...	...	...	...	...	...	23,438·78	14,750·03	...
Do. ...	(33E), (35E), (975E)	(North Boulder G.M. Co., Ltd.) ...	...	...	...	...	...	...	...	33,549·15	47,532·52	...
Do. ...	(33E), (35E), (975E)	(North Boulder G.Ms., Ltd.) ...	...	...	...	...	...	...	...	4,542·50	4,256·55	·63
Do ...	281E, 287E, 444E	(North Kalgurli Co., Ltd.)	...	...	...	...	...	43·99	...	104,116·49	60,229·47	7,202·47
Do. ...	281E, 287E, 444E	North Kalgurli (1912), Ltd.	...	...	153·46	127·39	...	...	...	36,310·59	19,338·76	...
Do. ...	5232E	Old Bank of England	...	...	...	...	...	...	...	1,082·68	972·85	...
Do. ...	(73E), 410E, (448E), (532E), (578E), (698E), 944E, (1395E), (3031E), (4180E)	(Oroya Brown Hill Co., Ltd.) ...	...	...	...	...	...	...	...	1,075,862·55	1,163,881·77	61,682·30

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

EAST COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926.					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.
Boulder ...	(6E), 22E, 34E, (73E), (131E), (245E), (269E), (301E), 410E, (448E), (532E), (578E), (698E), (739E), (743E), (750E), (794E), 944E, (969E), 1004E, (1395E), 1621E, 3031E, (4180E), 5405E, 5406E, 5407E, 5408E, 5409E, 5410E	Oroya Links, Ltd.	...	...	34,161·87	22,752·89	...	...	...	998,198·43	438,068·79	28,532·96
Do. ...	392E	Paringa Mining & Exploration Co., Ltd.	...	...	73·97	24·15	...	...	...	174·87	46·79	...
Do. ...	(4E), 392E ...	Paringa Mines (1909), Ltd.)	...	...	...	...	...	...	...	26,890·74	12,599·54	...
Do. ...	1208E, 3612E, 3643E	South Kalgurli Consolidated, Ltd. ...	...	...	87,839·00	46,953·95	...	...	...	1,124,746·29	461,436·54	15,071·52
Do. ...	1208E, 3612E ...	(South Kalgurli G.Ms., Ltd.) ...	...	...	...	...	...	...	...	826,909·00	347,222·75	17,609·67
Do. ...	4537E	Union Jack	...	...	16·02	8·05	...	...	...	6,741·42	3,223·04	...
Do. ...	...	Voided leases	...	...	...	...	...	109·90	5,780·86	242,262·59	158,240·98	...
Do. ...	...	Sundry claims	...	...	292·56	83·28	...	24·58	5·80	2,762·68	1,525·99	...
Feysville ...	Block 48 ...	Hampton Gold Mining Areas, Ltd....	...	...	...	...	...	...	15·36	278·73	443·28	...
		P.P.L. 40, Learhinan, D. ...	...	...	...	...	...	...	...	8·00	9·68	...
		P.P.L. 306, Excelsior	...	...	...	...	...	...	...	17·00	2·79	...
		P.P.Ls. 63, 84, 86, Golden Hope G.Ms., N.L.	...	...	...	...	...	...	...	16,585·30	8,442·36	69·60
		P.P.L. 1, White Hope: Hopeful Syndicate, Ltd.	...	...	5,708·00	2,040·27	...	...	...	26,640·03	10,478·02	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	20·53	22·06	...
Do. ...	Block 48 ...	(Hampton Plains Estates, Ltd.) ...	...	...	...	...	...	4,565·62	21·59	20,615·28	2,502·56	...
Do. ...	Block 50 ...	(Hampton Plains Estates (1906), Ltd.)	...	...	...	...	...	...	...	85·00	108·82	...
Do. ...	Block 45 ...	Hampton Properties, Ltd.... ...	...	...	...	...	...	...	52·75	69·75	80·52	...
		P.P.L. 252, Mount Martin ...	...	...	...	...	...	...	...	9,563·00	4,675·67	...
Do. ...	Block 50 ...	(Hampton Properties, Ltd.)	...	...	...	...	...	...	7·26	6,348·00	3,956·22	...
Do. ...	Block 50 ...	Hampton Properties, Ltd.... ...	...	...	...	...	...	...	106·23	943·27	699·50	...
		P.P.L. 17, McFarlane	...	...	...	...	...	...	...	67·40	33·40	...
		P.P.L. 12—Celebration Junction...	...	...	134·00	97·21	...	...	...	134·00	97·21	...
		P.P.Ls. 9, 274—Hampton Celebration (W.A.), Ltd.	...	...	6·75	304·48	...	...	...	22,117·75	9,461·47	...
		P.P.L. 222—Hampton Jubilee ...	...	...	48·03	29·04	...	...	...	366·28	271·32	...
		P.P.L. 23—Mutooroo Copper Corporation, N.L.	...	...	165·93	108·54	...	...	...	1,426·10	2,249·02	...

		P.P.L. 10—Pernatty Central Copper Mining Co., N.L.	...	...	178·99	132·25	...	...	...	909·29	830·83	...
		P.P.L. 29—Pernatty East	...	...	...	...	...	...	...	11·27	3·43	...
Do.	...	Voided leases	...	...	...	...	...	...	110·74	561·30	394·24	...
Do.	...	Sundry claims	...	7·94	14·35	11·90	...	...	20·07	420·09	334·84	...
Kalgoorlie	(5348E)	Big Genuine	...	...	17·43	8·92	...	...	...	211·67	165·21	...
Do.	(5390E)	Corn Cob	...	...	1,822·00	1,111·12	...	...	...	1,822·00	1,111·12	...
Do.	5394E	Dorothy	...	...	27·87	9·93	...	...	...	27·87	9·93	...
Do.	5411E	Elsie Marma	...	...	62·47	28·16	...	...	...	62·47	28·16	...
Do.	5350E, 5351E	Great Boulder Proprietary G.Ms., Ltd.	...	...	3,095·85	2,048·50	...	...	...	8,980·56	6,365·89	...
Do.	(5370E)	Hard Up	...	...	...	2·49	...	...	...	150·00	14·03	...
Do.	(4546E), 4547E, 4548E	Hannans Hill leases	...	...	737·00	548·64	...	...	...	861·00	735·85	...
Do.	(4546E), 4547E, 4548E, (4551E)	(Hannans Reward, Ltd.)	...	...	...	...	...	...	5·72	33,378·00	9,005·69	...
Do.	(5379E)	Hicks' Gold Mine	...	...	...	...	...	...	...	101·37	46·11	...
Do.	(5358E)	Invincible	...	...	...	...	...	...	...	37·94	33·73	...
Do.	(5375E)	Lucell	...	...	8·19	8·05	...	...	...	305·00	402·53	...
Do.	4632E	North End	...	...	70·18	19·20	...	...	...	332·99	73·73	...
Do.	5333E	Paymaster	...	...	...	...	...	...	...	437·72	171·70	...
Do.	5368E	Rose of Diorite	...	...	1,297·00	1,296·44	...	...	1·73	2,568·00	2,346·04	...
Do.	5389E	Sons of Gwalia, Kalgoorlie	...	...	66·26	32·05	...	...	...	125·90	45·33	...
Do.	5193E	Surprise North	...	...	886·00	1,852·78	...	...	...	3,698·93	5,890·05	...
Do.	...	Voided leases	...	...	...	...	...	242·48	9,478·81	936,001·03	376,567·80	44,017·12
Do.	...	Sundry claims	...	28·44	831·40	503·12	...	207·69	462·70	45,642·13	18,746·83	...
Wombola	5391E	Caledonian	...	...	109·83	184·01	...	...	...	170·08	310·80	...
Do.	(5395E)	Dinnie	...	...	52·00	53·88	...	...	...	97·00	82·57	...
Do.	5414E	Eclipsall	...	...	91·00	45·62	...	...	...	91·00	45·62	...
Do.	4766E	Great Hope	...	60·00	184·15	2,115·11	...	...	146·61	2,974·53	12,265·99	...
Do.	(4770E)	Great Hope North	...	...	81·00	29·87	...	...	...	2,872·24	3,455·59	...
Do.	...	Voided leases	...	...	...	...	...	...	1,867·91	6,483·09	9,214·23	...
Do.	...	Sundry claims	...	...	140·33	147·23	...	...	4·15	1,598·71	2,271·71	...
	From District generally :—											
		Sundry Claims	·53	·53	10·20	29·04	...	10,908·46	435·71	5,392·45	2,119·18	...
	Sundry Parcels treated at :											
		Adeline Works	...	...	...	...	...	42·64	35·12	127·90	20,900·12	...
		Associated Northern Works	...	...	...	...	...	...	...	...	287·41	...
		Bonnie Lass Works	...	...	...	...	...	...	...	55·00	1,297·73	...
		Brown Hill Consols' Works	...	...	...	...	...	...	...	780·38	45,161·54	...
		Dunstan & Cummings' Works	...	...	...	...	...	...	...	...	9,244·56	1,644·00
		Fraser's Works	...	...	...	23·94	...	...	...	...	23·94	...
		Fremantle Trading Co., Ltd., Works	...	...	...	...	...	...	...	...	12,860·37	8,028·22
	Great Boulder Perseverance Battery		...	...	...	...	...	...	...	...	7·18	...
		Hainault Sulphide Plant	...	...	...	13·56	...	...	...	35·66	5,539·19	870·95
		Hannans Central Lakeside Works	...	...	...	...	...	...	...	58·06	4,788·43	...
		Hannans Central Works	...	...	21·00	27·47	...	...	...	193·80	65,360·26	67·17
		Hannans Reward Battery	...	...	...	487·30	...	...	...	...	1,710·95	...
		Kalgurli G.Ms., Ltd., Works	...	...	...	...	...	...	...	7·44	658·04	...
		Lone Hand Works	...	...	...	...	...	...	14·43	469·00	6,046·06	...
		North Kalgurli Battery	...	...	...	...	...	...	...	...	810·22	...
		Oroya Links Battery	...	...	...	...	...	...	...	32·34	453·58	...
		Various Works	...	...	...	...	...	341·72	15·15	38,756·72	75,984·27	1,968·67
	Reported by Banks and Gold Dealers		351·57	...	...	11·35	...	11,529·00	9,013·32	2·39	52·06	...
		Total	**352·10**	**267·60**	**543,804·39**	**303,313·70**	**40,518·07**	**28,016·57**	**34,614·04**	**31,469,149·84**	**19,743,051·12**	**2,115,698·66**

TABLE IV.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—continued.

BULONG DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1926.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Balagundi ...	...	Voided leases	...	...	...	...	...	...	2,408·98	1,110·68	1,473·73	12·92
Do. ...	...	Sundry claims	...	3·22	25·00	9·72	...	...	125·36	294·76	231·91	...
Bulong ...	1266Y	Peacehaven	...	...	1·00	16·79	...	...	...	1·00	16·79	...
Do. ...	1191Y	Sweet Nell	...	...	6·00	35·58	...	...	...	390·84	914·37	...
Do. ...	...	Voided leases	...	...	...	...	...	107·54	8,433·70	99,635·96	82,526·49	...
Do. ...	...	Sundry claims	...	...	6·00	2·01	...	1,648·60	1,109·85	6,999·31	15,040·67	...
Hogan's Find	...	Voided leases	...	...	...	...	...	...	908·84	309·50	276·51	...
Majestic ...	Block 41 ...	Hampton Gold Mining Areas, Ltd.—P.P.L. 275—Long Looked For ...	...	...	...	...	...	19·45	...	235·34	218·57	...
Do. ...	Block 41 ...	(Hampton Properties, Ltd.)	...	...	...	...	...	...	...	41·00	22·66	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	1,007·70	333·30	...
Do. ...	...	Sundry claims	...	...	...	...	...	42·88	43·20	101·90	46·25	...
Mt. Monger ...	...	Voided leases	...	...	...	...	...	...	1,862·57	1,128·35	979·59	...
Do. ...	...	Sundry claims	...	...	...	...	...	215·60	...	369·80	302·47	...
Randalls ...	...	Voided leases	...	...	...	...	...	...	60·04	31,820·04	10,645·98	...
Do. ...	...	Sundry claims	...	...	...	...	...	20·45	...	1,893·55	486·04	...
Sudden Jerk	...	Voided leases	...	...	...	...	...	...	63·91	14·25	53·67	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	·15	10·23	...
Taurus ...	1265Y	Golden Jumble	...	...	...	...	...	...	...	8·70	22·59	...
Do. ...	...	Voided leases	...	...	...	...	...	2·06	3·70	1,688·90	868·75	...
Do. ...	...	Sundry claims	...	...	...	8·16	...	112·69	47·56	302·50	510·30	...
Trans Find ...	1198Y	Transville	...	...	...	...	...	...	...	654·92	707·13	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	4·50	31·63	...
Woodline ...	...	Voided leases	...	...	...	...	...	...	...	792·75	610·57	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	39·33	61·57	...
From District generally :—												
		Sundry claims	...	...	...	...	...	5·64	41·85	744·55	254·99	...
		Sundry Parcels treated at : Various Works	...	...	...	...	...	...	...	6,102·15	5,848·25	...
		Reported by Banks and Gold Dealers	28·09	...	...	...	...	24,578·79	52·39	...	...	...
		Total	**28·09**	**3·22**	**38·00**	**72·26**	...	**26,753·70**	**15,161·93**	**155,692·43**	**122,495·01**	**12·92**

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnievale ...	4600	Melva Maie	...	...	24·00	154·32	...	...	...	536·00	1,495·	...
Do. ...	...	Voided leases	...	...	...	...	...	...	25·00	350,852·84	188,088·12	...
Do. ...	...	Sundry claims	...	...	53·50	213·83	...	...	106·20	2,288·33	2,763·78	...
Bulla Bulling	...	Voided leases	...	...	...	...	...	...	...	776·81	668·19	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	12·82	375·56	263·64	...
Burbanks ...	(5188)	Burbanks Oversight G.M. Co., N.L. ...	...	...	...	...	...	...	...	611·25	386·76	...
Do. ...	(5208)	Main Lode South	...	...	...	...	...	...	...	18·00	11·82	...
Do. ...	...	Voided leases	...	...	...	...	...	13·36	342·96	407,762·11	301,320·55	521·06
Do. ...	...	Sundry claims	...	...	364·50	248·37	...	43·37	141·95	5,401·90	4,467·42	...
Cave Rocks ...	...	Voided leases	...	...	...	...	...	...	...	132·00	28·04	...
Coolgardie ...	(5209)	Benjamin George	...	...	33·75	16·73	...	...	...	69·25	42·74	...
Do. ...	(4555)	(Dreadnought)	...	...	...	...	...	...	...	867·85	870·10	...
Do. ...	(4555), (4561), (4563), (5065)	Dreadnought leases	...	...	...	...	...	...	...	962·18	1,028·24	...
Do.	(5197)	Great Empress of Coolgardie ...	...	...	18·00	3·83	...	...	...	82·00	29·84	...
Do. ...	4567	Griffith's Gold Mine	...	...	...	...	...	...	4·16	17,782·50	2,043·31	...
Do. ...	Block 59 ...	Hampton Gold Mining Areas, Ltd. :—		...	...	...	...	...	...	9·00	1·57	...
		P.P.L. 119, Golden Eagle ...	...	...	91·00	223·61	...	...	...	415·59	830 15	...
Do. ...	Block 49 ...	Hampton Plains Estates, Ltd. :— ...	...	...	...	...	...	...	10·94	150·00	157·31	...
		P.P.L. 384, A. W. Pane ...	...	...	13·50	11·86	...	...	...	39·25	20·95	...
Do. ...	Block 53 ...	(Hampton Plains Estate, Ltd.) ...	...	...	...	...	...	...	358·42	67·00	112·49	...
Do. ...	Block 59 ...	(Hampton Plains Estate, Ltd.) ...	...	...	...	...	...	...	4·12	8,008·25	7,194·52	...
Do. ...	...	Voided leases	...	...	...	...	...	1,299·02	4,494·64	541,702·70	318,551·25	·96
Do. ...	...	Sundry claims	·68	·37	465·50	175·20	...	136·18	2,082·52	38,847·56	15,778·49	...
Eundynie ...	...	Voided leases	...	...	...	...	...	...	...	29,812·50	14,966·76	1·75
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	117·00	31·11	...
Gibraltar ...	4586	Carlton	...	...	140·00	122·98	...	...	15·28	1,376·00	1,146·55	...
Do. ...	(4580)	(Lloyd George)	...	...	...	...	...	...	...	341·75	289·27	...
Do. ...	(4580), (4726), (4727)	Lloyd George G.M. Co., N.L. ...	...	...	378·00	470·73	...	...	...	27,838·00	13,895·18	...
Do. ...	5200	Perseverance	...	...	72·00	47·67	...	...	...	145·87	159·85	...
Do. ...	...	Voided leases	...	...	...	...	...	...	...	1,163·50	731·81	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	48·55	636·45	438·62	...
Gnarlbine ...	...	Voided leases	...	...	...	...	...	...	10·94	1,899·75	1,049·90	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	1·31	228·10	170·61	...
Higginsville ...	...	Voided leases	...	...	...	...	...	...	287·26	32,578·00	14,938·44	134·79
Do. ...	...	Sundry claims	...	...	...	1·50	...	...	16·52	772·90	516·90	...
Londonderry	...	Voided leases	...	...	...	...	...	...	46·25	27,102·85	18,537·59	...
Do. ...	...	Sundry claims	...	...	3·70	9·21	...	...	6·00	1,801·17	1,616·22	...
Mungari ...	...	Voided leases	...	...	...	...	...	...	17·71	735·00	331·78	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	107·82	346·51	204·90	...
Paris ...	...	Voided leases	...	...	...	...	...	...	4·30	...	...	...

TABLE IV.—*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 1926.					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
Red Hill ...	...	Voided leases	...	...	...	...	...	...	1,541·48	40,797·40	31,070·65	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	34·62	160·42	287·90	...
Ryan's Find	...	Voided leases	...	...	...	...	...	...	...	54·16	151·69	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	·44	87·69	226·64	...
St. Ives ...	4905	Brennan's Idough	...	...	341·00	148·35	...	...	38·03	2,432·50	1,685·52	...
Do. ...	5195	Clifton	...	...	394·75	195·81	...	...	...	932·90	375·70	...
Do. ...	4732	Ive's Lake View Reward Junction	...	...	1,439·25	379·37	...		...	3,343·75	1,134·39	...
Do. ...	4720, 4721, 4722	Ive's Reward Gold Mines, N.L. ...	...	...	1,226·77	450·71	...	...	...	11,524·41	3,360·87	...
Do. ...	(5164)	Just in Time	...	...	...	...	...	45·10	...	31·75	11·44	...
Do. ...	4720, 4721, 4722	(Lake View Reward leases) ...	...	...	...	...	...	...	...	883·25	544·64	...
Do. ...	5210	Rose Doreen	...	...	88·75	47·60	...	...	...	88·75	47·60	...
Do. ...	...	Voided leases	...	...	...	...	...	...	2·75	1,174·00	1,452·42	...
Do. ...	...	Sundry claims	124·60	...	43·25	17·10	...	173·65	...	961·81	349·29	...
Widgiemooltha	5207	Elgin	...	...	109·00	127·81	...	...	...	188·50	284·14	...
Do. ...	...	Voided leases	...	...	...	...	...	9·42	867·11	9,960·35	7,413·68	·17
Do. ...	...	Sundry claims	24·63	4·34	145·00	84·79	...	33·84	105·40	4,631·60	2,700·17	...
	From District generally :—											
	Sundry parcels treated at :											
	Burbanks Main Lode Works		...	...	...	...	...	2·77	...	557·50	1,261·60	114·17
	Fremantle Trading Co., Ltd., Works		...	...	...	...	...	...	...	...	20·08	...
	Highgate Battery		...	...	...	2·75	...	...	...	100·00	336·90	...
	Imperial Battery		...	...	...	...	...	...	...	26·00	10·59	...
	Lady Robinson Cyanide Works		...	...	...	...	...	...	...	70·00	348·28	...
	State Battery, Coolgardie		...	...	2·52	7·77	...	...	...	691·01	12,833·04	9·65
	State Battery, St. Ives		...	...	...	56·97	...	...	...	...	509·39	...
	Various Works		...	...	...	...	...	4·98	...	3,083·61	15,618·12	108·89
	Reported by Banks and Gold Dealers		133·95	...	...	...	...	7,770·93	543·04	...	...	...
		Total	283·86	4·71	5,447·74	3,218,87	...	9,532·62	11,278·54	1,586,434·64	997,215·33	891·44

KUNANALLING DISTRICT.

Balgarrie ...	...	Voided leases ...	...	...	...	...	...	10·94	75·48	5,142·25	4,825·96	1·38
Do. ...	...	Sundry claims	...	...	...	...	...	...	18·57	1,149·75	424·74	...
Carbine ...	33s	(Carbine) ...	...	...	...	...	...	...	10·85	2,401·00	1,164·53	...
Do. ...	33s, 710s, 711s, 807s, 863s, (890s)	Carbine leases	...	...	2,580·00	1,365·31	...	...	677·13	49,090·86	38,187·58	...
Do. ...	...	Voided leases ...	...	...	...	...	...	...	...	3,347·00	3,233·60	...
Do. ...	...	Sundry claims	123·94	...	...	33·81	...	123·94	...	85·00	158·93	...
Carnage ...	...	Voided leases ...	...	...	...	...	...	176·04	659·31	2,402·00	2,170·67	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	61·00	27·50	...
Cashman's (Siberia)	716s, [1289w] ...	Lady Evelyn	...	...	...	...	...	...	...	241·75	479·81	...
Do. ...	...	Voided leases ...	...	...	...	...	...	67·51	793·44	7,187·90	6,395·33	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	6·16	116·00	67·61	...
Chadwin ...	...	Voided leases ...	...	...	...	...	...	...	...	1,111·75	2,062·12	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	8·87	507·00	449·22	...
Dunnsville ...	...	Voided leases ...	...	...	...	...	...	...	181·12	17,407·10	7,982·23	...
Do. ...	...	Sundry claims	...	...	...	...	...	·43	121·27	313·19	321·04	...
Jourdie Hills	...	Voided leases ...	...	...	...	...	...	...	18·00	28,009·74	19,401·09	28·45
Do. ...	...	Sundry claims	1·86	...	...	...	...	1·86	27·85	760·50	422·33	...
Kandana ...	...	Voided leases ...	...	...	...	...	...	...	...	465·00	68·12	...
Kintore ...	...	Voided leases ...	...	...	...	...	...	6·66	143·66	44,174·14	31,882·70	...
Do. ...	...	Sundry claims	...	...	...	...	...	100·30	·78	1,241·70	1,163·14	...
Siberia ...	...	Voided leases ...	...	...	...	...	...	1·07	1,557·81	8,216·85	10,530·14	...
Do. ...	...	Sundry claims	...	...	...	...	...	30·91	...	223·00	349·86	...
25 Mile ...	696s	Blue Bell ...	...	...	...	...	...	...	...	85·00	24·19	...
Do. ...	696s	(Blue Bell)	...	...	...	...	...	...	8·05	697·00	429·47	...
Do. ...	696s, (727s) ...	(Blue Bell leases)	...	...	...	...	...	...	...	1,693·00	1,647·99	...
Do. ...	892s	Brittania ...	39·69	...	...	...	...	...	910·75	34·50	234·63	...
Do. ...	645s	Star of Fremantle	...	...	...	69·01	...	32·67	...	5,513·00	4,043·67	...
Do. ...	847s	Turn of the Tide	...	...	49·00	97·83	...	...	2·72	4,702·98	5,330·17	...
Do. ...	...	Voided leases ...	...	...	...	...	...	...	790·68	92,376·99	73,175·25	18·84
Do. ...	...	Sundry claims	9·42	6·79	373·75	636·52	...	201·05	514·08	8,098·08	6,016·86	...
	From District generally:—											
	Sundry Parcels treated at:											
	Blue Bell Battery		...	...	...	105·17	...	3·77	...	72·00	2,442·41	...
	Stanley Works		...	...	...	...	...	14·86	...	402·60	384·93	...
	Various Works		...	...	...	...	...	9·22	...	1,276·66	2,006·02	...
	Reported by Banks and Gold Dealers		·87	...	...	...	...	265·06	1·10	...	...	...
		Total ...	136·09	46·48	3,002·75	2,307·65	...	1,046·29	6,527·68	288,606·29	227,503·84	48·67

Table IV.—*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 1926. Alluvial.	Total for 1926. Dollied and Specimens.	Total for 1926. Ore treated.	Total for 1926. Gold therefrom.	Total for 1926. Silver.	Total Production. Alluvial.	Total Production. Dollied and Specimens.	Total Production. Ore treated.	Total Production. Gold therefrom.	Total Production. Silver.
			Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.)	Fine ozs.	Fine ozs.
Blackbourne...	...	Voided leases	...	...	...	...	...	...	...	1,282·50	341·37	...
Bullfinch ...	(3282)	Bullfinch Proprietary (1919), Ltd. ...	...	...	26·75	16·40	...	...	...	267·92	311·97	...
Do. ...	3323	Valley Queen	...	...	19·00	11·97	...	...	...	19·00	11·97	...
Do. ...	...	Voided leases	...	...	...	...	...	...	3·57	480,218·74	178,373·26	27,833·41
Do. ...	...	Sundry claims	...	...	422·00	312·48	...	...	...	778·80	595·96	...
Corinthian ...	...	Voided leases	...	...	...	...	...	...	...	134,508·00	29,324·83	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	104·50	77·35	...
Ennuin ...	...	Voided leases	...	...	...	...	...	...	...	134·56	361·34	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	117·00	72·12	...
Forrestonia ...	...	Voided leases	...	...	...	...	...	...	...	1,185·00	298·15	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	327·00	114·95	...
Golden Valley	P.P.L. (4) ...	New Radio	...	...	59·00	59·34	...	...	...	84·00	110·09	...
Do. ...	(3276)	O.K.	...	...	...	...	...	...	...	168·00	90·84	...
Do. ...	2994	Radio	...	...	652·00	2,352·97	...	...	...	4,518·30	14,367·62	7·43
Do. ...	3248	Radio Deeps	...	...	137·00	186·63	...	...	...	525·00	1,090·02	...
Do. ...	3272	Radio North	...	...	17·50	30·98	...	...	...	69·50	127·83	...
Do. ...	(3285)	Sweet Alice	...	...	...	...	...	...	...	27·50	17·76	...
De. ...	...	Voided leases	...	...	...	...	...	...	18·05	7,935·24	8,289·07	2·00
Do. ...	...	Sundry claims	...	...	...	...	...	...	2·75	2,318·72	2,178·36	...
Greenmount	(550)	Sunbeam	...	...	...	...	...	...	...	206·14	182·07	...
Do. ...	(550)	(Sunbeam)	...	...	...	...	...	14·00	...	4,472·00	1,427·25	...
Do. ...	(550), (565) ...	(Sunbeam leases)	...	...	...	...	...	...	...	3,191·00	816·42	...
Do. ...	3264	Transvaal	...	...	...	...	...	...	...	997·00	252·18	...
Do. ...	...	Voided leases	...	...	...	...	...	31·99	21·62	115,937·50	28,849·48	944·50
Do ...	...	Sundry claims	...	...	...	...	...	...	4·12	875·00	334·48	...
Hollow's Find	3312	Glenelg Queen	...	...	12·25	83·69	...	...	...	12·25	83·69	...
Do. ...	3280	Hollow & Heaton's Reward ...	...	...	21·50	127·55	...	...	9·33	21·50	127·55	...
Hope's Hill ...	2544	Colleen Bawn	...	...	5·00	27·29	...	...	15·26	410·20	1,916·07	...
Do. ...	...	Voided leases	...	...	...	...	...	...	56·97	129,884·85	33,899·78	1·00
Do. ...	...	Sundry claims	...	...	40·50	28·84	...	...	25·38	1,663·00	534·90	...
Kennyville ...	(3278)	Great Leviathan	...	...	70·00	18·24	...	...	...	325·00	103·21	...
Do. ...	...	Voided leases	...	...	...	...	...	...	18·76	32,052·13	15,119·47	·59
Do. ...	...	Sundry claims	...	...	22·00	11·76	...	...	5·06	2,048·50	896·73	...
Kolyanobbing	...	Voided leases	...	...	...	...	...	...	...	308·00	116·74	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	55·00	11·24	...

Marvel Loch...	(3069)	(Banker)	...	...	...	...	...	...	...	1,043·00	926·75	...
Do. ...	(3069)	Banker: Golden Butterfly G.M. Co., N.L.	...	...	...	5·78	...	...	...	707·00	868·11	...
Do. ...	(3069), (3151), (3152), (3157), (3213)	(Golden Butterfly G.M. Co., N.L.) ...	...	...	...	...	...	...	...	4,911·00	3,148·65	...
Do. ...	719	(Great Victoria)	...	...	...	...	...	...	...	1,356·00	281·53	...
Do. ...	719, 944, 945, 1227, 1228, 1606	Great Victoria G.Ms., N.L.	...	...	21,399·00	4,633·54	...	...	...	54,838·00	13,225·89	...
Do. ...	719, 944, 945, 1227, 1228, 1606	(Great Victoria leases)	...	...	...	...	...	...	...	132,664·26	17,869·89	...
Do. ...	3277	Just in Time	...	...	4,497·00	958·52	...	...	...	4,497·00	958·52	...
Do. ...	852	May Queen	...	...	64·00	130·28	...	...	4·07	1,137·50	4,873·05	...
Do. ...	3307	Nevoria: Great Victoria G.Ms., N.L.	...	...	2,684·00	592·30	...	...	...	2,986·00	693·84	...
Do. ...	(3305)	Pro Patria	...	...	5·00	7·87	...	...	...	5·00	7·87	...
Do. ...	3281	Resurrection	...	...	...	23·27	...	...	...	11·00	54·59	...
Do. ...	(3273)	Salvation	...	...	82·00	123·76	...	...	...	851·00	1,371·05	...
Do. ...	...	Voided leases	...	...	...	...	...	...	104·39	249,638·00	90,693·83	771·03
Do. ...	...	Sundry claims	...	...	217·00	135·40	...	8·87	84·42	11,288·74	5,823·97	...
Mt. Jackson...	...	Voided leases	...	...	...	...	...	...	114·88	37,186·03	27,676·47	2,305·28
Do. ...	...	Sundry claims	...	...	...	...	...	4·42	30·46	1,689·25	1,131·60	·74
Mt. Rankin ...	...	Voided leases	...	...	...	...	...	3·84	5·20	496·00	122·17	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	170·00	54·38	...
Parker's Range	2801	Scots Greys	...	...	95·00	32·25	...	...	...	1,501·00	543·85	...
Do. ...	724	(Spring Hill)	...	...	...	...	...	...	...	3,232·00	607·21	...
Do. ...	724, (760) ...	(Spring Hill leases)	...	...	...	...	...	...	...	8,910·00	2,215·59	...
Do. ...	724, 2633, (2793)	Spring Hill G.M. Co., N.L.	...	...	483·00	760·57	...	...	...	4,822·00	2,655·36	...
Do. ...	(3319)	Star of the Range	...	...	89·00	10·78	...	...	...	89·00	10·78	...
Do. ...	2951	White Horseshoe	...	...	330·50	194·54	...	...	...	4,277·00	3,531·46	...
Do. ...	...	Voided leases	...	...	...	...	...	...	105·14	13,686·25	10,013·04	...
Do. ...	...	Sundry claims	...	...	18·50	18·70	...	...	...	2,255·25	1,540·03	...
Southern Cross	...	Voided leases	...	...	...	...	...	2·13	211·22	434,105·88	212,008·46	364·41
Do. ...	...	Sundry claims	...	...	57·75	83·96	...	5·50	595·45	4,298·73	1,416·75	...
Weston's ...	3308	Consolidated	...	...	176·00	188·89	...	...	...	176·00	188·89	...
Do. ...	(3288)	Edna May Consols	...	...	74·00	27·50	...	...	...	74·00	27·50	...
Do. ...	3310	Les Trois	...	...	222·00	212·80	...	...	...	222·00	212·80	...
No. ...	3226	Royal Flush	...	...	143·00	87·88	...	...	...	842·00	616·93	...
Do. ...	...	Voided leases	...	...	...	...	...	...	4·06	421,823·99	298,991·18	21·78
Do. ...	...	Sundry claims	...	...	24·00	13·92	...	...	52·91	1,395·75	1,368·45	...
	From Goldfield generally :—											
	Sundry Parcels treated at:											
	Edna May Deeps Battery		...	...	...	117·37	...	...	...	...	117·37	...
	Glideaway Battery		...	...	...	13·27	...	...	...	...	250·87	...
	Great Victoria Cyanide Works		...	...	...	...	...	...	...	...	5,847·54	...
	Howlett's Battery		...	...	...	150·93	...	...	...	...	1,365·86	...
	Never Never Works		...	...	...	...	...	...	...	...	1,629·53	...
	Smith's Cyanide Works		...	...	...	...	...	...	...	...	26·16	...
	Spring Hill Works		...	...	...	...	...	...	...	...	854·27	...
	Sunbeam Battery		...	...	...	...	...	...	...	38·50	7,244·60	...
	Violet Works		...	...	...	...	...	...	...	...	998·34	...
	Various Works		...	...	...	...	...	...	...	118·28	26,087·03	36·54
	Reported by Banks and Gold Dealers		...	...	...	...	...	22·05	3·53	...	...	...
		Total	...	...	**32,165·25**	**11,792·22**	...	**92·80**	**1,497·00**	**2,334,390·76**	**1,070,978·13**	**32,288·71**

TABLE IV.—*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 1926.					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	...	...	...	...	...	...	3·02	846·05	708·99	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	36·53	341·27	519·77	...
Dundas ...	...	Voided leases	...	...	...	...	...	...	...	4,543·23	2,208·48	...
Do ...	...	Sundry claims	...	...	...	...	...	...	385·37	182·50	143·88	...
Killaloe ...	...	Voided leases	...	...	...	...	...	...	...	20·65	6·88	...
Norseman ...	1291	Mararoa No. 1	...	...	600·00	484·54	...	...	...	1,366·96	1,470·33	...
Do. ...	1290	Mararoa No. 2	...	...	250·00	95·64	...	...	...	436·50	285·39	...
Do. ...	1288	Mararoa No. 3	...	...	550·00	313·69	...	...	...	1,026·25	1,382·14	...
Do. ...	(1261)	Mararoa South Extended ...	...	...	...	...	...	...	...	377·00	70·32	...
Do. ...	1315	New Mararoa	...	...	210·75	58·90	...	...	...	210·75	58·90	...
Do. ...	1317	O.K.	...	...	61·00	137·82	...	...	...	61·00	137·82	...
Do. ...	1307	Recoup North	...	...	51·50	39·74	...	...	...	278·00	240·33	...
Do. ...	990	Viking No. 1	...	...	138·75	373·28	...	...	42·44	809·25	1,910·26	...
Do. ...	990	(Viking No. 1)	...	...	...	...	...	...	...	1,274·00	3,095·95	...
Do. ...	990, 1060 ...	(Viking No. 1 leases)	...	...	...	...	...	...	...	775·50	1,176·13	16·89
Do. ...	990, (1016),(1060), (1117), (1181), (1194), (1235)	(Viking No. 1 leases)	...	...	...	...	...	...	...	48,452·00	44,457·70	242·83
Do. ...	...	Voided leases	...	...	...	...	...	4·23	10,415·94	820,862·77	525,936·26	34,600·73
Do. ...	...	Sundry claims	12·46	14·38	249·25	294·29	...	1,013·97	3,088·24	21,482·71	12,750·33	·59
Pensinsula ...	...	Voided leases	...	...	...	...	...	...	17·61	7,807·14	4,833·88	...
From Goldfield generally :—												
Sundry Parcels treated at :												
Rawlings and Bullen's Works			...	...	...	...	...	...	...	57·39	4,266·10	...
State Battery, Norseman			...	...	...	848·43	...	...	...	405·14	14,143·21	885·41
Various Works			...	...	...	...	...	...	54·52	425·75	6,562·86	646·45
Reported by Banks and Gold Dealers			8·51	...	...	...	...	1,034·80	...	...	1·04	...
		Total	**20·97**	**14·38**	**2,111·25**	**2,646·33**	...	**2,053·00**	**14,043·67**	**912,041·81**	**626,366·95**	**36,392·90**

Phillips River Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
Hatter Hill ...	...	Sundry claims	...	...	7·00	7·45	...	...	...	40·00	14·98	...
Kundip ...	147, 179 ...	Fair Play leases	...	...	...	...	...	...	...	4,860·72	8,678·54	12·63
Do. ...	184	Gem	...	...	...	...	...	...	...	4,159·15	3,324·86	...
Do. ...	151	(Gem Consolidated)	...	...	...	...	...	...	...	777·50	616·30	...
Do. ...	151, 156 ...	Gem Consolidated leases ...	...	...	...	...	...	...	...	6·315·76	5,690·35	8·00
Do. ...	M.L. 52, M.L. 94	Harbour View Gold & Copper Co., Ltd.	...	...	...	...	...	...	...	1,602·89	1,836·05	360·11
Do. ...	M.L. 52, M.L. 94	(Harbour View leases)	...	...	...	...	...	...	379·86	3,619·25	1,560·86	61·41
Do. ...	M.L. 52, M.L. 94	(Harbour View leases)	...	...	...	...	...	...	...	3,403·50	2,227·62	1·88
Do. ...	98	Hillsborough	...	...	...	...	...	...	...	3,295·51	6,018·84	118·03

Do. ...	M.L. 370 ...	North Harbour View	...	...	...	...	...	...	...	35·27	22·16	...
Do. ...	M.L. 52, M.L. 94	(Ravensthorpe G.M. Syndicate, N.L.)	...	...	...	...	...	...	...	1,124·00	433·94	164·98
Do. ...	...	Voided leases	...	...	...	...	...	113·28	176·31	37,704·03	25,448·75	3,070·20
Do. ...	...	Sundry claims	3·59	...	...	...	...	82·64	71·58	956·88	596·33	15·45
Mt. Desmond	...	Voided leases	...	...	...	...	...	...	1·40	9·00	3,905·46	6,891·59
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	...	32·81	51·01
Mt. Purchas	...	Voided leases	...	...	...	...	...	...	4·38	346·05	293·13	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	4·75	4·68	...
Ravensthorpe	M.L. (16) ...	(Marion Martin)	...	...	...	...	...	...	...	...	20·09	...
Do. ...	M.L. (16) ...	Marion Martin	...	...	...	...	...	...	...	...	240·70	...
Do. ...	M.L. (16) ...	(Marion Martin: Phillips River Gold & Copper Co., Ltd.)	...		...	...	...	...	...	...	275·33	205·97
Do. ...	(201)	Mount Doran	...	...	...	...	...	...	...	17·00	11·56	...
Do. ...	...	Voided leases	...	...	...	...	...	...	141·80	21,916·76	24,601·82	4,178·10
Do. ...	...	Sundry claims	2·64	...	10·00	5·65	...	160·46	6·60	2,268·18	1,425·66	20·65
West River ...	...	Voided leases	...	...	...	...	...	...	...	...	10·34	31·06
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	...	3·29	3·44
	From Goldfields generally :—											
	Sundry Parcels treated at:											
	Gem Battery		...	...	...	...	...	...	...	...	138·89	...
	Phillips River Smelter		...	...	...	...	...	...	...	...	385·96	493·66
	Two Boys' Works		...	...	...	...	...	...	...	...	100·95	...
	Various Works		...	...	...	...	...	...	...	...	4·76	...
	Reported by Banks and Gold Dealers		...	...	...	...	...	122·48	...	...	...	...
		Total	**6·23**	...	**17·00**	**13·10**	...	**478·86**	**781·93**	**92,456·20**	**87,925·01**	**15,688·17**

Donnybrook Goldfield.

Donnybrook ...	...	Voided leases	...	...	...	...	...	23·24	...	1,613·30	816·23	...
Do. ...	...	Sundry claims	...	...	...	...	...	...	...	40·00	2·29	...
		Total	...	...	...	...	...	**23·24**	...	**1,653·30**	**818·52**	...

State generally.

Jimbel Bar ...	41H	Coobina	...	57·42	...	...	·58	...	57·42	...	...	·58
Do. ...	...	Voided leases	...	...	...	...	...	...	53·66	...	...	...
Narra Tarra...	Loc. 833 ...	Narra Tarra: Fremantle Trading Co., Ltd.	...	...	...	...	...	...	...	...	91·51	20,718·76
	From State generally :—											
	Sundry Parcels treated at:											
	Fremantle Trading Co., Ltd., Works		...	...	...	67·25	...	...	...	...	3,300·16	9,675·43
	Hainault Sulphide Plant, Kalgoorlie		...	...	...	...	...	...	...	...	21 28	...
	State Smelter, Ravensthorpe		...	...	...	...	...	...	...	...	41·20	...
	Various Works		...	...	...	...	...	...	...	27·00	4,411·14	481·77
	Sundry Specimens		...	·29	...	...	...	4·24	56·85	...	...	...
	Reported by Banks and Gold Dealers		8·43	...	...	...	...	150·21	183·87	...	...	...
		Total	**8·43**	**57·71**	...	**67·25**	**·58**	**154·45**	**351·80**	**27·00**	**7,865·29**	**30,876·54**

TABLE V.

TOTAL OUTPUT OF GOLD BULLION ENTERED FOR EXPORT, AND RECEIVED AT THE PERTH BRANCH OF THE ROYAL MINT, FROM 1ST JANUARY, 1886, TO 31ST DECEMBER, 1926, SHOWING, IN FINE OUNCES, THE QUANTITY OBTAINED EACH YEAR FROM THE RESPECTIVE GOLDFIELDS, AND THE TOTAL ANNUAL VALUE.

Year.	Kimberley.			Pilbara.			*a* West Pilbara.			Ashburton.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs
1886	270·17	...	270·17	...	...	...	...	...	...	...	...	...
1887	4,359·37	...	4,359·37	...	...	...	...	...	...	...	...	...
1888	3,124·82	...	3,124·82	...	...	...	...	...	...	...	...	...
1889	2,204·28	...	2,204·28	9,992·63	...	9,992·63	...	...	...	...	...	...
1890	4,002·42	...	4,002·42	14,363·01	...	14,363·01	...	...	...	...	...	...
1891	2,415·07	...	2,415·07	10,623·32	...	10,623·32	...	...	...	750·31	...	750·31
1892	974·08	...	974·08	11,533·84	...	11,533·84	...	...	...	·63	...	·63
1893	1,450·77	...	1,450·77	10,465·43	...	10,465·43	...	...	...	418·43	...	418·43
1894	526·59	...	526·59	14,541·20	...	14,541·20	...	...	...	255·20	...	255·20
1895	784·27	...	784·27	17,464·65	...	17,464·65	...	...	...	483·76	...	483·76
1896	797·85	...	797·85	10,565·27	...	10,565·27	...	...	...	598·64	...	598·64
1897	495·67	...	495·67	10,695·67	...	10,695·67	...	...	...	928·75	...	928·75
1898	257·54	...	257·54	10,433·27	...	10,433·27	1,814·48	...	1,814·48	402·46	...	402·46
1899	728·52	275·94	1,004·46	17,888·69	473·96	18,362·65	1,749·39	...	1,749·39	214·26	252·10	466·36
1900	29·16	576·14	605·30	8,629·83	6,703·99	15,333·82	522·76	122·85	645·61	44·82	424·27	469·09
1901	...	601·26	601·26	36·68	10,223·75	10,260·43	78·38	357·46	435·84	7·70	50·24	57·94
1902	1·48	378·02	379·50	...	9,199·50	9,199·50	...	2,822·20	2,822·20	...	...	...
1903	...	433·71	433·71	2·26	12,049·52	12,051·78	...	5,493·23	5,493·23	...	114·67	114·67
1904	...	31·51	31·51	...	6,931·27	6,931·27	...	4,320·82	4,320·82	...	125·96	125·96
1905	...	545·95	545·95	48·33	13,353·49	13,401·82	...	1,164·92	1,164·92	...	42·05	42·05
1906	...	647·77	647·77	...	4,956·14	4,956·14	...	755·35	755·35	...	138·84	138·84
1907	...	362·06	362·06	...	4,130·48	4,130·48	...	332·30	332·30	...	41·85	41·85
1908	...	338·00	338·00	...	8,172·26	8,172·26	...	1,076·68	1,076·68	...	45·87	45·87
1909	...	168·95	168·95	...	5,529·19	5,529·19	...	1,396·22	1,396·22	...	228·16	228·16
1910	...	487·25	487·25	...	5,894·32	5,894·32	63·66	1,387·66	1,451·32	...	173·06	173·06
1911	...	148·53	148·53	...	4,874·00	4,874·00	58·00	819·35	877·35	...	270·68	270·68
1912	...	294·55	294·55	...	6,274·04	6,274·04	...	747·34	747·34	...	38·73	38·73
1913	...	266·41	266·41	...	4,207·37	4,207·37	...	1,237·85	1,237·85	...	39·26	39·26
1914	...	196·46	196·46	...	5,544·64	5,544·64	...	1,262·73	1,262·73	...	46·14	46·14
1915	...	220·94	220·94	...	7,411·06	7,411·06	·64	1,239·94	1,240·58	...	16·63	16·63
1916	...	249·58	249·58	...	6,700·93	6,700·93	...	560·79	560·79	...	31·16	31·16
1917	...	108·90	108·90	...	4,673·40	4,673·40	63·80	559·95	623·75	...	21·21	21·21
1918	...	116·34	116·34	2·35	2,951·81	2,954·16	...	267·48	267·48	...	6·29	6·29
1919	...	239·74	239·74	...	3,849·66	3,849·66	...	23·90	23·90	...	3·30	3·30
1920	...	131·53	131·53	9·42	5,295·85	5,305·27	...	114·20	114·20	...	2·96	2·96
1921	...	49·35	49·35	...	1,404·86	1,404·86	...	160·51	160·51	...	22·31	22·31
1922	...	5·01	5·01	...	3,732·13	3,732·13	...	95·88	95·88	...	13·57	13·57
1923	...	30·55	30·55	...	2,814·68	2,814·68	...	59·89	59·89	...	9·24	9·24
1924	...	12·77	12·77	6·58	2,209·05	2,215·63	...	70·49	70·49	...	3·18	3·18
1925	...	34·16	34·16	...	1,544·35	1,544·35	...	...	...	...	6·34	6·34
1926	...	64·61	64·61	...	2,762·18	2,762·18	...	64·54	64·54	...	10·26	10·26
Total	22,422·06	7,015·99	29,438·05	147,302·43	153,867·88	301,170·31	4,351·11	26,514·53	30,865·64	4,104·96	2,178·33	6,283·29

Year.	*b* Gascoyne.			*c* Peak Hill.			*c* East Murchison.			Murchison.		
1886	...	...	...	...	...	...	...	...	...	...	...	...
1887	...	...	...	...	...	...	...	...	...	...	...	...
1888	...	...	...	...	...	...	...	...	...	...	...	...
1889	...	...	...	...	...	...	...	...	...	...	...	...
1890	...	...	...	...	...	...	...	...	...	...	...	...
1891	...	...	...	...	...	...	...	...	...	1,846·83	...	1,846·83
1892	...	...	...	...	...	...	...	...	...	21,789·19	...	21,789·19
1893	...	...	...	...	...	...	...	...	...	18,974·77	...	18,974·77
1894	...	...	...	...	...	...	...	...	...	47,365·54	...	47,365·54
1895	...	...	...	...	...	...	...	...	...	58,575·66	...	58,575·66
1896	...	...	...	...	...	...	...	...	...	63,769·17	...	63,769·17
1897	...	...	...	4,571·38	...	4,571·38	8,457·34	...	8,457·34	74,154·67	...	74,154·67
1898	...	...	...	12,288·93	...	12,288·93	35,393·19	...	35,393·19	83,794·22	...	83,794·22
1899	297·96	76·63	374·59	14,064·24	14,558·64	28,622·88	33,826·08	3,361·95	37,188·03	61,586·09	22,074·71	83,660·80
1900	...	77·02	77·02	9,528·14	16,119·79	25,647·93	23,545·54	28,671·55	52,217·09	53,815·70	43,423·77	97,239·47
1901	6·59	16·82	23·41	231·85	19,352·44	19,584·29	29,780·63	40,557·07	70,337·70	92,149·56	38,996·10	131,145·66
1902	...	107·29	107·29	85·93	28,044·55	28,130·48	25,450·63	53,583·10	79,033·73	141,731·91	40,926·08	182,657·99
1903	...	30·76	30·76	203·60	29,395·32	29,598·92	21,878·06	65,334·05	87,212·11	154,012·88	54,348·53	208,361·41
1904	...	10·95	10·95	...	17,475·33	17,475·33	21,296·85	64,550·36	85,847·21	165,232·67	52,683·16	217,915·83
1905	...	21·34	21·34	125·01	13,371·75	13,496·76	1,361·68	89,249·93	90,611·61	131,656·36	92,742·05	224,398·41
1906	...	78·73	78·73	...	2,038·62	2,038·62	140·68	95,168·89	95,309·57	79,172·69	109,936·80	189,109·49
1907	...	8·44	8·44	...	5,918·75	5,918·75	2,891·66	117,735·69	120,627·35	54,811·74	115,497·50	170,309·24
1908	...	31·82	31·82	...	9,864·36	9,864·36	10,701·24	137,028·14	147,729·38	45,483·05	111,540·54	157,023·59
1909	...	7·37	7·37	...	7,322·29	7,322·29	11,599·83	136,637·67	148,237·50	24,682·47	107,167·27	131,849·74
1910	...	26·31	26·31	...	3,057·25	3,057·25	1,557·78	137,190·44	138,748·22	19,568·85	111,414·23	130,983·08
1911	...	7·87	7·87	...	134·23	134·23	11·77	96,442·87	96,454·64	13,919·70	109,444·91	123,364·61
1912	...	6·55	6·55	...	196·11	196·11	...	90,397·82	90,397·82	6,377·17	105,245·32	111,622·49
1913	...	...	...	...	258·10	258·10	195·78	80,122·11	80,317·89	5,749·47	115,694·96	121,444·43
1914	...	4·11	4·11	...	85·66	85·66	354·75	65,609·61	65,964·36	6,443·82	111,822·67	118,266·49
1915	...	65 55	65·55	·56	446·00	446·56	268·57	52,926·34	53,194·01	8,669·79	96,610·36	105,280·15
1916		60·53	60·53	...	155·01	155·01	902·67	30,284·85	31,187·52	6,694·02	77,369·19	84,063·21
1917	...	...	...	...	...	...	...	7,942·96	7,942·96	1,082·93	94,142·67	95,225·60
1918	...	...	...	...	...	...	...	768·08	768·08	214·23	75,478·06	75,692·29
1919	...	...	...	...	57·83	57·83	...	766·30	766·30	...	64,425·15	64,425·15
1920	...	3·19	3·19	...	18·78	18·78	...	98 82	98·82	835·05	56,338·49	57,173·54
1921	...	7·46	7·46	...	1·23	1·23	21·54	76·18	97·72	677·71	50,411·30	51,089·01
1922	...	1·52	1·52	...	5·12	5·12	556·07	614·95	1,171·02	238·39	40,724·62	40,963·01
1923	...	...	...	...	454·04	454·04	371·22	2,466·06	2,837·28	485·08	30,220·87	30,705·95
1924	...	2·46	2·46	2·98	1,669·92	1,672·90	...	4,490·78	4,490·78	613·28	22,414·52	23,027·80
1925	...	6·83	6·83	...	1,896·10	1,896·10	...	4,739·90	4,739·90	592·19	24,042·48	24,634·67
1926	...	5·87	5·87	...	1,557·22	1,557·22	21·55	4,726·77	4,748·32	671·64	29,099·54	29,771·18
Total	304·55	665·42	969·97	41,102·62	173,454·44	214,557·06	230,585·11	1,411,543·24	1,642,128·35	1,447,438·49	2,004,235·85	3,451,674·34

a Prior to 1st May, 1898, included with Pilbara. *b* Prior to March, 1899, included with Ashburton. *c* From 1st August, 1897.

TABLE V.—*continued.*

Total Output of Gold Bullion entered for Export, and Received at the Perth Branch of the Royal Mint, etc.— continued.

Year.	*d* YALGOO. Export.	Mint.	Total.	*e* MT. MARGARET. Export.	Mint.	Total.	*f* NORTH COOLGARDIE. Export.	Mint.	Total.	*g* BROAD ARROW. Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
1886	...	...	...	...	...	...	...	...	...	...	...	...
1887	...	...	...	...	...	...	...	...	...	...	...	...
1888	...	...	...	...	...	...	...	...	...	...	...	...
1889	...	...	...	...	...	...	...	...	...	...	...	...
1890	...	...	...	...	...	...	...	...	...	...	...	...
1891	...	...	...	...	...	...	...	...	...	...	...	...
1892	...	...	...	...	...	...	...	...	...	...	...	...
1893	...	...	...	...	...	...	...	...	...	...	...	...
1894	...	...	...	...	...	...	...	...	...	...	...	...
1895	...	...	...	...	...	...	...	...	...	...	...	...
1896	...	...	...	...	...	...	15,351·71	...	15,351·71	...	...	...
1897	1,819·81	...	1,819·81	7,770·22	...	7,770·22	66,697·57	...	66,697·57	3,720·87	...	3,720·87
1898	3,360·44	...	3,360·44	38,706·19	...	38,706·19	63,181·09	...	63,181·09	22,035·17	...	22,035·17
1899	5,089·83	4,643·00	9,732·83	58,064·19	15,128·98	73,193·17	54,489·26	40,059·43	94,548·69	32,224·04	7,607·18	39,831·22
1900	462·55	7,918·53	8,381·08	65,998·38	60,607·45	126,605·83	15,660·11	79,340·01	95,000·12	29,955·07	12,860·80	42,815·87
1901	6·80	8,330·42	8,337·22	65,352·46	114,840·17	180,192·63	6,620·82	122,806·58	129,427·40	9,313·50	17,066·09	26,379·59
1902	433·32	4,396·91	4,830·23	61,846·01	124,306·49	186,152·50	4,064·18	156,856·06	160,920·24	2,128·49	13,665·52	15,794·01
1903	47·08	1,430·59	1,477·67	65,416·09	125,437·19	190,853·28	1,348·74	167,153·90	168,502·64	5,201·12	18,245·41	23,446·53
1904	..	2,796·23	2,796·23	63,180·89	119,889·93	183,070·82	1,614·64	139,518·37	141,133·01	318·83	20,660·78	20,979·61
1905	73·75	4,549·25	4,626·00	34,949·75	153,203·05	188,152·80	1,193·71	145,615·47	146,809·18	603·66	15,300·58	15,904·24
1906	...	4,883·17	4,883·17	21,869·88	137,022·23	158,892·11	1,140·45	107,890·76	109,031·21	1,245·75	16,841·70	18,087·45
1907	...	3,199·60	3,199·60	23,989·43	154,059·92	178,049·35	13,240·87	72,701·05	85,941·92	4,292·34	13,610·81	17,903·15
1908	...	456·43	456·43	19,324·02	147,879·90	167,203·92	6,701·28	76,700·77	83,402·05	3,613·64	7,946·35	11,559·99
1909	...	626·80	626·80	24,123·15	135,914·94	160,038·09	6,389·19	66,631·79	73,020·98	6,711·37	4,863·50	11,574·87
1910	...	725·79	725·79	28,507·31	131,976·01	160,483·32	1,889·24	60,886·71	62,775·95	...	321·40	321·40
1911	...	294·80	294·80	21,302·54	131,280·97	152,583·51	209·17	60,270·42	60,479·59	176·57	280·54	457·11
1912	...	1,169·18	1,169·18	4,835·73	101,353·79	106,189·52	53·68	49,946·08	49,999·76	...	4·33	4·33
1913	...	2,837·97	2,837·97	157·14	89,408·71	89,565·85	...	60,855·69	60,855·69	...	8,947·58	8,947·58
1914	...	1,403·35	1,403·35	184·66	103,550·71	103,735·37	...	73,943·49	73,943·49	...	3,074·74	3,074·74
1915	...	4,218·34	4,218·34	68·20	107,934·53	108,002·73	638·99	56,372·00	57,010·99	...	14,447·56	14,447·56
1916	...	4,336·27	4,336·27	642·48	111,277·58	111,920·06	...	39,714·46	39,714·46	...	6,815·74	6,815·74
1917	...	1,108·11	1,108·11	...	111,357·98	111,357·98	...	28,306·34	28,306·34	...	9,185·65	9,185·65
1918	...	878·02	878·02	...	95,186·67	95,186·67	...	30,273·00	30,273·00	...	2,493·63	2,493·63
1919	...	648·81	648·81	...	95,129·83	95,129·83	...	21,535·19	21,535·19	...	2,782·50	2,782·50
1920	...	243·26	243·26	...	82,976·60	82,976·60	...	11,221·31	11,221·31	...	5,642·42	5,642·42
1921	...	188·04	188·04	...	27,703·53	27,703·53	380·43	9,785·52	10,165·95	...	163·81	163·81
1922	...	11,669·19	11,669·19	215·69	30,878·39	31,094·08	180·55	11.236·64	11,417·19	...	...	...
1923	46·38	5,657·27	5,703·65	352·97	33,162·16	33,515·13	212·97	9,455·91	9,668·88	...	331·78	331·78
1924	73·79	5,924·03	5,997·82	330·17	40,750·48	41,080·65	202·60	9,145·96	9,348·56	...	1,616·40	1,616·40
1925	11·46	2,222·77	2,234·23	123·26	38,264·17	38,387·43	175·56	4,391·29	4,566·85	...	5,694·50	5,694·50
1926	...	5,830·28	5,830·28	...	41,927·57	41,927·57	327·46	1,484,82	1,812·28	...	258·54	258·54
Total	11,478·21	92,586·41	104,064·62	607,310·81	2,662,409·93	3,269,720·74	261,964·27	1,714,099·02	1,976,063·29	121,540·42	210,729·84	332,270·26

Year.	*f* NORTH-EAST COOLGARDIE. Export.	Mint.	Total.	*f* EAST COOLGARDIE. Export.	Mint.	Total.	*h* COOLGARDIE. Export.	Mint.	Total.	YILGARN. Export.	Mint.	Total.
1886	...	...	...	...	...	...	...	...	...	...	...	...
1887	...	...	...	...	...	...	...	...	...	...	...	...
1888	...	...	...	...	...	...	...	...	...	...	...	...
1889	...	...	...	...	...	...	...	...	...	1,662·61	...	1,662·61
1890	...	...	...	...	...	...	...	...	...	2,036·99	...	2,036·99
1891	...	...	...	...	...	...	...	...	...	11,480·61	...	11,480·61
1892	...	...	...	...	...	...	...	...	...	18,973·91	...	18,973·91
1893	...	...	...	...	...	...	...	...	...	67,760·73	...	67,760·73
1894	...	...	...	...	...	...	94,227·58	...	94,227·58	28,178·31	...	28,178·31
1895	...	...	...	...	...	...	111,919·21	...	111,919·21	17,666·25	...	17,666·25
1896	3,679·63	...	3,679·63	76,297·42	...	76,297·42	61,848·03	...	61,848·03	14,819·20	...	14,819·20
1897	29,437·40	...	29,437·40	268,411·95	...	268,411·95	93,312·00	...	93,312·00	16,097·78	...	16,097·78
1898	112,039·58	...	112,039·58	402,847·31	...	402,847·31	113,816·75	...	113,816·75	10,463 35	...	10,463·35
1899	57,674·82	14,940·55	72,615·37	796,696·63	29,567·58	826,264·21	101,589·22	24,700·89	126,290·11	6,919·11	8,114·60	15,033·71
1900	10,400·57	36,233·90	46,634·47	600,328·29	125,105·24	725,433·53	60,988·33	46,167·62	107,155·95	688·47	25,628·83	26,317·30
1901	6,798·56	39,024·18	45,822·74	698,042·56	238,840·93	936,883·49	9,584·35	70,720·21	80,304·56	49·15	26,677·85	26,727·00
1902	549·07	46,316·67	46,865·74	460,462·26	546,964·68	1,007,426·94	2,872·61	80,887·85	83,760·46	3·31	22,232·80	22,236·11
1903	4,308·99	36,145·75	40,454·74	570,447·27	580,790·97	1,151,238·24	7,318·63	69,681·38	77,000·01	...	22,761·00	22,761·00
1904	55·09	33,262·10	33,317·19	555,016·48	584,579·88	1,139,596·36	1,100·07	61,073·11	62,173·18	28·87	29,965·37	29,994·24
1905	2,187·11	40,220·19	42,407·30	479,254·37	613,103·20	1,092,357·57	177·80	62,066·34	62,244·14	...	25,291·11	25,291·11
1906	1,590·31	30,943·82	32,534·13	454,645·84	612,546·81	1,067,192·65	103·78	60,474·81	60,578·59	...	25,570·77	25,570·77
1907	3,132·83	25,399·75	28,532·58	323,550·05	643,139·11	966,689·16	1,050·88	61,670·65	62,721·53	...	23,311·41	23,311·41
1908	925·44	23,902·44	24,827·88	267,748·62	657,936 89	925,685·51	871·76	40,982·65	41,854·41	...	20,866·10	20,866·10
1909	1,774·45	24,566·87	26,341·32	306,462·21	620,612·07	927,074·28	350·91	36,311·70	36,662·61	204·41	20,958·23	21,162·64
1910	...	19,082·01	19,082·01	179,062·94	653,211·05	832,273·99	...	38,264·02	38,264·02	...	24,049·13	24,049·13
1911	...	18,528·97	18,528·97	123,160·54	686,386·80	809,547·34	...	33,840·93	33,840·93	...	14,688·17	14,688·17
1912	194·22	14,475·38	14,669·60	71,429·00	717,356·45	788,785·45	...	42,327·65	42,327·65	...	27,439·38	27,439·38
1913	...	11,210·69	11,210·69	70,078·57	722,593·22	792,671·79	...	35,593·00	35,593·00	9,688·59	63,679·58	73,368·17
1914	...	5,210·22	5,210·22	40,393·05	677,609·26	718,002·31	...	21,957·78	21,957·78	3,788·03	81,713·56	85,511·59
1915	...	8,773·97	8,773·97	5,493·67	709,061·79	714,555·46	...	17,590·21	17,590·21	...	90,705·75	90,705·75
1916	...	1,996·06	1,996·06	6,194·14	635,425·68	641,619·82	...	12,381·82	12,381·82	...	84,800·82	84,800·82
1917	...	769·16	769·16	4,523·28	602,459·51	606,982·79	...	6,500·66	6,500·66	...	74,399·36	74,399·36
1918	...	145·91	145·91	10,216·56	560,438·18	570,654·74	...	6,727·82	6,727·82	745·57	67,956·84	68,702·41
1919	...	116·83	116·83	6,445·89	459,912·83	466,358·72	...	3,918·19	3,918·19	...	60,140·27	60,140·27
1920	...	350·26	350·26	2,186·57	402,861·25	405,047·82	...	4,031·16	4,031·16	2,230·09	35,930·17	38,160·26
1921	...	43·63	43·63	3,095·25	428,936·85	432,032·10	...	214·67	214·67	262·39	22,031·97	22,294·36
1922	...	...	...	2,631·78	415,979·06	418,610·84	...	518·97	518·97	1,437·76	13,267·24	14,705·00
1923	...	564·05	564·05	4,015·37	404,110·59	408,125·96	89·96	1,071·95	1,161·91	211·47	7,305·74	7,517·21
1924	61·74	1,322·28	1,384·02	1,071·69	375,211·10	376,282·79	126·97	6,721·06	6,848·03	75·22	8,644·23	8,719.45
1925	...	836·05	836·05	2,461·32	335,847·68	338,309·00	13·19	3,537·95	3,551·14	391·54	12,595·06	12,986·60
1926	169·49	2,528·79	2,698·28	1,935·32	327,757·10	329,692·42	...	2,857·39	2,857·39	...	10,775·99	10,775·99
Total	234,979·30	436,910·48	671,889·78	6,794,606·20	14,368,345·76	21,162,951·96	661,362·03	852,792·44	1,514,154·47	215,873·72	951,501·33	1,167,375·05

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.

TABLE V.—*continued.*

Total Output of Gold Bullion entered for Export, and Received at the Perth Branch of the Royal Mint, etc.—continued.

Year.	*i* DUNDAS.			*j* PHILLIPS RIVER.			¶ DONNYBROOK.			STATE GENERALLY.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
1886	...	...	...	...	...	...	...	...	...	...	...	...
1887	...	...	...	...	...	...	...	...	...	...	...	...
1888	...	...	...	...	...	...	...	...	...	...	...	...
1889	...	...	...	...	...	...	...	...	...	...	...	...
1890	...	...	...	...	...	...	...	...	...	...	...	...
1891	...	...	...	...	...	...	...	...	...	...	...	...
1892	...	...	...	...	...	...	...	...	...	...	...	...
1893	132·37	...	132·37	...	...	...	...	...	...	...	...	...
1894	204·31	..	204·31	...	...	...	...	...	...	...	...	...
1895	216·40	...	216·40	...	...	...	...	...	...	...	...	...
1896	3,891·77	..	3,891·77	...	...	...	...	...	...	...	...	...
1897	17,275·36	...	17,275·36	...	...	...	...	...	...	...	...	...
1898	28,655·52	...	28,655·52	...	...	...	...	...	...	...	...	...
1899	39,980·65	423·71	40,404·36	...	...	...	277·27	175·49	452·76	...	809·07	809·07
1900	8,144·72	28,254·19	36,398·91	...	...	...	...	237·56	237·56	5,644·83	1,450·08	7,094·91
1901	5,411·46	29,752·16	35,163·62	...	...	...	...	4·20	4·20	215·91	1,511·63	1,727·54
1902	4,401·31	26,714·16	31,115·47	2,946·53	4,422·56	7,369·09	4·94	57·64	62·58	7·77	2,115·52	2,123·29
1903	1,311·53	33,905·88	35,217·41	2,136·09	5,441·68	7,577·77	...	82·64	82·64	53·44	2,839·44	2,892·88
1904	1,834·03	31,347·06	33,181·09	936·76	2,047·59	2,984·35	...	...	...	·86	1,344·25	1,345·11
1905	1,324·48	27,411·31	28,735·79	2,060·46	1,458·44	3,518·90	...	...	...	70·41	1,515·58	1,585·99
1906	1,111·18	20,198·62	21,309·80	945·65	1,439·03	2,384·68	...	...	...	284·38	763·15	1,047·53
1907	...	22,830·71	22,830·71	4,043·86	1,514·90	5,558·76	...	...	...	799·48	285·47	1,084·95
1908	...	41,203·39	41,203·39	969·00	3,631·02	4,600·02	...	...	...	15·91	1,953·56	1,969·47
1909	...	35,894·72	35,894·72	4,025·81	3,605·75	7,631·56	...	...	...	46·78	455·34	502·12
1910	...	43,260·55	43,260·55	3,271·89	5,031·60	8,303·49	...	...	...	48·67	222·89	271·56
1911	...	48,361·14	48,361·14	1,374·96	4,241·05	5,616·01	...	...	...	209·03	129·01	338·04
1912	...	38,373·40	38,373·40	...	3,292·05	3,292·05	...	...	...	687·32	142·72	830·04
1913	...	27,090·46	27,090·46	...	3 515·02	3,515·02	...	...	...	385·58	230·17	615·75
1914	...	27,803·51	27,803·51	...	395·67	395·67	...	...	...	280·34	287·86	568·20
1915	...	24,148·61	24,148·61	2,011·73	263·06	2,274·79	...	...	...	188·32	318·59	506·91
1916	...	21,956·42	21,956·42	4,119·93	181·13	4,301·06	...	...	...	8,188·93	357·85	8,546·78
1917	...	19,346·27	19,346·27	2,995·76	196·24	3,192·00	...	...	...	356·72	216·30	573·02
1918	...	16,215·83	16,215·83	4,463·52	400·11	4,863·63	...	...	...	1·89	562·96	564·85
1919	...	13,631·96	13,631·96	...	349·49	349·49	...	...	...	...	88·12	88·12
1920	...	7,156·82	7,156·82	...	34·62	34·62	...	...	...	...	129·31	129·31
1921	...	4,961·45	4,961·45	2,733·42	329·14	3,062·56	...	...	...	...	68·11	68·11
1922	...	3,799·37	3,799·37	...	317·13	317·13	...	...	...	59·92	67·33	127·25
1923	...	534·52	534·52	...	258·90	258·90	...	...	...	148·40	69·39	217·79
1924	1·38	2,126·14	2,127·52	...	67·72	67·72	...	...	...	18·80	47·21	66·01
1925	...	1,504·11	1,504·11	...	34·63	34·63	...	...	...	142·07	143·19	285·26
1926	...	2,361·15	2,361·15	...	29·55	29·55	...	...	...	62·76	52·81	115·57
Total	113,896·47	600,567·62	714,464·09	39,035·37	42,498·08	81,533·45	282·21	557·53	839·74	17,918·52	18,176·91	36,095·43

i Prior to 1893 included with Yilgarn. *j* Prior to 1902, included in State generally. ¶ Abolished 4th March, 1908.

Year.	GRAND TOTAL.					
	Export.	Mint.	Total.	Value.		
	fine ozs.	fine ozs.	fine ozs.	£	s.	d.
1886	270·17	...	270·17	1,147	12	2¼
1887	4,359·37	...	4,359·37	18,517	8	6¼
1888	3,124·82	...	3,124·82	13,278	7	10¾
1889	13,859·52	...	13,859·52	58,871	9	11¼
1890	20,402·42	...	20,402·42	86,668	19	5
1891	27,116·14	...	27,116·14	115,182	0	10½
1892	53,271·65	...	53,271·65	226,283	11	8
1893	99,202·50	...	99,202·50	421,385	8	8½
1894	185,298·73	...	185,298·73	787,098	19	6
1895	207,110·20	...	207,110·20	879,748	4	2¼
1896	251,618·69	...	251,618·69	1,068,808	5	2
1897	603,846·44	...	603,846·44	2,564,976	12	9¼
1898	939,489·49	...	939,489·49	3,990,697	18	10
1899	1,283,360·25	187,244·41	1,470,604·66	6,246,731	10	7¾
1900	894,387·27	519,923·59	1,414,310·86	6,007,610	13	4½
1901	928,686·96	779,729·56	1,708,416·52	7,235,658	9	1
1902	707,039·75	1,163,997·60	1,871,037·35	7,947,661	9	7¾
1903	833,685·78	1,231,115·62	2,064,801·40	8,770,718	17	0¼
1904	810,616·04	1,172,614·03	1,983,230·07	8,424,225	17	8¾
1905	655,089·88	1,300,226·00	1,955,315·88	8,305,653	18	5½
1906	562,250·59	1,232,296·01	1,794,546·60	7,622,749	8	7
1907	431,803·14	1,265,750·45	1,697,553·59	7,210,749	6	2¾
1908	356,353·96	1,291,557·17	1,647,911·13	6,999,881	10	10½
1909	386,370·58	1,208,898·83	1,595,269·41	6,776,273	14	7¼
1910	233,970·34	1,236,661·68	1,470,632·02	6,246,847	15	0
1911	160,422·28	1,210,445·24	1,370,867·52	5,823,075	1	9¾
1912	83,577·12	1,199,080·87	1,282,657·99	5,448,384	16	5¾
1913	86,255·13	1,227,788·15	1,314,043·28	5,581,701	1	2¾
1914	51,454·65	1,181,522·17	1,232,976·82	5,237,352	12	6½
1915	17,340·47	1,192,771·23	1,210,111·70	5,140,227	15	5¼
1916	26,742·17	1,034,655·87	1,061,398·04	4,508,532	5	11
1917	9,022·49	961,294·67	970,317·16	4,121,645	6	2¼
1918	15,644·12	860,867·03	876,511·15	3,723,182	14	9
1919	6,445·89	727,619·90	734,065·79	3,118,118	5	6¼
1920	5,261·13	612,581·00	617,842·13	2,624,426	11	0
1921	7,170·74	546,559·92	553,730·66	2,352,098	6	8½
1922	5,320·16	532,926·12	538,246·28	2,286,324	17	5
1923	5,933·82	498,577·59	504,511·41	2,143,028	5	0½
1924	2,585·20	482,449·78	485,034·98	2,060,297	12	8½
1925	3,910·59	437,341·56	441,252·15	1,874,319	19	10¾
1926	3,188·22	434,154·98	437,843·20	1,857,715	16	7
TOTAL	10,977,858·86	25,730,651·03	36,708,509·89	155,927,838	14	8¾

TABLE VI.

Comparative Return of Gold Bullion entered for Export and received at the Perth Branch of the Royal Mint, during the Years 1924, 1925, and 1926, showing in Fine Ounces the Quantity recorded each Month, and its Value.

Months and Quarters.	1924.				1925.				1926.			
	Export.	Mint.	Total.	Value.	Export.	Mint.	Total.	Value.	Export.	Mint.	Total.	Value.
	fine ozs.	fine ozs.	fine ozs.	£ s. d.	fine ozs.	fine ozs.	fine ozs.	£ s. d.	fine ozs.	fine ozs.	fine ozs.	£ s. d.
January	198·08	37,260·27	37,458·35	159,112 19 1¾	109·71	31,123·79	31,233·50	132,671 9 6	193·51	29,108·03	29,301·54	124,465 0 7¼
February	285·15	42,849·78	43,134·93	183,225 10 8¾	395·63	32,087·86	32,483·49	137,981 1 10¾	276·68	34,408·08	34,684·76	147,331 9 11
March	111·14	36,188·99	36,300·13	154,193 3 0¼	1,082·93	31,013·95	32,096·88	136,338 17 7¼	546·52	30,081·73	30,628·25	130,100 10 8¾
1st January to 31st March ...	**594·37**	**116,299·04**	**116,893·41**	**496,531 12 10¾**	**1,588·27**	**94,225·60**	**95,813·87**	**406,991 9 0**	**1,016·71**	**93,597·84**	**94,614·55**	**401,897 1 3**
April	...	45,087·57	45,087·57	191,519 16 5¾	444·57	39,170·09	39,614·66	168,272 7 7¼	495·49	43,199·89	43,695·38	185,606 3 6¼
May	423·18	39,914·29	40,337·47	171,342 13 7½	305·96	34,468·49	34,774·45	147,712 9 5¾	...	35,437·90	35,437·90	150,530 12 7½
June	87·10	47,083·23	47,170·33	200,366 16 6¼	228·90	39,274·09	39,502·99	167,798 0 8½	...	39,682·49	39,682·49	168,560 10 0¾
1st January to 30th June ...	**1,104·65**	**248,384·13**	**249,488·78**	**1,059,760 19 6¼**	**2,567·70**	**207,138·27**	**209,705·97**	**890,774 6 9½**	**1,512·20**	**211,918·12**	**213,430·32**	**906,594 7 5½**
July	170·50	35,788·99	35,959·49	152,746 4 1	106·88	34,469·40	34,576·28	146,870 14 0½	300·64	34,815·60	35,116·24	149,164 6 1½
August	...	41,581·96	41,581·96	176,628 18 9¼	124·72	44,007·26	44,131·98	187,460 14 8½	328·41	40,564·93	40,893·34	173,703 17 4
September	384·86	38,305·91	38,690·77	164,347 18 10¾	191·55	34,647·44	34,838·99	147,986 12 5½	143·73	33,000·47	33,144·20	140,787 12 3
1st January to 30th September ...	**1,660·01**	**364,060·99**	**365,721·00**	**1,553,484 1 3¼**	**2,990·85**	**320,262·37**	**323,253·22**	**1,373,092 8 0**	**2,284·98**	**320,299·12**	**322,584·10**	**1,370,250 3 2**
October	371·23	41,036·20	41,407·43	175,887 11 7¾	174·68	38,488·28	38,662·96	164,229 16 3½	424·70	41,292·63	41,717·33	177,203 19 1
November	167·50	33,151·29	33,318·79	141,529 4 5¾	289·22	34,809·58	35,098·80	149,090 4 6¼	89·72	32,120·19	32,209·91	136,819 0 0
December	386·46	44,201·30	44,587·76	189,396 15 3¾	455·84	43,781·33	44,237·17	187,907 11 1	388·82	40,443·04	40,831·86	173,442 14 4
Total	**2,585·20**	**482,449·78**	**485,034·98**	**2,060,297 12 8½**	**3,910·59**	**437,341·56**	**441,252·15**	**1,874,319 19 10¾**	**3,188·22**	**434,154·98**	**437,343·20**	**1,857,715 16 7**

TABLE VII.

MONTHLY RETURN OF GOLD, CONTAINED IN BULLION, FURNACE PRODUCTS, AND ORE, ENTERED FOR EXPORT DURING 1926.

MONTH.	UNITED KINGDOM.			CANADA.			VICTORIA.			NEW SOUTH WALES.			TOTALS.			Minted Gold Exported*
	Bullion.	Furnace Products.	Ore.	Bullion.	Furnace Products.	Ore.	Bullion.	Furnace Products.	Ore.	Bullion.	Furnace Products.	Ore.	**Bullion.**	**Furnace Products.**	**Ore.**	
1926.	Fine ozs.	Estimated fine ozs.	Estimated fine ozs.	Fine ozs.	Estimated fine ozs.	Estimated fine ozs.	Fine ozs.	Estimated fine ozs.	Estimated fine ozs.	Fine ozs.	Estimated fine ozs.	Estimated fine ozs.	Fine ozs.	Estimated fine ozs.	Estimated fine ozs.	Fine ozs.
January	1·88	...	...	...	...	...	...	...	191·63	...	...	...	**1·88**	...	**191·63**	...
February	...	...	...	...	...	...	...	...	...	...	276·68	...	...	**276·68**	...	...
March	...	...	...	...	...	...	...	...	72·27	...	474·25	...	...	**474·25**	**72·27**	...
April	...	...	...	...	...	...	...	...		...	495·49	...	...	**495·49**	...	34,161·42
May	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	12,262·33
June	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
July	...	...	...	...	...	...	...	...	193·99	...	106·65	...	...	**106·65**	**193·99**	23,629·07
August	...	...	1·88	...	...	...	...	...	155·85	...	170·68	...	...	**170·68**	**157·73**	30,616·05
September	1·13	...	...	...	...	...	...	...	...	...	142·60	...	**1·13**	**142·60**	...	...
October	...	...	...	...	...	·07	...	...	...	...	424·63	...	...	**424·63**	**·07**	...
November	...	...	...	...	...	...	...	...	...	...	89·72	...	...	**89·72**	...	35·53
December	...	...	...	...	...	...	...	...	...	...	388·82	...	...	**388·82**	...	...
TOTALS	3·01	...	1·88	...	...	·07	...	...	613·74	...	2,569·52	...	**3·01**	**2,569·52**	**615·69**	**100,704·40**

*When considering the total production of gold for this State, these amounts must be disregarded, having been already recorded in the total receipts of gold at the Mint.

TABLE VIII.—RETURN OF GOLD BULLION RECEIVED AT THE PERTH BRANCH OF THE ROYAL MINT FROM MAY, 1899, TO THE 31ST DECEMBER, 1926, SHOWING IN GROSS OUNCES THE QUANTITY OBTAINED FROM THE RESPECTIVE GOLDFIELDS AND OTHER COUNTRIES, AND THE ACTUAL VALUE THEREOF.

Year.	Kimberley.	Pilbara.	West Pilbara.	Ashburton.	Gascoyne.	Peak Hill.	East Murchison.	Murchison.	Yalgoo.
	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Previous to 1902	1,615·84	19,303·61	531·71	811·48	190·31	55,644·75	80,554·69	116,240·41	23,232·58
1902	439·93	10,706·03	3,284·37	...	124·86	32,637·17	62,357·98	47,628·18	5,116·94
1903	511·75	14,217·53	6,481·58	135·30	36·29	34,684·27	77,089·29	64,127·18	1,687·99
1904	37·69	8,293·58	5,170·06	150·73	13·10	20,909·99	77,237·31	63,037·71	3,345·82
1905	656·34	16,053·42	1,400·46	50·54	25·65	16,075·36	107,295·17	111,493·34	5,469·06
1906	785·23	6,007·79	915·63	168·30	95·43	2,471·21	115,363·22	133,264·79	5,919·37
1907	431·72	4,924·97	396·22	49·89	10·06	7,057·22	140,382·15	137,713·43	3,815·06
1908	400·19	9,676·11	1,292·97	54·32	37·68	11,679·58	162,243·76	132,066·00	2,625·14
1909	203·59	6,662·82	1,682·49	274·93	8·89	8,823·58	164,652·43	129,139·74	755·31
1910	586·44	7,094·46	1,670·20	208·31	31·67	3,679·72	165,123·37	134,098·94	873·58
1911	183·78	6,033·33	1,014·60	334·38	9·78	165·36	119,267·86	135,342·96	363·85
1912	361·11	7,674·55	912·60	47·77	8·09	237·96	110,585·25	128,679·43	1,410·49
1913	319·55	5,048·77	1,491·66	47·37	...	564·67	96,270·04	139,021·56	3,410·52
1914	238·83	6,750·56	1,538·31	56·09	5·00	104·45	79,785·02	135,990·48	1,705·85
1915	270·76	9,084·52	1,540·93	20·50	81·05	550·77	65,111·82	118,861·14	5,208·56
1916	306·92	8,265·75	692·68	38·34	74·07	190·21	37,169·30	95,071·24	5,320·33
1917	133·03	5,770·70	683·84	25·85	...	...	9,660·88	115,360·36	1,366·18
1918	144·31	3,643·49	339·36	7·87	...	...	949·78	93,501·94	1,090·10
1919	293·46	4,813·34	29·62	4·10	...	71·92	958·91	79,921·84	806·04
1920	164·07	6,589·24	137·59	3·79	4·03	22·62	121·47	70,428·05	307·48
1921	62·45	1,772·78	201·52	28·42	9·39	1·58	97·40	63,808·17	235·89
1922	6·36	4,694·01	123·65	17·41	1·89	6·40	789·30	51,649·85	14,819·53
1923	37·92	3,506·31	74·18	1·31	...	564·84	3,066·04	37,634·94	7,059·53
1924	16·21	2,760·69	86·49	4·00	3·02	2,128·28	5,707·71	28,211·09	7,449·97
1925	43·90	1,962·09	...	8·22	8·72	2,418·19	6,067·06	30,610·94	2,835·37
1926	80·74	3,430·80	81·50	12·77	7·42	1,938·85	5,870·50	36,315·56	7,259·27
Total ...	8,332·12	184,741·25	31,774·22	2,561·99	786·40	202,628·95	1,693,777·71	2,429,219·27	113,489·81

Year.	Mt. Margaret.	North Coolgardie.	Broad Arrow.	North-East Coolgardie.	East Coolgardie.	Coolgardie.	Yilgarn.	Dundas.	*Phillips River.
	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Previous to 1902	211,363·90	268,960·83	41,708·73	100,259·65	436,411·68	157,244·57	67,153·05	64,882·58	...
1902	144,663·12	182,543·06	15,903·42	53,901·58	636,536·52	94,134·17	25,873·68	31,088·91	5,146·80
1903	148,006·49	197,229·08	21,528·20	42,649·25	685,289·82	82,218·79	26,856·28	40,006·39	6,420·79
1904	143,453·51	166,939·82	24,721·53	39,799·55	699,475·35	73,076·66	35,854·87	37,508·11	2,450·03
1905	184,178·87	175,057·14	18,394·17	48,352·22	737,065·14	74,615·36	30,404·65	32,953·56	1,753·32
1906	166,097·63	130,784·60	20,415·43	37,509·91	742,525·99	73,307·24	30,996·76	24,484·65	1,744·38
1907	183,693·29	86,685·09	16,228·85	30,285·39	766,846·83	73,532·99	27,795·35	27,222·21	1,806·30
1908	175,092·47	90,815·08	9,408·64	28,300·91	779,009·10	48,524·18	22,835·58	48,785·54	4,299·19
1909	163,781·55	80,293·29	5,860·66	29,603·84	747,856·04	43,756·68	25,255·30	43,254·22	4,345·04
1910	158,847·24	73,283·66	386·84	22,967·23	786,209·41	46,054·82	28,945·68	52,068·70	6,056·08
1911	162,319·77	74,536·34	346·78	22,917·38	848,725·06	41,861·54	18,190·20	59,831·49	5,242·16
1912	124,123·10	61,018·13	5·32	17,705·86	876,900·05	51,732·78	33,429·29	52,220·76	4,026·32
1913	107,391·67	73,160·41	10,814·52	13,452·90	867,887·30	42,738·63	76,581·73	47,535·02	4,221·40
1914	125,937·60	89,904·49	3,727·56	6,318·12	824,280·77	26,696·51	99,410·57	47,487·27	480·65
1915	132,819·64	69,318·34	17,810·14	10,808·78	872,406·66	21,593·44	111,539·75	42,283·16	324·48
1916	136,731·10	48,799·86	8,415·40	2,441·68	780,354·90	15,238·33	104,136·12	36,653·26	221·89
1917	136,343·74	34,650·24	11,300·38	936·97	737,833·22	7,968·62	91,168·91	34,685·39	238·50
1918	118,132·80	37,572·67	3,087·67	179·83	695,564·50	8,338·10	84,297·45	29,649·05	494·27
1919	117,763·53	26,692·84	3,455·12	144·34	569,081·41	4,866·10	74,493·69	20,346·85	434·47
1920	103,788·16	14,038·70	6,997·95	440·84	507,113·25	5,035·18	45,007·22	9,865·14	43·29
1921	35,134·85	12,492·59	206·82	54·75	543,397·61	273·77	27,844·76	6,259·31	413·29
1922	39,372·87	14,263·42	...	...	527,784·28	664·06	16,847·62	4,800·69	403·98
1923	41,206·42	11,757·92	423·44	703·32	502,783·94	1,334·06	9,085·08	674·62	325·25
1924	51,477·10	11,534·54	2,047·14	1,670·74	473,587·19	8,486·18	10,904·41	2,708·25	85·41
1925	49,010·57	5,619·91	7,246·05	1,062·56	427,548·64	4,524·68	16,016·10	1,909·16	43·83
1926	52,173·91	1,854·60	325·48	3,146·70	408,289·49	3,559·11	13,395·86	2,922·16	36·77
Total ...	3,212,904·90	2,039,806·65	250,766·24	515,614·30	17,480,764·15	1,011,376·55	1,154,319·96	802,086·45	51,057·89

Year.	†Donnybrook.	State generally.	TOTAL. Western Australia. Quantity.	Actual Value.			Other Countries. Quantity.	Actual Value.			GRAND TOTAL. Quantity.	Actual Value.		
	ozs.	ozs.	ozs.	£	s.	d.	ozs.	£	s.	d.	ozs.	£	s.	d.
Previous to 1902	466·36	4,193·11	1,650,769·84	5,892,070	6	0	213·20	678	19	6	1,650,983·04	5,892,749	5	6
1902	67·08	2,461·98	1,354,615·78	4,791,303	18	1	16·27	38	10	2	1,354,632·05	4,791,342	8	3
1903	97·52	3,350·32	1,452,624·11	5,139,852	11	9	294·78	703	14	10	1,452,918·89	5,140,556	6	7
1904	...	1,608·47	1,403,083·89	4,955,870	9	0	263·05	614	11	9	1,403,346·94	4,956,485	0	9
1905	...	1,821·99	1,563,115·76	5,475,841	2	10	525·80	1,491	0	7	1,563,641·56	5,477,332	3	5
1906	...	925·10	1,493,782·66	5,330,245	12	1	413·86	974	16	0	1,494,196·52	5,331,220	8	1
1907	...	340·39	1,509,217·41	5,416,812	0	7	640·51	1,663	4	3	1,509,857·92	5,418,475	4	10
1908	...	2,080·42	1,529,226·86	5,386,858	15	8	1,313·84	3,885	2	3	1,530,540·70	5,390,743	17	11
1909	...	548·71	1,456,759·11	5,143,035	17	1	882·56	1,109	6	7	1,457,641·67	5,144,145	3	8
1910	...	268·26	1,488,454·61	5,163,100	17	11	2,251·71	1,670	11	7	1,490,706·32	5,164,771	9	6
1911	...	159·90	1,496,846·52	5,143,795	10	5	452·22	915	19	4	1,497,298·74	5,144,711	9	9
1912	...	174·26	1,471,253·12	5,106,466	9	1	641·47	1,527	8	0	1,471,894·59	5,107,993	17	1
1913	...	277·70	1,490,235·42	5,204,738	18	3	697·50	1,247	12	7	1,490,932·92	5,205,986	10	10
1914	...	350·48	1,450,768·61	5,016,905	19	0	915·24	1,726	5	1	1,451,683·85	5,018,632	4	1
1915	...	392·28	1,480,026·72	5,060,196	7	6	1,260·07	2,610	8	11	1,481,286·79	5,062,806	16	5
1916	...	437·33	1,280,558·71	4,405,278	13	10	1,059·26	2,060	6	9	1,281,617·97	4,407,339	0	7
1917	...	264·27	1,188,391·08	4,074,112	6	7	1,016·70	1,905	17	7	1,189,407·78	4,076,018	4	2
1918	...	705·32	1,077,698·51	3,655,942	4	5	1,468·02	2,476	6	11	1,079,166·53	3,658,418	11	4
1919	...	109·08	904,286·66	3,089,243	3	1	1,358·71	2,611	16	1	905,645·37	3,091,854	19	2
1920	...	161·46	770,269·53	2,595,167	17	9	1,375·73	1,531	18	5	771,645·26	2,596,699	16	2
1921	...	86·45	692,381·80	2,322,697	14	1	1,563·59	2,206	15	8	693,945·39	2,324,904	9	9
1922	...	85·44	676,330·76	2,264,069	17	11	3,319·49	2,130	17	2	679,650·25	2,266,200	15	1
1923	...	86·62	620,325·74	2,118,348	19	7	1,310·52	2,752	9	4	621,636·26	2,121,101	8	11
1924	...	58·91	608,927·33	2,049,636	8	9	1,006·53	1,814	18	4	609,933·86	2,051,451	7	1
1925	...	183·41	557,119·40	1,862,674	9	6	1,352·45	1,659	3	4	558,471·85	1,864,333	12	10
1926	...	65·55	540,767·04	1,850,338	10	0	684·00	1,226	2	10	541,451·04	1,851,564	12	10
Total	630·96	21,197·21	31,207,836·98	108,514,605	0	9	26,297·08	43,234	3	10	31,234,134·06	108,557,839	4	7

* Prior to 1902 included in State generally. † Abolished 4th March, 1908.

PART II.—MINERALS OTHER THAN GOLD.

TABLE IX.—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 1926, AND PREVIOUS YEARS.

Period.	BLACK 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.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Previous to 1901 ...	...	520·82	520·82	35,205	...	2,303·27	2,303·27	117,294	...	2,824·09	2,824·09	152,499
1901	...	412·98	412·98	21,148	...	321·34	321·34	18,852	...	734·32	734·32	40,000
1902	...	216·35	216·35	15,103	...	403·21	403·21	24,680	...	619·56	619·56	39,783
1903	...	292·11	292·11	21,528	...	524·94	524·94	34,362	...	817·05	817·05	55,890
1904	...	320·86	320·86	24,355	...	533·64	533·64	34,462	...	854·50	854·50	58,817
1905	...	435·74	435·74	33,880	...	643·52	643·52	52,960	...	1,079·26	1,079·26	86,840
1906	36·59	675·06	711·65	78,449	26·18	757·10	783·28	79,195	62·77	1,432·16	1,494·93	157,644
1907	104·13	749·56	853·69	85,603	40·40	729·60	770·00	73,045	144·53	1,479·16	1,623·69	158,648
1908	31·00	372·03	403·03	30,636	13·90	562·43	576·33	41,046	44·90	934·46	979·36	71,682
1909	81·75	212·21	293·96	22,431	44·40	414·35	458·75	34,786	126·15	*628·08	*754·23	†57,335
1910	33·75	119·75	153·50	12,899	25·06	292·65	317·71	27,974	58·81	412·40	471·21	40,873
1911	27·35	121·30	148·65	16,064	27·82	383·30	411·12	44,638	55·17	504·60	559·77	60,702
1912	10·25	113·13	123·38	14,993	14·90	415·55	430·45	50,166	25·15	528·68	553·83	65,159
1913	14·15	124·95	139·10	16,506	29·06	429·42	458·48	50,954	43·21	‡557·72	‡600·93	§67,717
1914	12·35	75·05	87·40	8,168	5·32	239·22	244·54	21,145	17·67	314·27	331·94	29,313
1915	5·05	73·60	78·65	7,633	7·55	239·78	247·33	21,431	12·60	313·38	325·98	29,064
1916	6·50	146·67	153·17	15,939	9·94	271·80	281·74	27,319	16·44	418·47	434·91	43,258
1917	4·05	65·00	69·05	9,264	11·18	226·74	237·92	29,928	15·23	291·74	306·97	39,192
1918	5·70	93·80	99·50	20,984	50·52	245·28	295·80	57,653	56·22	339·08	395·30	78,637
1919	...	36·70	36·70	5,871	23·66	220·95	244·61	34,959	23·66	257·65	281·31	40,830
1920	...	41·50	41·50	7,616	10·25	179·84	190·09	31,249	10·25	221·34	231·59	38,865
1921	...	14·50	14·50	1,460	7·00	45·87	52·87	5,778	7·00	60·37	67·37	7.238
1922	...	25·35	25·35	2,446	·15	15·71	15·86	1,393	·15	41·06	41·21	3,839
1923	...	24·40	24·40	2,960	...	28·02	28·02	3,024	...	52·42	52·42	5,984
1924	...	28·55	28·55	4,048	·32	52·24	52·56	7,469	·32	80·79	81·11	11,517
1925	...	23·96	23·96	3,609	1·21	54·06	55·27	8,764	1·21	78·02	79·23	12,373
1926	...	35·42	35·42	5,446	...	61·41	61·41	10,126	...	96·83	96·83	15,572
Total	372·62	5,371·35	5,743·97	524·244	348·82	10,595·24	10,944·06	944,652	721·44	15,971·43	16,692·90	1,469,271

* Includes tons 1·52, the produce of Cue District. † Includes £118, value of tons 1·52, the produce of Cue District, ‡ Includes tons 3·20, the produce of Cue District and tons ·15 of Coolgardie District. § Includes £242, value of tons 3·20 the produce of Cue District, and £15, value of ·15 tons of Coolgardie District.

Period.	TANTALITE.											
	Pilbara Goldfield—Marble Bar District.				Greenbushes Mineral Field.				Total.			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Previous to 1901 ...	...	...	...	...	...	...	...	...	...	...	...	...
1901	...	...	...	...	...	...	...	...	...	...	...	...
1902	...	...	...	...	...	...	...	...	...	...	...	...
1903	...	...	...	...	...	...	...	...	...	...	...	...
1904	...	...	...	...	...	...	...	...	...	...	...	...
1905	...	70·95	70·95	8,925	...	2·34	2·34	1,590	...	73·29	73·29	10,515
1906	1·80	12·85	14·65	2,644	...	...	...	...	1·80	12·85	14·65	2,644
1907	...	...	...	...	...	...	...	...	...	...	...	...
1908	...	...	...	...	...	...	...	...	...	...	...	...
1909	·45	...	·45	113	...	·85	·85	214	·45	·85	1·30	327
1910	...	...	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	...	...	...	...
1912	...	...	...	...	...	...	...	...	...	...	...	...
1913	...	...	...	...	...	...	...	...	...	...	...	...
1914	...	...	...	...	...	...	...	...	...	...	...	...
1915	...	...	...	...	...	...	...	...	...	...	...	...
1916	...	...	...	...	...	...	...	...	...	...	...	...
1917	...	12·50	12·50	1,782	...	...	...	...	...	12·50	12·50	1,782
1918	...	...	...	...	...	...	...	...	...	...	...	...
1919	...	...	...	...	...	...	...	...	...	...	...	...
1920	...	...	...	...	...	...	...	...	...	...	...	...
1921	...	...	...	...	...	...	...	...	...	...	...	...
1922	...	...	...	...	...	...	...	...	...	...	...	...
1923	...	...	...	...	...	...	...	...	...	...	...	...
1924	...	...	...	...	...	...	...	...	...	...	...	...
1925	...	6·25	6·25	750	...	...	...	...	...	6·25	6·25	750
1926	...	19·45	19·45	2,357	...	...	...	...	...	19·45	19·45	2,357
Total	2·25	122·00	124·25	16,571	...	3·19	3·19	1,804	2·25	125·19	127·44	18,875

Period.	PYRITIC ORE.		COPPER ORE.													
	Mt. Margaret G.F.		West Kimberley Goldfield		Pilbara Goldfield.				West Pilbara Gf.		Ashburton Gf.		Peak Hill Gf.		E. Murchison Gf.	
	Mt. Morgans D.				Marble Bar D		Nullagine D.								Lawlers D.	
	Quantity.	‖Value.	Q'ntity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	
Previous to 1901 ...	...	...	...	...	...	...	...	...	11,178·00	96,887	...	...	...	...	...	...
1901 ...	...	...	...	...	...	...	...	...	1,162·00	15,891	...	...	...	...	...	...
1902 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1903 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1904 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1905 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1906 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1907 ...	...	...	...	...	7·77	190	...	...	3,365·50	63,548	...	...	...	...	...	...
1908 ...	...	...	...	...	...	...	...	...	1,486·00	17,691	188·00	2,311	...	...	6·77	69
1909 ...	...	...	...	...	...	...	...	...	7,135·50	62,447	10·75	259	...	...	...	...
1910 ...	...	...	...	...	...	...	...	...	8,479·80	64,361	...	...	...	...	...	...
1911 ...	9,938·92	3,529	...	...	25·10	196	5·00	120	9,082·02	69,140	...	...	...	...	...	...
1912 ...	7,625·80	2,543	...	...	...	...	...	...	12,284·02	194,289	...	...	...	...	...	...
1913 ...	10,216·18	3,658	...	...	...	...	...	...	12,621·73	76,878	...	...	...	...	...	...
1914 ...	9,758·83	3,485	38·50	426	...	...	...	...	7,764·18	40,607	...	...	112·70	2,409	...	...
1915 ...	6,557·62	2,368	67·55	1,247	...	...	...	...	314·75	3,546	146·00	3,744	237·58	7,618	10·93	147
1916 ...	4,409·22	2,263	3·47	36	...	...	...	...	48·87	16,116	2·61	27	250·93	8,268	63·42	1,311
1917 ...	3,575·46	1,752	...	...	...	...	...	...	783·61	13,406	3·71	67	287·84	9,683	75·00	1,523
1918 ...	2,251·81	1,629	...	...	...	...	...	...	1,844·19	28,961	...	...	76·28	2,480	82·44	1,314
1919 ...	4,135·93	4,919	...	...	...	...	...	...	1,030·78	15,807	...	...	14·39	353	...	...
1920 ...	6,019·98	7,276	...	...	...	...	9·00	360	1,700·50	32,059	...	...	35·39	1,401	...	...
1921 ...	6,116·66	7,871	...	...	...	...	...	...	1,055·00	18,955	...	...	...	...	...	...
1922 ...	3,441·15	4,203	...	...	...	...	...	...	164·00	2,481	...	...	...	...	...	...
1923 ...	...	...	...	...	...	...	...	...	221·00	3,500	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...	...	...	79·00	1,012	...	...	...	...	...	...
1925 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1926 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	74,047·56	45,496	109·52	1,709	32·87	386	14·00	480	82,700·45	748,082	351·07	6,408	1,015·11	32,212	238·56	4,364

‖ Represents the value of the sulphur only, the copper contents not having been treated yet.

TABLE IX.—*Minerals other than Gold, etc.*—continued.

Period.	COPPER ORE—*continued.* Murchison Gf. Meekatharra D. Quantity.	Murchison Gf. Meekatharra D. Value.	Murchison Gf. Day Dawn D. Quantity.	Murchison Gf. Day Dawn D. Value.	Yalgoo Gf. Quantity.	Yalgoo Gf. Value.	Northampton Mf. Quantity.	Northampton Mf. Value.	Yandanooka Mf. Quantity.	Yandanooka Mf. Value.	Mt. Margaret Goldfield. Mt. Morgans District. Quantity.	Mt. Margaret Goldfield. Mt. Morgans District. Value.	Mt. Margaret Goldfield. Mt. Margaret District. Quantity.	Mt. Margaret Goldfield. Mt. Margaret District. Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Previous to 1901	...	...	5·15	91	...	...	98·00	1,715	38·00	407	4,812·00	35,056	...	...
1901	...	...	10·50	76	...	...	38·50	277	...	...	7,660·00	40,738	...	...
1902	...	...	...	...	...	...	...	...	...	...	1,954·00	6,852	...	...
1903	...	...	...	...	...	...	...	...	...	...	18,965·00	45,557	...	...
1904	...	...	...	...	...	...	...	...	...	...	500·00	900	...	...
1905	...	...	...	...	...	...	...	...	...	...	60·00	674	...	...
1906	133·50	2,816	...	...	13·91	91	...	...	...	...	4,361·05	21,934	...	...
1907	...	...	31·71	274	10·00	130	...	...	...	...	5,141·52	58,888	2·85	26
1908	...	...	...	...	9·50	97	...	...	133·55	1,482	4,404·10	20,221	...	...
1909	608·00	2,823	...	...	...	...	...	...	...	...	...	...	...	...
1910	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1912	...	...	4·80	54	...	...	...	...	...	...	...	...	...	...
1913	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1914	15·19	248	3·40	27	...	...	...	...	...	...	...	...	...	...
1915	33·70	492	...	...	4·99	95	...	...	...	...	...	...	...	...
1916	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1917	82·92	2,164	...	...	...	...	...	...	...	...	...	...	...	...
1918	78·34	1,794	...	...	...	...	...	...	...	...	...	...	...	...
1919	16·81	377	...	...	...	...	...	...	...	...	...	...	...	...
1920	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1921	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1922	...	...	...	...	...	...	998·66	13,435	...	...	...	...	...	...
1923	...	...	...	...	...	...	9,626·29	59,143	...	...	...	...	...	...
1924	...	...	...	...	...	...	10,672·00	34,955	...	...	...	...	...	...
1925	...	...	...	...	...	...	2,469·72	8,952	...	...	...	...	...	...
1926	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	968·46	10,714	55·56	522	38·40	413	23,903·17	118,477	171·55	1,889	47,857·67	230,820	2·85	26

Period.	COPPER ORE—*continued.* North Coolgardie Goldfield. Menzies District. Quantity.	North Coolgardie Goldfield. Menzies District. Value.	East Coolgardie Goldfield. E. Coolgardie D. Quantity.	East Coolgardie Goldfield. E. Coolgardie D. Value.	Phillips River Goldfield. Quantity.	Phillips River Goldfield. Value.	State generally. Quantity.	State generally. Value.	Total. Quantity.	Total. Value.	GYPSUM. State generally. Quantity.	GYPSUM. State generally. Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Previous to 1901 ...	...	...	...	...	34·00	725	...	...	16,165·15	134,881	...	...
1901	...	...	...	...	1,089·14	12,918	...	...	9,960·14	69,900	...	...
1902	...	...	...	...	308·25	1,238	...	...	2,262·25	8,090	...	...
1903	...	...	...	...	1,561·33	10,984	...	...	20,526·33	56,541	...	...
1904	...	...	...	...	3,468·89	24,280	...	...	3,968·89	25,180	...	...
1905	...	...	...	...	2,329·04	15,592	...	...	2,389·04	16,266	...	...
1906	4·70	33	...	...	2,885·00	25,270	13·50	193	7,411·66	50,337	...	...
1907	1·42	18	...	...	10,414·57	57,273	3·08	40	18,978·42	180,387	...	...
1908	...	...	50·67	330	2,015·71	9,233	...	...	8,294·30	51,434	...	...
1909	...	...	...	...	7,330·70	29,815	...	...	15,084·95	95,344	...	...
1910	...	...	...	...	25,871·65	96,745	...	...	34,351·45	161,606	...	...
1911	...	...	...	...	13,563·68	46,862	...	...	22,675·80	116,318	...	...
1912	...	...	...	...	1,318·38	15,815	...	...	13,607·20	120,158	...	...
1913	...	...	...	...	806·95	9,737	...	...	13,428·68	86,615	...	...
1914	...	...	...	...	4,841·15	37,524	...	...	12,775·12	81,241	...	...
1915	...	...	...	...	3,681·03	24,093	2·03	16	4,498·56	40,998	...	...
1916	...	...	...	...	5,428·08	48,618	...	...	6,697·38	74,376	...	...
1917	...	...	...	...	5,255·57	66,868	...	...	6,488·65	93,711	...	...
1918	...	...	...	...	2,901·66	42,978	...	...	4,982·91	77,527	...	...
1919	...	...	...	...	215·02	4,993	...	...	1,277·00	21,530	...	...
1920	...	...	...	...	217·27	4,125	...	...	1,962·16	37,945	...	...
1921	...	...	...	...	95·34	1,207	...	...	1,150·34	20,162	664·50	622
1922	...	...	...	...	31·84	217	...	...	1,194·50	16,133	63·00	16
1923	...	...	...	...	26·01	541	...	...	9,873·30	63,184	...	...
1924	...	...	...	...	3·69	44	...	...	10,754·69	36,011	4,237·00	5,278
1925	...	...	...	...	...	...	...	...	2,469·72	8,952	3,059·95	4,118
1926	...	...	...	...	...	...	...	...	...	...	3,917·76	5,618
Total ...	6·12	51	50·67	330	95,698·95	587,695	18·61	249	253,228·59	1,744,827	11,942·21	15,652

Period.	IRONSTONE. W. Pilbara Gf. Quantity.	IRONSTONE. W. Pilbara Gf. Value.	IRONSTONE. E. Coolgardie Gf. E. Coolgardie D. Quantity.	IRONSTONE. E. Coolgardie Gf. E. Coolgardie D. Value.	IRONSTONE. State generally. Quantity.	IRONSTONE. State generally. Value.	IRONSTONE. Total. Quantity.	IRONSTONE. Total. Value.	LEAD ORE. Northampton Mf. Quantity.	LEAD ORE. Northampton Mf. Value.	LEAD ORE. West Pilbara Gf. Quantity.	LEAD ORE. West Pilbara Gf. Value.	LEAD ORE. Total. Quantity.	LEAD ORE. Total. Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Previous to 1901 ...	100·00	300	...	...	25,103·00	18,197	25,203·00	18,497	350·75	1,445	...	...	350·75	1,445
1901 ...	...	...	450·00	247	20,119·00	12,999	20,569·00	13,246	...	...	...	...	...	...
1902 ...	...	...	...	...	4,800·00	2,040	4,800·00	2,040	...	...	...	...	...	...
1903 ...	...	...	...	...	220·00	88	220·00	88	...	...	...	...	...	...
1904 ...	...	...	...	...	1,441·50	577	1,441·50	577	...	...	...	...	...	...
1905 ...	...	...	...	...	3,212·60	1,285	3,212·60	1,285	...	...	...	...	...	...
1906 ...	...	...	...	...	1,279·87	512	1,279·87	512	...	...	...	...	...	...
1907 ...	...	...	...	...	1,093·53	438	1,093·53	438	10·00	128	...	...	10·00	128
1908 ...	...	...	...	...	...	...	...	...	57·00	461	...	...	57·00	461
1909 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1910 ...	...	...	...	...	† 10·50	† 12	10·50	12	185·10	1,777	...	...	185·10	1,777
1911 ...	...	...	...	...	...	...	...	...	8,194·76	17,663	...	...	8,194·76	17,663
1912 ...	...	...	...	...	...	...	...	...	11,098·50	24,412	...	...	11,098·50	24,412
1913 ...	...	...	...	...	...	...	...	...	26,589·53	50,474	...	...	26,589·53	50,474
1914 ...	...	...	...	...	...	...	...	...	15,334·62	38,351	...	...	15,334·62	38,351
1915 ...	...	...	...	...	...	...	...	...	15,678·30	29,396	...	...	15,678·30	29,396
1916 ...	...	...	...	...	...	...	...	...	34,578·34	110,872	44·00	770	34,622·34	111,642
1917 ...	...	...	...	...	...	...	...	...	46,801·97	143,925	62·57	759	46,864·54	144,684
1918 ...	...	...	...	...	...	...	...	...	47,079·68	176,330	...	...	47,079·68	176,330
1919 ...	...	...	...	...	...	...	...	...	7,385·70	29,841	...	...	7,385·70	29,841
1920 ...	...	...	...	...	...	...	...	...	27,716·40	172,483	...	...	27,716·40	172,483
1921 ...	...	...	...	...	...	...	...	...	10,330·43	25,649	...	...	10,330·43	25,649
1922 ...	...	...	...	...	...	...	...	...	29,602·90	72,338	...	...	29,602·90	72,338
1923 ...	...	...	...	...	...	...	...	...	21,634·50	59,194	...	...	21,634·50	59,194
1924 ...	...	...	...	...	...	...	...	...	36,750·00	101,219	...	...	36,750·00	101,219
1925 ...	...	...	...	...	...	...	...	...	37,865·99	119,299	...	...	37,865·99	119,299
1926 ...	...	...	...	...	...	...	...	...	23,973·35	72,872	...	...	23,973·35	72,872
Total ...	100·00	300	450·00	247	57,280·00	36,148	57,830·	36,695	401,217·82	1,248,129	106·57	1,529	401,324·39	1,249,658

† Iron ore from K[illegible] Island, Yampi Sound.

TABLE IX.—*Minerals other than Gold, etc.*—continued.

Period.	SILVER LEAD ORE.				TUNGSTEN ORES.											
	Pilbara Goldfield.		Ashburton Gf.		WOLFRAM.		SCHEELITE.									
	Marble Bar District.				State generally.		North Coolgardie Gf. Menzies District.		Broad Arrow Goldfield.		Coolgardie Gf. Coolgardie District.		Dundas Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Q'nty.	Value.	Quantity.	Value.	Q'nty.	Value.	Q'nty.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Previous to 1901 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1901 ...	...	...	21·05	152	...	...	...	...	...	...	...	...	...	...	...	...
1902 ...	...	...	35·85	277	...	...	...	...	...	...	...	...	...	...	...	...
1903 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1904 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1905 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1906 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1907 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1908 ...	...	...	727·25	6,914	...	...	...	...	...	...	...	...	...	...	...	...
1909 ...	...	...	440·00	3,520	*5·00	90	...	...	...	...	...	...	...	...	...	...
1910 ...	...	...	...	...	†42·00	115	...	...	...	...	...	...	...	...	...	...
1911 ...	...	...	...	...	‡194·00	877	...	...	...	...	...	...	...	...	...	...
1912 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1913 ..	...	...	125·50	1,757	‡4·64	69	...	...	...	...	...	...	...	...	...	...
1914 ...	...	...	715·10	9,807	...	...	...	...	...	...	...	...	...	...	...	...
1915 ...	...	...	298·96	4,429	**·25	27	...	...	...	...	...	...	...	...	...	...
1916 ...	...	...	67·83	554	20·00	117	...	...	...	...	...	...	...	...	...	...
1917 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1918 ...	...	...	237·48	3,461	...	...	...	...	...	...	...	...	...	...	...	...
1919 ...	...	...	214·76	3,116	...	...	273·06	829	...	...	45·71	101	...	...	318·77	930
1920 ...	...	...	...	...	...	...	134·25	113	3·35	175	40·00	54	·41	10	178·01	352
1921 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1922 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1923 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1924 ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1925 ...	51·00	1,268	30·00	630	...	...	...	...	...	...	...	...	...	...	...	...
1926 ...	90·50	1,305	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	141·50	2,573	2,913·78	34,617	265·89	1,295	407·31	942	3·35	175	85·71	155	·41	10	496·78	1,282

Period.	COAL.		FIRECLAY.		GADOLINITE.		ASBESTOS.							
	Collie Mf.		Collie Mf.		Pilbara Gf. Marble Bar D.		Pilbara Gf. Marble Bar D.		Pilbara Gf. Nullagine D.		West Pilbara Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Q'nty.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Previous to 1901	176,254·10	82,547	...	...	...	...	...	...	...	...	...	...	...	...
1901	117,835·80	68,561	...	...	...	...	...	...	...	...	...	...	...	...
1902	140,883·90	86,188	...	...	...	...	...	...	...	...	...	...	...	...
1903	133,426·62	69,128	...	...	...	...	...	...	...	...	...	...	...	...
1904	138,550·04	67,174	...	...	...	...	...	...	...	...	...	...	...	...
1905	127,364·06	55,312	...	...	...	...	...	...	...	...	...	...	...	...
1906	149,755·27	57,998	...	...	...	...	...	...	...	...	...	...	...	...
1907	142,372·54	55,158	...	...	...	...	...	...	...	...	...	...	...	...
1908	175,247·92	75,694	...	...	...	...	40·00	1,600	...	...	...	...	40·00	1,600
1909	214,301·98	90,965	...	...	...	...	2·83	154	...	...	...	...	2·83	154
1910	262,166·06	113,699	...	...	...	...	...	...	...	...	...	...	...	...
1911	249,899·15	111,154	...	...	...	...	...	...	...	...	...	...	...	...
1912	295,078·91	135,857	...	...	...	...	...	...	...	...	...	...	...	...
1913	313,817·96	153,614	...	...	1·00	112	...	...	...	...	...	...	...	...
1914	319,210·32	148,684	...	...	...	...	...	...	...	...	...	...	...	...
1915	286,666 35	137,859	...	...	...	...	...	...	...	...	...	...	...	...
1916	301,525·97	147,823	...	...	...	...	...	...	...	...	...	...	...	...
1917	326,550·07	191,822	...	...	...	...	...	...	...	...	...	...	...	...
1918	337,039·24	204,319	...	...	...	...	...	...	...	...	...	...	...	...
1919	401,713·18	270,355	...	...	...	...	...	...	53·00	1,443	...	...	53·00	1,443
1920	462,020·78	350,346	...	...	...	...	32·00	1,900	124·50	5,386	...	...	156·50	7,286
1921	468,816·65	407,117	677·80	646	...	...	32·60	1,360	202·75	12,221	...	...	235·35	13,581
1922	438,442·78	381,555	...	...	...	...	2·50	250	179·18	7,350	...	...	181·68	7,600
1923	420,713·98	368,949	...	...	...	...	3·00	150	111·00	3,865	·85	17	114·85	4,032
1924	421,863·86	363,255	...	...	...	...	...	...	73·58	2,206	...	...	73·58	2,206
1925	437,461·20	363,203	...	...	...	...	...	...	50·00	1,619	·74	22	50·74	1,641
1926	474,818·69	394,400	...	...	...	...	...	...	91·45	2,436	13·89	292	105·34	2,728
Total ...	7,733,797·38	4,952,736	677·80	646	1·00	112	112·93	5,414	885·46	36,526	15·48	331	1,013·87	42,271

Period.	LIMESTONE.								DIAMONDS.		MAGNESITE.		ANTIMONY.		MANGANESE.	
	Murchison Gf. Cue District.		Yilgarn Goldfield.		State generally.		Total.		Pilbara Gf. Nullagine District.		East Coolgardie Goldfield. Bulong District.		West Pilbara Goldfield.		Peak Hill Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value
	tons.	£	tons.	£	tons.	£	tons.	£	carats.	£	tons.	£	tons.	£	tons.	£
Previous to 1901	...	...	269·85	273	33,250·00	6,159	33,519·85	6,432	§	24	...	...	...	...	...	...
1901	...	...	1,642·00	919	16,568·00	3,429	18,210·00	4,348	...	...	...	...	...	...	...	...
1902	...	...	535·00	340	4,545·35	1,000	5,080·35	1,340	...	...	...	...	...	...	...	...
1903	...	...	102·00	75	1,177·50	103	1,279·50	178	...	...	...	...	...	...	...	...
1904	...	...	...	...	13,397·20	1,699	13,397·20	1,699	...	...	...	...	...	...	...	...
1905	...	...	...	...	9,144·60	1,220	9,144·60	1,220	...	...	...	...	...	...	...	...
1906	...	...	...	...	9,472·28	1,691	9,472·28	1,691	...	...	...	...	...	...	...	...
1907	298·00	772	...	...	3,303·95	610	3,601·95	1,382	...	...	...	...	...	...	...	...
1908	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1909	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1910	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1911	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1912	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1913	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1914	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1915	...	...	...	...	...	...	...	...	...	...	601·50	601	...	...	...	...
1916	...	...	...	...	...	...	...	...	...	...	97·50	97	20·78	491	...	...
1917	...	...	...	...	...	...	...	...	...	...	20·50	21	...	...	...	...
1918	...	...	...	...	...	...	...	...	...	...	105·25	334	...	...	...	...
1919	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1920	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1921	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1922	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18·11	142
1923	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1924	...	...	...	...	...	...	...	...	...	...	...	...	...	...	58·63	294
1925	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1926	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total ...	298·00	772	2,548·85	1,607	90,858·88	15,911	93,705·73	18,290	...	24	824·75	1,053	20·78	491	76·74	436

* Produced within the West Kimberley Goldfield. † Tons 22·00, value £30, the produce of West Kimberley, and tons 20·00, value £85, the produce of Cue. ‡ The produce of Cue District. § Weight unknown. ** The produce of Yalgoo Goldfield.

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, the latest available returns of which are to be found in Table XXVIII., pages 72–77.

TABLE X.

QUANTITY AND VALUE OF BLACK TIN REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926.				Totals to Date.			
			Quantity.			Value.	Quantity.			Value.
			Lode.	Stream.	Total.		Lode.	Stream.	Total.	
			tons.	tons.	tons.	£	tons.	tons.	tons.	£
			PILBARA GOLDFIELD.							
			Marble Bar District.							
Cooglegong ...	...	Sundry claims	...	16·06	16·06	2,506	...	1,742·51	1,742·51	157,091
Mills Find ...	...	Sundry claims	...	...	...	...	...	·85	·85	69
Moolyella ...	...	Voided leases	...	...	...	...	...	330·53	330·53	21,340
Do. ...	...	Sundry claims	...	19·21	19·21	2,918	...	2,884·47	2,884·47	276,497
Old Shaw ...	...	Voided leases	...	...	...	...	...	6·75	6·75	424
Do. ...	...	Sundry claims	...	...	...	...	...	214·04	214·04	14,525
Tabba Tabba ...	...	Sundry claims	...	·15	·15	22	...	117·45	117·45	13,225
Wodgina ...	M.Ls. 86, 87, 95	H.M. and Anchorite leases ...	...	...	...	...	...	5·00	5·00	500
Do. ...	M.L. 84 ...	(Mount Cassiterite)	...	...	...	...	133·52	13·85	147·37	14,184
Do. ...	M.Ls. 84, (93), (148)	Mount Cassiterite leases ...	...	...	...	...	195·50	1·60	197·10	16,913
Do. ...	...	Voided leases	...	...	...	...	37·82	6·10	43·92	4,414
Do. ...	...	Sundry claims	...	...	...	...	5·78	48·20	53·98	5,062
		Totals	...	**35·42**	**35·42**	**5,446**	**372·62**	**5,371·35**	**5,743·97**	**524,244**
			MURCHISON GOLDFIELD.							
			Cue District.							
Poona	...	Sundry claims	...	...	...	...	...	1·52	1·52	118
Cuddingwarra ...	...	Sundry claims	...	...	...	...	...	3·20	3·20	242
		Totals	...	...	...	...	...	**4·72**	**4·72**	**360**
			COOLGARDIE GOLDFIELD.							
			Coolgardie District.							
Bulla Bulling ...	...	Sundry claims	...	...	...	...	...	·15	·15	15
		Totals	...	...	...	...	...	**·15**	**·15**	**15**
			GREENBUSHES MINERAL FIELD.							
Greenbushes ...	515	Kapanga	...	·21	·21	35	34·63	1·17	35·80	4,554
Do. ...	505 (519) 614...	Scotia leases	...	11·99	11·99	1,921	...	90·51	90·51	10,582
Do. ...	(580)	Southern Cross	...	...	...	...	7·95	...	7·95	1,086
Do. ...	Locs. 289, 290	Clarth and others	...	...	...	...	...	318·04	318·04	28,959
Do. ...	Loc. 290 ...	McKay & Struthers ...	...	...	...	...	...	5·39	5·39	762
Do. ...	...	Voided leases	...	...	...	...	235·14	3,471·20	3,706·34	367,163
Do. ...	...	Sundry claims	...	49·21	49·21	8,170	71·10	6,708·93	6,780·03	531,546
		Totals	...	**61·41**	**61·41**	**10,126**	**348·82**	**10,595·24**	**10,944·06**	**944,652**

TABLE XI.

QUANTITY AND VALUE OF TANTALITE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926.				Total to Date.			
			Quantity.			Value.	Quantity.			Value.
			Lode.	Stream.	Total.		Lode.	Stream.	Total.	
			tons.	tons.	tons.	£	tons.	tons.	tons.	£
			PILBARA GOLDFIELD.							
			Marble Bar District.							
Wodgina ...	M.Ls. 86, 87, 95	H.M. and Anchorite leases ...	...	19·45	19·45	2,357	2·25	68·50	70·75	10,207
Do. ...	M.L. 293 ...	May Be	...	...	...	...	...	2·00	2·00	240
Do. ...	...	Sundry claims	...	...	...	...	...	51·50	51·50	6,124
		Totals	...	**19·45**	**19·45**	**2,357**	**2·25**	**122·00**	**124·25**	**16,571**
			GREENBUSHES MINERAL FIELD.							
Greenbushes ...	(369)	Enterprise	...	...	...	...	...	3·19	3·19	1,804
		Totals	...	...	...	...	...	**3·19**	**3·19**	**1,804**

TABLE XII.

QUANTITY AND VALUE OF PYRITIC ORE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926.		Total to Date.	
			Quantity.	†Value.	Quantity.	†Value.
			tons.	£	tons.	£
		MT. MARGARET GOLDFIELD.				
		MT. MORGANS DISTRICT.				
Eulaminna ...	M.Ls. (4F), (5F), (11F), (12F)	West Australian Copper Co., Ltd.	...	...	61,687·98	38,818
Murrin Murrin...	M.L. (18F) ...	Nangeroo: Nangaroo Mines, Ltd.	...	...	12,359·58	6,678
		Totals	...	...	74,047·56	45,496

† Represents the value of the sulphur only, the copper contents not having been treated.

TABLE XIII.

QUANTITY AND VALUE OF COPPER ORE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926.			Total to Date.		
			Quantity.		Value.	Quantity.		Value.
			Ore.	Metallic Copper.		Ore.	Metallic Copper.	
			tons.	tons.	£	tons.	tons.	£
		WEST KIMBERLEY GOLDFIELD.						
Berylton ...	...	Voided leases	...	...	...	13·19	2·76	200
Yampi Sound ...	M.L. (1), [221H]	Yampi Sound Copper Mine	...	...	...	92·86	22·80	1,473
Do. ...	... ...	Sundry claims	...	...	...	3·47	·36	36
		Totals	...	...	...	109·52	25·92	1,709
		PILBARA GOLDFIELD.						
		MARBLE BAR DISTRICT.						
Marble Bar ...	... ...	Voided Leases	...	...	...	11·00	1·64	90
Do. ...	... ...	Sundry claims	...	...	...	4·75	·48	25
North Pole ...	... ...	Voided leases	...	...	...	9·35	1·39	81
North Shaw ...	... ...	Voided leases	...	...	...	7·77	1·90	190
		Totals	...	...	...	32·87	5·41	386
		NULLAGINE DISTRICT.						
Lionel	... ...	Sundry claims	...	...	...	9·00	4·75	360
McPhee's Creek	M.L. (14L) ...	Tambina	...	...	...	5·00	2·22	120
		Totals	...	...	...	14·00	6·97	480
		WEST PILBARA GOLDFIELD.						
Croydon ...	... ...	Voided leases	...	...	...	604·00	108·65	7,333
Egina	... ...	Voided leases	...	...	...	542·00	104·15	6,643
Roebourne ...	M.L. 183 ...	(Carlow Castle: Roebourne Copper Mine, Ltd.)	...	...	...	69·00	7·80	780
Do. ...	M.L. 174 ...	Good Fortune	...	...	...	56·77	8·58	904
Do. ...	M.Ls. 174, (175)	(Good Fortune leases)	...	...	...	63·40	9·58	1,011
Do. ...	M.L. 184 ...	Good Luck	...	...	...	5·21	1·01	111
Do. ...	M.L. 167 ...	(Quod Est.)	...	...	...	22·43	3·49	256
Do. ...	M.Ls. 167, 183	Roebourne Copper Mines, Ltd.	...	...	...	122·45	18·50	1,855
Do. ...	M.Ls. 144, (192), (193)	Yannery and Whundo Copper Mining Co., Ltd.	...	...	...	404·50	87·14	8,116
Do. ...	M.L. 144 ...	Yannery Hill Copper Mine	...	...	...	469·25	113·81	9,961
Do. ...	...	Voided leases	...	...	...	2,729·28	515·83	44,459
Do. ...	...	Sundry claims	...	...	...	77·41	13·61	800
Whim Creek ...	M.L. 34 ...	(Balla Balla Copper Mines, Ltd.)	...	...	...	2,009·00	166·33	12,036
Do. ...	M.L. 34 ...	Mons. Cupri: Whim Well Copper Mines, Ltd.	...	...	...	282·50	33·75	2,979
Do. ...	Loc. 71 ...	Pilbarra Copper Fields, Ltd.	...	...	...	2,650·50	574·31	46,096
Do. ...	Loc. 71 ...	(Whim Well Copper Mines, Ltd.)	...	...	...	72,562·75	9,343·89	604,492
Do. ...	...	Voided leases	...	...	...	30·00	5·50	250
		Totals	...	...	...	82,700·45	11,115·93	748,082

TABLE XIII.—*Quantity and Value of COPPER ORE, etc.*—continued.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity. Ore.	1926. Quantity. Metallic Copper.	1926. Value.	Totals to Date. Quantity. Ore.	Totals to Date. Quantity. Metallic Copper.	Totals to Date. Value.
			tons.	tons.	£	tons.	tons.	£
		ASHBURTON GOLDFIELD.						
Ashburton ...	...	Sundry claims ...	...	...	...	6·32	·79	94
Red Hill ...	...	Voided leases ...	...	...	...	175·50	33·85	2,126
Uaroo	...	Voided leases ...	...	...	...	169·25	62·49	4,188
		Totals ...	...	...	...	**351·07**	**97·13**	**6,408**
		PEAK HILL GOLDFIELD.						
Peak Hill ...	M.L. (35P) ...	Burra Copper Mines, Ltd. ...	...	...	...	25·84	8·85	943
Do. ...	M.Ls. (37P), (38P)	Sonia leases ...	...	...	...	135·04	47·26	4,807
Do. ...	M.L. (9P) ...	Sons of Gwalia ...	...	...	...	458·49	169·89	15,680
Do. ...	M.Ls. (29P), (30P) (31P)	(Two Sisters leases) ...	...	...	...	64·04	30·93	1,466
Do. ...	M.L. (31P) ...	Two Sisters North...	...	...	...	115·76	31·40	3,594
Do. ...	... ...	Voided leases ...	...	...	...	153·91	43·02	3,885
Do. ...	... ...	Sundry claims ...	...	...	...	62·03	21·96	1,837
		Totals ...	...	...	...	**1,015·11**	**353·31**	**32,212**
		EAST MURCHISON GOLDFIELD. LAWLERS DISTRICT.						
Kathleen Valley	M.L. (12) ...	Shepherd ...	...	...	...	6·77	1·32	69
Lawlers ...	M.L. (29) ...	Bungarra ...	...	...	...	157·44	23·85	2,837
Do. ...	...	Sundry claims ...	...	...	...	74·35	13·25	1,458
		Totals ...	...	...	...	**238·56**	**38·42**	**4,364**
		MURCHISON GOLDFIELD. MEEKATHARRA DISTRICT.						
Gabanintha ...	...	Voided leases ...	...	...	...	920·56	119·84	9,381
Do. ...	...	Sundry claims ...	...	...	...	34·42	9·23	1,072
Holden's Find...	...	Sundry claims ...	...	...	...	6·72	1·11	111
Yaloginda ...	...	Sundry claims ...	...	...	...	6·76	1·41	150
		Totals ...	...	...	...	**968·46**	**131·59**	**10,714**
		DAY DAWN DISTRICT.						
Day Dawn ...	... ...	Voided leases ...	...	...	...	26·95	5·47	305
Do. ...	... ...	Sundry claims ...	...	...	...	28·61	2·93	217
		Totals ...	...	...	...	**55·56**	**8·10**	**522**
		YALGOO GOLDFIELD.						
Mount Gibson ...	... ...	Sundry claims ...	...	...	...	4·99	1·10	95
Twin Peaks ...	... ...	Sundry claims ...	...	...	...	19·50	3·49	227
Wadgingarra ...	M.L. (6) ...	Olive Queen ...	...	...	...	13·91	·98	91
		Totals ...	...	...	...	**38·40**	**5·57**	**413**
		NORTHAMPTON MINERAL FIELD.						
Geraldine ...	M.Ls. (10), (11)	Geraldine leases ...	...	...	...	136·50	36·05	1,992
Narra Tarra ...	Loc. 833 ...	Narra Tarra: Fremantle Trading Co., Ltd.	...	...	...	23,766·67	1,784·64	116,485
		Totals ...	...	...	...	**23,903·17**	**1,820·69**	**118,477**
		YANDANOOKA MINERAL FIELD.						
Arrino	... ...	Sundry claims ...	...	...	...	126·05	18·48	1,386
Yandanooka ...	Freehold Gd. ...	Muggawa Copper Mines ...	...	...	...	7·50	1·20	96
Do. ...	... ...	Voided leases ...	...	...	...	38·00	7·95	407
		Totals ...	...	...	...	**171·55**	**27·63**	**1,889**
		MOUNT MARGARET GOLDFIELD. MOUNT MORGANS DISTRICT.						
Eulaminna ...	[10C, 11C], (4F), (5F) (12C, 37C)	(Mt. Malcolm Copper Mine leases) ...	...	...	...	13,516·00	1,001·98	70,754
Do. ...	[10C, 11C], (4F), (5F)	(Mt. Malcolm Copper Mine leases) ...	...	...	...	3,839·00	418·00	17,065
Do. ...	[10C, 11C], (4F), (5F), (12C, 37C)	(Murrin Copper Mines, Ltd.) ...	...	...	...	19,165·00	798·50	45,817
Do. ...	(4F), (5F), (11F), (12F)	West Australian Copper Co., Ltd. ...	...	...	...	9,794·05	1,976·08	80,199
Mt. Margaret ...	G.M.L. (66F) ...	Mt. Morven ...	...	...	...	11·53	2·40	163
Murrin Murrin...	(18F) ...	Nangeroo: Nangaroo Mines, Ltd. ...	...	...	...	6·80	3·00	160
Do. ...	... ...	Voided leases ...	...	...	...	1,525·29	248·04	16,662
		Totals ...	...	...	...	**47,857·67**	**4,448·00**	**230,820**

TABLE XIII.—*Quantity and Value of COPPER ORE, etc.*—continued.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity. Ore.	1926. Quantity. Metallic Copper.	1926. Value.	Totals to Date. Quantity. Ore.	Totals to Date. Quantity. Metallic Copper.	Totals to Date. Value.
			tons.	tons.	£	tons.	tons.	£
		MOUNT MARGARET GOLDFIELD—*continued*.						
		MOUNT MARGARET DISTRICT.						
Burtville ...	M.L. (16T) ...	Dreadnought	...	...	...	2·85	·29	26
		Totals	...	...	...	2·85	·29	26
		NORTH COOLGARDIE GOLDFIELD.						
		MENZIES DISTRICT.						
Goongarrie ...	M.L. (13Z) ...	Providence Copper Mining Syndicate, Ltd.	...	...	...	4·70	·42	33
Do. ...	... ...	Sundry claims	...	...	...	1·42	·40	18
		Totals	...	...	...	6·12	·82	51
		EAST COOLGARDIE GOLDFIELD.						
		EAST COOLGARDIE DISTRICT.						
Boorara ...	M.L. (100E) ...	Premier Copper Mine	...	...	...	50·67	6·22	330
		Totals	...	...	...	50·67	6·22	330
		PHILLIPS RIVER GOLDFIELD.						
Kundip ...	G.M.Ls. 147, 179	Fair Play leases	...	...	...	130·09	131·30	11,975
Do. ...	G.M.L. 184 ...	Gem	...	...	...	90·98	22·58	2,404
Do. ...	G.M.Ls. 151, 156	Gem Consolidated leases	...	...	...	48·00	76·75	8,327
Do. ...	M.Ls. 52, 94 ...	Harbour View Gold and Copper Co., Ltd. ...	...	...	...	1,209·93	90·14	8,236
Do. ...	M.Ls. 52, 94 ...	(Harbour View leases)	...	...	...	604·36	76·80	4,524
Do. ...	M.Ls. 52, 94 ...	(Harbour View leases)	...	...	...	508·27	64·66	3,642
Do. ...	G.M.L. (98) ...	Hillsborough	...	...	...	692·84	57·65	4,746
Do. ...	M.L. 370 ...	North Harbour View	...	...	...	15·72	·99	124
Do. ...	M.Ls. 52, 94 ...	(Ravensthorpe G.M. Syndicate, N.L.) ...	...	...	...	132·56	24·36	1,382
Do. ...	... ...	Voided leases	...	...	...	3,430·67	319·32	22,398
Do. ...	... ...	Sundry claims	...	...	...	111·12	17·40	1,372
Mt. Desmond ...	... ...	Voided leases	...	...	...	46,952·31	4,107·47	279,054
Do. ...	... ...	Sundry claims	...	...	...	140·25	25·17	1,901
Ravensthorpe ...	M.L. (16) ...	Marion Martin	...	...	...	2,270·63	256·94	26,496
Do. ...	M.L. (16) ...	(Marion Martin)	...	...	...	865·69	130·61	6,650
Do. ...	M.L. (16) ...	(Marion Martin: Phillips River Gold and Copper Co., Ltd.)	...	...	...	2,855·36	375·44	23,506
Do. ...	M.L. (15) ...	Mount Cattlin	...	...	...	2,178·01	142·64	15,296
Do. ...	M.L. (15) ...	(Mount Cattlin)	...	...	...	281·56	31·35	1,716
Do. ...	M.L. (15) ...	(Mount Cattlin: Mount Cattlin Copper Mining Co., Ltd.)	...	...	...	6,608·76	333·59	28,841
Do. ...	M.L. (15) ...	(Mount Cattlin: Phillips River Gold & Copper Co., Ltd.)	...	...	...	1,263·76	80·26	7,646
Do. ...	M.L. (15) ...	(Mount Cattlin: Phillips River Gold and Copper Co., Ltd.)	...	...	...	14,432·25	714·90	40,313
Do. ...	... ...	Voided leases	...	...	...	7,880·86	986·55	63,429
Do. ...	... ...	Sundry claims	...	...	...	1,157·36	133·24	11,482
West River ...	... ...	Voided leases	...	...	...	44·04	7·41	414
Do. ...	... ...	Sundry claims	...	...	...	150·69	25·84	2,061
		From Goldfield generally	...	...	...	1,637·88	128·64	9,760
		Totals	...	...	...	95,693·95	8,362·00	587,695
		STATE GENERALLY.						
...	... ...	Voided leases	...	...	...	5·11	1·54	56
...	... ...	Sundry claims	...	...	...	13·50	2·27	193
		Totals	...	...	...	18·61	3·81	249

TABLE XIV.

QUANTITY AND VALUE OF IRONSTONE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		WEST PILBARA GOLDFIELD.				
Whim Creek ...	(17), (18), (21)	Whim Well Copper Mines	...	...	100·00	300
		Totals	...	...	**100·00**	**300**
		EAST COOLGARDIE GOLDFIELD.				
		EAST COOLGARDIE DISTRICT.				
Boulder ...	(1490E) ...	Mt. Ferrum	...	...	450·00	247
		Totals	...	...	**450·00**	**247**
		STATE GENERALLY.				
		Avon	...	...	22,223·00	16,241
		Clackline	...	...	18,253·50	8,789
		Coates' Paddock	...	...	4,712·00	3,277
		Greenbushes	...	...	7,481·00	4,629
		Koolan Island—Yampi Sound	...	...	10·50	12
		Werribee	...	...	4,600·00	3,200
		Totals	...	...	**57,280·00**	**36,148**

TABLE XV.

QUANTITY AND VALUE OF LEAD ORE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Lead Ore.	1926. Metal therefrom.	1926. Value.	Totals to Date. Lead Ore.	Totals to Date. Metal therefrom.	Totals to Date. Value.
			tons.	tons.	£	tons.	tons.	£
		NORTHAMPTON MINERAL FIELD.						
Geraldine ...	Loc. 1 ...	Geraldine Mine	...	...	...	774·59	257·13	5,139
Do. ...	M.L. 200 ...	Grand Junction	130·00	10·19	295	130·00	10·19	295
Do. ...	M.L., 24P.P. ...	(Springvale)	975·00	101·91	3,236	2,290·00	261·33	8,893
Do. ...	M.L., 24P.P. ...	Springvale: Tarcoola Blocks Mines, N.L.	135·00	33·20	1,063	135·00	33·20	1,063
Do. ...	M.Ls. 148, 150, 154, 158, 20P.P.	Surprise leases	5,029·50	478·22	14,848	93,834·03	13,019·33	392,709
Do. ...	M.L. 158 ...	(Surprise South)	...	...	...	14·00	5·41	170
Do. ...	M.L. 153 ...	Three Sisters: Ajana Lead Mines, Ltd.	3,141·00	330·34	10,526	8,726·00	892·88	30,619
Do. ...	M.L. 153 ...	(Three Sisters)...	...	...	...	6·25	3·94	112
Do. ...	M.L. 197 ...	(Two Boys)	4,768·50	537·39	16,012	4,874·50	547·99	16,403
Do. ...	M.L. 197 ...	Two Boys: Two Boys Lead Mining Co., Ltd.	4,658·75	374·17	11,549	4,658·75	374·17	11,549
Do. ...	M.L. 202 ...	Welcome: Two Boys Lead Mining Co., Ltd.	389·00	29·21	870	389·00	29·21	870
Do. ...	M.L. 23P.P. ...	Wheal Ina	20·00	5·00	150	418·00	61·46	1,409
Do. ...	Loc. 7 ...	Thring & Green	1,170·00	366·17	9,328	2,621·38	819·25	21,053
Do. ...	...	Voided leases	...	...	...	145·49	87·61	1,357
Do. ...	...	Sundry claims	...	...	...	327·04	175·65	3,408
Narra Tarra ...	Loc. 833 ...	Narra Tarra: Fremantle Trading Co., Ltd.	3,511·60	153·15	4,863	126,429·50	12,377·27	361,745
Do. ...	Loc. 118, 119	Lauder & Raven (Tributers)	...	...	...	106·21	60·02	1,345
Do. ...	...	Sundry claims	...	...	...	238·16	34·18	442
Northampton ...	Loc. 1472 ...	Baddera: Fremantle Trading Co., Ltd.	...	...	...	129,264·56	13,888·33	317,631
Do. ...	Loc. 436 ...	Fortune Exploration Co., N.L. ...	...	...	...	123·38	51·17	1,316
Do. ...	M.L. 27P.P. ...	Lady Samson	45·00	7·25	132	45·00	7·25	132
Do. ...	Loc. 1146 ...	Wheal Ellen: Fremantle Trading Co., Ltd.	...	...	...	22,033·28	1,818·71	52,456
Do. ...	Loc. 436 ...	(Wheal of Fortune Extended Syndicate)	...	...	...	125·82	43·13	793
Do. ...	...	Voided leases	...	...	...	3,266·76	723·13	14,329
Do ...	...	Sundry claims	...	...	...	222·12	132·14	2,679
Victoria... ...	...	Voided leases	...	...	...	19·00	12·54	212
		Totals	**23,973·85**	**2,426·20**	**72,872**	**401,217·82**	**45,726·62**	**1,248,129**
		WEST PILBARA GOLDFIELD.						
Roebourne ...	... ...	Sundry claims	...	...	...	2·57	1·36	39
Whim Creek ...	M.L. (172) ...	Cumstock	...	...	...	104·00	46·00	1,490
		Totals	...	...	...	**106·57**	**47·36**	**1,529**

TABLE XVI.

QUANTITY AND VALUE OF SILVER-LEAD ORE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		PILBARA GOLDFIELD.				
		MARBLE BAR DISTRICT.				
Braeside ...	M.L. (289) ...	Federal South ...	...	...	1·50	35
Do. ...	M.L. 295 ...	Koongalin ...	...	...	24·00	600
Do. ...	M.L. 297 ...	Oakover ...	3·00	54	3·00	54
Do. ...	M.L. 288 ...	Ragged Hill ...	22·50	477	28·50	627
Do. ...	...	Sundry claims ...	65·00	774	84·50	1,257
		Totals ...	90·50	1,305	141·50	2,573
		ASHBURTON GOLDFIELD.				
Uaroo ...	M.L. (3) ...	Rainbow ...	...	...	56·90	429
Do. ...	M.L. 102 ...	Silver Star ...	...	...	30·00	630
Do. ...	M.Ls. (43), (49), (84)	Uaroo Silver Lead Mines, Ltd. ...	...	...	2,824·05	33,518
Do. ...	...	Sundry claims ...	...	...	2·83	40
		Totals ...	...	...	2,913·78	34,617

TABLE XVII.

QUANTITY AND VALUE OF COAL REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		COLLIE MINERAL FIELD.				
Collie ...	197, etc. ...	Amalgamated Collieries of W.A., Ltd. (Cardiff Mine) ...	56,193·70	45,056	424,884·73	349,009
Do. ...	244, etc. ...	Amalgamated Collieries of W.A., Ltd. (Co-operative Mine) ...	133,343·50	107,896	760,349·81	640,284
Do. ...	85, etc. ...	Amalgamated Collieries of W.A., Ltd. (Proprietary Mine) ...	131,556·40	108,709	799,839·10	679,554
Do. ...	250, etc. ...	Amalgamated Collieries of W.A., Ltd. (Westralia Mine) ...	114,187·00	99,329	428,283·36	377,299
Do. ...	151, etc. ...	(Amalgamated Collieries of W.A., Ltd.) (Scottish Mine) ...	...	...	380·00	251
Do. ...	197, etc. ...	(Cardiff Coal Mining Co., Ltd.) ...	...	...	976,824·78	471,417
Do. ...	151, etc. ...	(Collie Boulder Coal Co., Ltd.) ...	...	...	71,512·70	26,139
Do. ...	244 ...	(Collie Co-operative Collieries, Ltd.) ...	...	...	970,044·30	511,862
Do. ...	88 (part of) ...	(Collie Proprietary Coalfields of W.A., Ltd.) ...	...	...	477,781·55	242,918
Do. ...	85, etc. ...	(Collie Proprietary Coalfields of W.A., Ltd.) ...	...	...	580,392·15	289,246
Do. ...	314. etc. ...	Griffin Leases ...	687·62	521	687·62	521
Do. ...	260, etc. ...	Premier Coal Mining Co., Ltd. ...	38,850·47	32,889	458,514·28	339,244
Do. ...	151, etc. ...	(Scottish Collieries, Ltd.) ...	...	...	2,314·51	1,210
Do. ...	151, etc. ...	(Scottish Co-operative Collieries Co., Ltd.) ...	...	...	430,796·95	171,303
Do. ...	85, etc. ...	(The Proprietary Coal Mines of W.A., Ltd.) ...	...	...	693,045·34	413,755
Do. ...	88 (part of) ...	(The Proprietary Coal Mines of W.A., Ltd.) ...	...	...	109·00	54
Do. ...	250, etc. ...	(Westralian Coal Mining Co., Ltd.) ...	...	...	507,384·11	307,913
Do. ...	250, etc. ...	(Westralia Black Diamond Collieries, Ltd.) ...	...	...	125,083·24	117,827
		Voided leases ...	...	...	25,569·85	12,930
		Totals ...	474,818·69	394,400	7,733,797·38	4,952,736

TABLE XVIII.

QUANTITY AND VALUE OF FIRECLAY REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
		COLLIE MINERAL FIELD.	tons.	£	tons.	£
Collie ...	87 ...	Amalgamated Collieries of W.A., Ltd. (Proprietary lease) ...	...	...	677·80	646
		Total ...	...	...	677·80	646

TABLE XIX.

Quantity and Value of LIMESTONE reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value
			tons.	£	tons.	£
		MURCHISON GOLDFIELD.				
		Cue District.				
Cuddingwarra ...	M.L. (3) ...	Linella ...	...	...	298·00	772
		Totals ...	...	...	298·00	772
		YILGARN GOLDFIELD.				
Southern Cross	...	Voided leases ...	...	...	2,548·85	1,607
		Totals ...	...	...	2,548·85	1,607
		STATE GENERALLY.				
Fremantle ...	...	...	...	...	90,858·88	15,911
		Totals ...	...	...	90,858·88	15,911

TABLE XX.

Quantity and Value of ASBESTOS reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		PILBARA GOLDFIELD.				
		Marble Bar District.				
Cooglegong ...	M.Ls. 274, 275	Chrysotile No. 1 leases ...	...	...	70·10	3,660
Soanesville ...	...	Voided leases ...	...	...	42·83	1,754
		Totals ...	...	...	112·93	5,414
		Nullagine District.				
Lionel ...	M.Ls. (32L), (33L)	Bullswool No. 2 and Junction leases ...	...	...	6·15	330
Do. ...	M.L. (37L) ...	Fibre Chief ...	...	...	2·50	70
Do. ...	M.L. (38L) ...	Lone Pine ...	5·55	132	5·55	132
Do. ...	...	Voided leases ...	...	...	564·78	26,665
Do. ...	...	Sundry claims ...	85·90	2,304	306·48	9,329
		Totals ...	91·45	2,436	885·46	36,526
		WEST PILBARA GOLDFIELD				
Roebourne ...	...	Sundry claims ...	...	...	·85	17
Do. ...	M.L. 215 ...	Greenhill Reward ...	13·89	292	14·63	314
		Totals ...	13·89	292	15·48	331

TABLE XXI.

Quantity and Value of GADOLINITE reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		PILBARA GOLDFIELD.				
		Marble Bar District.				
Cooglegong ...	(M.L. 254) ...	Iverna ...	...	...	1·00	112
		Totals ...	...	...	1·00	112

TABLE XXII.

QUANTITY AND VALUE OF TUNGSTEN ORES REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

SCHEELITE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Ore.	1926. Contents Tungstic Trioxide.	1926. Value.	Totals to Date. Ore.	Totals to Date. Contents Tungstic Trioxide.	Totals to Date. Value.
			tons.	units.	£	tons.	units.	£
		NORTH COOLGARDIE GOLDFIELD.						
		MENZIES DISTRICT.						
Comet Vale ...	G.M.L. 5410z...	Lake View	...	...	...	380·84	338·39	818
Do. ...	... ...	Sundry claims	...	...	...	26·47	47·38	124
		Totals	...	...	...	407·31	385·77	942
		BROAD ARROW GOLDFIELD.						
Ora Banda ...	... ...	Sundry claims	...	...	...	3·35	66·50	175
		Totals	...	...	...	3·35	66·50	175
		COOLGARDIE GOLDFIELD.						
		COOLGARDIE DISTRICT.						
Higginsville ...	... ...	Sundry claims	...	...	...	85·71	59·07	155
		Totals...	...	...	...	85·71	59·07	155
		DUNDAS GOLDFIELD.						
Norseman ...	... ...	Sundry claims	...	...	...	·41	3·98	10
		Totals	...	...	...	·41	3·98	10

WOLFRAM.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Ore.	1926. Metallic contents.	1926. Value.	Totals to Date. Ore.	Totals to Date. Metallic contents.	Totals to Date. Value.
			tons.	tons.	£	tons.	tons.	£
		MURCHISON GOLDFIELD.						
		CUE DISTRICT.						
Callie Spring ...	M.L. (11) ...	Socialist	...	...	...	194·00	6·11	877
Do. ...	... ...	Sundry claims	...	...	...	44·64	2·30	271
		Totals	...	...	...	238·64	8·41	1,148
		YALGOO GOLDFIELD.						
Yalgoo	M.L. (36) ...	Yandanoo King North	...	...	...	·25	·12	27
		Totals	...	...	...	·25	·12	27
		STATE GENERALLY.						
Derby	(146H) ...	Taylor's Wolfram Reward ...	...	...	...	27·00	2·00	120
		Totals	...	...	...	27·00	2·00	120

TABLE XXIII.

QUANTITY AND VALUE OF MAGNESITE REPORTED TO THE MINES DEPARTMENT DURING 1926, AND TOTALS TO DATE.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		EAST COOLGARDIE GOLDFIELD.				
		BULONG DISTRICT.				
Bulong	... ...	Sundry claims	...	...	824·75	1,053
		Totals	...	...	824·75	1,053

TABLE XXIV.

Quantity and Value of ANTIMONY reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim or Area.	Registered Name of Company or Lease.	1926. Ore.	1926. Metallic contents.	1926. Value.	Totals to Date. Ore.	Totals to Date. Metallic contents.	Totals to Date. Value.
			tons.	tons.	£	tons.	tons.	£
		WEST PILBARA GOLDFIELD.						
Balla Balla ...	M.L. (185) ...	Star	...	...	...	20·78	11·58	491
		Totals	...	...	...	20·78	11·58	491

TABLE XXV.

Quantity and Value of GYPSUM reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons	£	tons.	£
		YILGARN GOLDFIELD.				
Lake Seabrook	... ...	Sundry claims	139·00	139	139·00	139
		Totals	139·00	139	139·00	139
		STATE GENERALLY.				
Baandee ...	... ...	Sundry claims	1,167·01	1,659	2,066·21	2,829
Dukin ...	... ...	Sundry claims	...	...	487·00	561
Hines Hill ...	... ...	Sundry claims	301·50	302	1,977·00	1,659
Koorda ...	M.L. 280H ...	White Cross	1,260·55	1,891	3,666·05	4,860
Woolundra ...	... ...	Sundry claims	1,049·70	1,627	3,606·95	5,604
		Totals	3,778·76	5,479	11,803·21	15,513

TABLE XXVI.

Quantity and Value of DIAMONDS reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			carats.	£	carats.	£
		PILBARA GOLDFIELD.				
		Nullagine District.				
Nullagine ...	M.R.C. (6L) ...	Morgans, A. E.	...	...	...	24
		Totals	...	...	...	24

XXVII.

Quantity and Value of MANGANESE reported to the Mines Department during 1926, and Totals to Date.

Locality.	Number of Lease, Claim, or Area.	Registered Name of Company or Lease.	1926. Quantity.	1926. Value.	Totals to Date. Quantity.	Totals to Date. Value.
			tons.	£	tons.	£
		PEAK HILL GOLDFIELD.				
Horseshoe ...	...	Voided leases	...	...	18·11	142
Do. ...	...	Sundry claims	...	...	58·63	294
		Totals	...	...	76·74	436

TABLE

RETURN OF ORE AND MINERALS OTHER THAN GOLD

Year.	Copper. — Copper Ore. — West Pilbara Gf. — Quantity.	West Pilbara Gf. — Value.	Northampton Mf. — Quantity.	Northampton Mf. — Value.	Phillips River Gf. — Quantity.	Phillips River Gf. — Value.	State generally. — Quantity.	State generally. — Value.	Total. — Quantity.	Total. — Value.	Copper Ingot, Matte, Etc. — State generally. — Quantity.	Copper Ingot, Matte, Etc. — State generally. — Value.	Total Value of Copper Exported.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	£
1850 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
1 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
2 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
3 ...	...	...	[2]†	7	...	...	...	...	...	7	...	...	7
4 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
5 ...	...	...	2	26	...	...	...	...	2	26	...	...	26
6 ...	...	...	57	1,018	...	...	...	...	57	1,018	...	...	1,018
7 ...	...	...	80	1,920	...	...	...	...	80	1,920	...	...	1,920
8 ...	...	...	433	9,531	...	...	...	...	433	9,531	...	...	9,531
9 ...	...	...	941	14,122	...	...	...	...	941	14,122	...	...	14,122
1860 ...	...	...	517	8,021	...	...	...	...	517	8,021	...	...	8,021
1 ...	...	...	409	6,339	...	...	...	...	409	6,339	...	...	6,339
2 ...	...	...	783	12,536	...	...	...	...	783	12,536	...	...	12,536
3 ...	...	...	763	12,208	...	...	...	...	763	12,208	...	...	12,208
4 ...	...	...	1,076	17,216	...	...	...	...	1,076	17,216	...	...	17,216
5 ...	...	...	886	13,290	...	...	...	...	886	13,290	...	...	13,290
6 ...	...	...	557	8,362	...	...	...	...	557	8,362	...	...	8,362
7 ...	...	...	337	5,055	...	...	...	...	337	5,055	...	...	5,055
8 ...	...	...	83	1,245	...	...	...	...	83	1,245	...	...	1,245
9 ...	...	...	155	2,325	...	...	...	...	155	2,325	...	...	2,325
1870 ...	...	...	6	90	...	...	...	...	6	90	...	...	90
1 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
2 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
3 ...	...	...	56	848	...	...	...	...	56	848	...	...	848
4 ...	...	...	67	998	...	...	...	...	67	998	...	...	998
5 ...	...	...	205	3,071	...	...	...	...	205	3,071	...	...	3,071
6 ...	...	...	279	4,185	...	...	...	...	279	4,185	...	...	4,185
7 ...	...	...	54	803	...	...	...	...	54	803	...	...	803
8 ...	...	...	9	135	...	...	...	...	9	135	...	...	135
9 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
1880 ...	...	...	8	120	...	...	...	...	8	120	...	...	120
1 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
2 ...	...	...	2	23	...	...	...	...	2	23	...	...	23
3 ...	...	...	5	75	...	...	...	...	5	75	...	...	75
4 ...	...	...	118	1,770	...	...	...	...	118	1,770	...	...	1,770
5 ...	...	...	120	1,793	...	...	...	...	120	1,793	...	...	1,793
6 ...	...	...	249	3,735	...	...	...	...	249	3,735	...	...	3,735
7 ...	...	...	23	345	...	...	...	...	23	345	...	...	345
8 ...	...	...	88	1,488	...	...	...	...	88	1,488	...	...	1,488
9 ...	...	...	112	1,904	...	...	...	...	112	1,904	...	...	1,904
1890 ...	...	...	8	136	...	...	...	...	8	136	...	...	136
1 ...	263	4,462	...	...	...	...	...	...	263	4,462	...	...	4,462
2 ...	[1]†412	6,319	155	2,377	...	...	...	...	567	8,696	...	...	8,696
3 ...	50	606	...	...	...	...	...	...	50	606	...	...	606
4 ...	...	...	...	...	...	...	...	...	...	...	...	...	...
5 ...	802	12,832	24	120	...	...	...	...	826	12,952	...	...	12,952
6 ...	6	100	...	...	...	...	...	...	6	100	...	...	100
7 ...	65	731	21	302	...	...	...	...	86	1,033	...	...	1,033
8 ...	281	3,334	75	932	...	...	...	...	356	4,266	...	...	4,266
9 ...	1,404	31,979	587	9,473	...	...	...	...	1,991	41,452	...	...	41,452
1900 ...	544	10,696	...	...	105	2,411	197	3,355	846	16,462	249	17,475	33,937
1 ...	1,058	26,464	1	10	1,205	22,107	397	6,322	2,661	54,903	880	55,866	110,769
2 ...	68	1,698	20	330	162	2,469	33	489	283	4,986	175	7,918	12,904
3 ...	4	180	25	460	302	3,538	15	349	346	4,527	1,075	33,288	37,815
4 ...	50	500	...	...	11	154	310	3,378	371	4,032	102	3,827	7,859
5 ...	...	...	...	...	80	2,808	713	8,576	793	11,384	794	53,867	65,251
6 ...	112	323	...	...	...	...	224	2,930	336	6,162	343	30,367	36,529
7 ...	...	...	...	...	...	...	3,727	61,493	3,727	61,493	1,602	141,883	203,376
8 ...	...	...	...	...	...	...	2,503	29,272	2,503	29,272	479	27,819	57,091
9 ...	...	...	...	...	...	...	6,959	59,541	6,959	59,541	833	45,100	104,641
1910 ...	...	...	...	...	...	...	6,309	27,271	6,309	27,271	1,281	68,657	95,928
1 ...	...	...	...	...	...	...	9,825	33,709	9,825	33,709	828	44,409	78,118
2 ...	...	...	...	...	...	...	9,536	58,688	9,536	58,688	28	1,136	59,824
3 ...	...	...	...	...	...	...	4,339	136,472	4,339	136,472	82	5,891	142,363
4 ...	...	...	...	...	...	...	3,913	33,654	3,913	33,654	183	4,520	38,174
5 ...	...	...	...	...	...	...	737	13,768	737	13,768	946	77,401	91,169
6 ...	...	...	...	...	...	...	650	14,971	650	14,971	457	49,862	64,833
7 ...	...	...	...	...	...	...	966	20,878	966	20,878	535	64,860	85,738
8 ...	...	...	...	...	...	...	1,643	24,877	1,643	24,877	478	41,269	66,146
9 ...	...	...	...	...	...	...	455	9,740	455	9,740	4	365	10,105
1920 ...	...	...	...	...	...	...	1,511	22,467	1,511	22,467	137	2,698	25,165
1921 ...	...	...	...	...	...	...	1,040	16,153	1,040	16,153	206	8,448	24,601
1922 ...	...	...	...	...	...	...	352	5,519	352	5,519	660	14,860	20,379
1923 ...	...	...	...	...	...	...	3,394	48,907	3,394	48,907	1,057	16,193	65,100
1924 ...	...	...	...	...	...	...	2,795	40,676	2,795	40,676	...	...	40,676
1925 ...	...	...	...	...	...	...	1,201	18,200	1,201	18,200	...	...	18,200
1926 ...	...	...	...	...	...	...	...	...	...	...	1	84	84
Total ...	...	...	...	...	...	...	...	...	80,124	987,019	13,415	818,063	1,805,082

[1]† *See* Woodward's Mining Handbook, Perth: By Authority, 1895; page 123. [2]† Weight not stated.

XXVIII.

ENTERED FOR EXPORT FROM 1850 TO 1926, INCLUSIVE.

Tin.											
Black Tin (Dressed Tin ore).								Tin Ingot.		Total Value of Tin Exported.	Year.
Pilbara Gf.		Greenbushes Mf.		[3]†State generally.		Total.		Greenbushes Mf.			
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	£	
...	...	...	...	...	...	...	...	...	...	...	1850
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	1860
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	1870
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	1880
...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	6
...	...	5	300	...	...	5	300	...	...	300	9
...	...	68	5,400	...	...	68	5,400	...	...	5,400	1890
...	...	204	10,200	...	...	204	10,200	...	...	10,200	1
...	...	265	13,843	...	...	265	13,843	...	...	13,843	2
57	3,470	171	7,664	...	...	228	11,134	...	...	11,134	3
19	949	371	14,325	...	...	390	15,274	...	...	15,274	4
...	...	277	9,703	...	...	277	9,703	...	...	9,703	5
...	...	137	4,338	...	...	137	4,338	...	...	4,338	6
...	...	96	3,275	...	...	96	3,275	...	...	3,275	7
...	...	68	2,760	...	...	68	2,760	...	...	2,760	8
30	2,025	278	21,138	...	...	308	23,163	...	...	23,163	9
368	30,146	102	8,032	...	...	470	38,178	142	18,872	57,050	1900
439	34,600	68	4,895	...	...	507	39,495	97	12,607	52,102	1
248	19,698	31	2,870	...	...	279	22,568	141	16,830	39,398	2
267	20,988	25	1,868	...	...	292	22,856	235	29,277	52,133	3
64	4,932	24	1,389	379	20,797	467	27,118	129	16,155	43,273	4
188	16,853	119	8,177	666	51,748	973	76,778	[2]†	1	76,779	5
329	28,375	444	46,254	624	64,005	1,397	138,634	45	8,746	147,380	6
...	...	...	...	1,424	151,414	1,424	151,414	78	14,725	166,139	7
...	...	...	...	1,093	83,294	1,093	83,594	[2]†	1	83,595	8
...	...	...	...	698	62,989	698	62,989	...	...	62,989	9
...	...	...	...	500	45,129	500	45,129	...	...	45,129	1910
...	...	...	...	495	55,220	495	55,220	...	...	55,220	1
...	...	...	...	651	79,738	651	79,738	...	...	79,738	2
...	...	...	...	484	72,142	484	72,142	...	...	72,142	3
...	...	...	...	363	35,649	363	35,649	...	...	35,649	4
...	...	...	...	429	41,391	429	41,391	...	...	41,391	5
...	...	...	...	463	49,101	463	49,101	...	...	49,101	6
...	...	...	...	383	45,288	383	45,288	...	...	45,288	7
...	...	...	...	415	76,952	415	76,952	...	...	76,952	8
...	...	...	...	318	47,269	318	47,269	...	...	47,269	9
...	...	...	...	243	49,449	243	49,449	...	...	49,449	1920
...	...	...	...	67	6,485	67	6,485	...	...	6,485	1921
...	...	...	...	110	10,930	110	10,930	...	...	10,930	1922
...	...	...	...	131	15,095	131	15,095	...	...	15,095	1923
...	...	...	...	87	12,008	87	12,008	...	...	12,008	1924
...	...	...	...	108	15,392	108	15,392	...	...	15,392	1925
...	...	...	...	67	10,450	67	10,450	...	...	10,450	1926
...	...	...	...	...	...	14,960	1,430,702	867	117,214	1,547,916	Total

[2]†Weight not stated. [3]†Probably the produce of Pilbara Goldfield and Greenbushes Mineral Field.

TABLE XXVIII.—*Return of Ore and Minerals other than Gold*

Year.	Silver. State generally.		‡ Lead. Northampton Mf.		‡ Lead and Silver-Lead. State generally.		Pig Lead. State generally.		Zinc Ingots and Concentrates. State generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	ozs.	£	tons.	£	tons.	£	tons.	£	tons.	£
1850	...	...	5	55	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	²†	4	...	...	55	1,200	...	...
4	...	...	...	...	...	...	122	2,440	...	...
5	...	...	25	250	...	...	134	2,675	...	...
6	...	...	...	...	...	...	60	1,200	...	...
7	...	...	...	...	...	...	120	2,410	...	...
8	...	...	...	...	...	...	61	1,220	...	...
9	...	...	13	135	...	...	25	495	...	...
1860	...	...	98	985	...	...	...	...	...	...
1	...	...	79	790	...	...	...	...	...	...
2	...	...	9	90	...	...	...	...	...	...
3	...	...	230	2,300	...	...	...	...	...	...
4	...	...	80	800	...	...	...	...	...	...
5	...	...	703	8,436	...	...	...	...	...	...
6	...	...	273	3,282	...	...	...	...	...	...
7	...	...	902	10,824	...	...	⁴†3	50	...	...
8	...	...	1,100	13,206	...	...	...	...	...	...
9	...	...	699	8,394	...	...	...	...	...	...
1870	...	...	1,209	14,514	...	...	...	...	...	...
1	...	...	420	5,040	...	...	...	...	...	...
2	...	...	364	4,368	...	...	...	...	...	...
3	...	...	965	11,586	...	...	...	...	...	...
4	...	...	2,144	25,725	...	...	...	...	...	...
5	...	...	2,289	27,468	...	...	4	89	...	...
6	...	...	2,192	26,298	...	...	⁴†7	155	...	...
7	...	...	3,956	47,466	...	...	⁴†1	15	...	...
8	...	...	3,618	43,410	...	...	...	...	...	...
9	...	...	2,775	33,300	...	...	...	...	...	...
1880	...	...	1,921	15,368	...	...	⁴†5	89	...	...
1	...	...	1,401	11,204	...	...	⁴†1	20	...	...
2	...	...	1,794	14,348	...	...	...	...	...	...
3	...	...	1,038	7,266	...	...	...	...	...	...
4	...	...	696	4,872	...	...	...	...	...	...
5	...	...	465	3,255	...	...	...	...	...	...
6	...	...	611	4,277	...	...	...	...	...	...
7	...	...	471	4,710	...	...	⁴†6	120	...	...
8	...	...	532	5,320	...	...	⁴†2	40	...	...
9	...	...	250	2,500	...	...	...	...	...	...
1890	...	...	214	2,135	...	...	...	...	...	...
1	...	...	25	250	...	...	...	...	...	...
2	...	...	30	150	...	...	...	...	...	...
3	...	...	...	...	...	...	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	...	...	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	²†	4	...	...	⁴†1	11	...	...
8	...	...	5	33	...	...	...	...	...	...
9	...	...	16	96	...	...	77	1,077	...	...
1900	28,749	3,594	27	242	...	...	...	...	...	...
1	60,869	7,609	...	...	...	...	...	...	...	...
2	83,293	9,190	...	...	...	...	...	...	...	...
3	168,113	19,153	...	...	...	...	...	...	...	...
4	399,190	45,912	...	...	...	...	...	...	...	...
5	359,744	44,278	...	...	...	...	...	...	...	...
6	282,145	37,612	...	...	...	...	...	...	...	...
7	189,265	25,382	...	...	211	1,866	...	...	73	3,390
8	168,455	18,877	...	...	518	5,006	...	...	11	98
9	176,843	18,778	...	...	211	1,199	...	...	19	244
1910	176,139	18,777	248	1,433	...	...	...	...	12	147
1	169,043	18,333	1,549	15,002	...	...	...	...	12	189
2	165,371	19,725	1,868	22,270	...	...	...	...	14	217
3	188,020	23,420	3,169	59,002	...	...	...	...	...	...
4	193,057	23,227	3,554	46,285	...	...	...	...	22	379
5	222,159	24,295	...	...	2,883	39,032	13	302	7	143
6	173,012	22,258	...	...	428	12,033	3,523	74,930	14	630
7	222,075	38,339	...	...	22	593	4,661	139,940	...	...
8	109,830	22,711	...	...	282	3,045	5,489	163,880	...	...
9	223,332	55,342	...	...	248	3,704	1,780	48,462	...	...
1920	130,692	36,605	...	...	3,427	84,743	1,930	69,136	...	...
1921	116,151	18,658	...	...	...	...	2,156	48,863	...	...
1922	118,696	18,164	...	...	...	...	2,796	69,528	...	...
1923	109,005	16,036	...	...	3,172	43,416	20	609	...	...
1924	89,146	13,409	...	...	4,854	83,095	...	...	...	...
1925	81,226	11,661	...	...	4,664	103,300	...	...	...	...
1826	68,413	8,863	...	...	4,162	76,741	...	...	...	...
Total ...	4,472,033	620,208	44,032	508,748	25,082	457,773	23,052	628,956	184	5,437

²† Weight not stated. ⁴† Estimated. ‡ Ore and Concentrates.

entered for EXPORT from 1850 to 1926, inclusive—continued.

Tungsten Ore.				Arsenical Ore.		Tantalite.		Non-Metallic Minerals.				Year.
Wolfram.		Scheelite.						Graphite.		Magnesite.		
State generally.		State generally.		State generally.		State generally.		State generally.		State generally.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	
...	...	...	...	...	...	...	...	...	...	...	...	1850
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1860
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...		...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1870
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1880
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1890
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	...	...	...	...	1900
...	...	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	1	6	...	...	2
...	...	...	...	...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	18	5,729	...	...	...	...	5
...	...	...	...	...	...	...	...	...	...	...	...	6
...	...	4	140	...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	2†	400	...	...	...	...	8
1	100	...	...	...	...	...	...	...	...	...	...	9
2	190	...	...	...	...	...	...	...	...	...	...	1910
9	826	...	...	...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	...	...	...	...	2
1	86	...	...	...	...	...	...	...	...	...	...	3
½	40	...	...	...	...	...	...	7	40	...	...	4
¼	25	...	...	...	...	...	...	...	...	688	1,196	5
1	128	3	438	11	19	47	9,375	21	284	12	47	6
...	...	½	42	57	707	17	2,513	18	158	42	50	7
¼	31	5	720	679	2,564	...	...	5	75	62	225	8
½	15	6	772	...	...	¼	75	...	...	...	...	9
...	...	2½	395	1,765	4,260	...	...	13	130	...	...	1920
...	...	...	...	7	16	...	...	...	...	...	...	1921
...	...	...	...	1,075	1,784	...	...	2†	3	...	...	1922
...	...	...	...	**	686	4½	688	...	...	2	8	1923
...	...	...	...	**	777	...	...	...	...	...	...	1924
...	...	...	...	**	1,045	5	1,010	...	...	...	...	1925
...	...	...	...	**	347	24½	5,751	...	...	...	...	1926
15	1,441	21	2,507	...	12,205	...	25,541	...	696	806	1,526	Total

** Contained in Gold ore. 2† Weight not stated.

TABLE XXVIII.—*Return of Ore and Minerals other than Gold*

YEAR.	NON-METALLIC MINERALS—*continued.*						MINERALS NOT ELSEWHERE INCLUDED.		Total Value of Minerals other than Gold exported to Date.	YEAR.
	ASBESTOS.		COAL.		MICA.					
	State generally.		Collie River Mf.		State generally.					
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.		
	tons.	£	tons.	£	tons.	£	tons.	£	£	
1850	...	...	...	...	...	...	...	...	55	1850
1	...	...	...	...	...	...	...	...	...	1
2	...	...	...	...	...	...	...	...	...	2
3	...	...	...	...	...	...	...	...	1,211	3
4	...	...	...	...	...	...	...	...	2,440	4
5	...	...	...	...	...	...	...	...	2,951	5
6	...	...	...	...	...	...	...	...	2,218	6
7	...	...	...	...	...	...	...	...	4,330	7
8	...	...	...	...	...	...	...	...	10,751	8
9	...	...	...	...	...	...	...	...	14 752	9
1860	...	...	...	...	...	...	...	...	9,006	1860
1	...	...	...	...	—	...	...	...	7,129	1
2	...	...	...	...	...	...	...	...	12,626	2
3	...	...	...	...	...	...	...	...	14,508	3
4	...	...	...	...	...	...	...	...	18,016	4
5	...	...	...	...	...	...	...	...	21,726	5
6	...	...	...	...	...	...	...	...	11,644	6
7	...	...	...	...	...	...	...	...	15,929	7
8	...	...	...	...	...	...	...	...	14,451	8
9	...	...	...	...	...	...	...	...	10,719	9
1870	...	...	...	...	...	...	...	...	14,604	1870
1	...	...	...	...	...	...	...	...	5,040	1
2	...	...	...	...	...	...	...	...	4,368	2
3	...	...	...	...	...	...	...	...	12,434	3
4	...	...	...	...	...	...	...	...	26,723	4
5	...	...	...	...	...	...	...	...	30,628	5
6	...	...	...	...	...	...	...	...	30,638	6
7	...	...	...	...	...	...	...	...	48,284	7
8	...	...	...	...	...	...	...	...	43,545	8
9	...	...	...	...	...	...	...	...	33,300	9
1880	...	...	...	...	...	...	...	...	15,577	1880
1	...	...	...	...	...	...	...	...	11,224	1
2	...	...	...	...	...	...	...	...	14,371	2
3	...	...	...	...	...	...	...	...	7,341	3
4	...	...	...	...	...	...	...	...	6,642	4
5	...	...	...	...	...	...	...	...	5,048	5
6	...	...	...	...	...	...	...	...	8,012	6
7	...	...	...	...	...	...	...	...	5,175	7
8	...	...	...	...	...	...	...	...	6,848	8
9	...	...	...	...	...	...	...	...	4,704	9
Carried forward ...	...	...	...	...	...	...	...	...	508,968	...

entered for EXPORT from 1850 to 1926, inclusive—continued.

Year.	Non-Metallic Minerals—*continued.* Asbestos. State generally. Quantity.	Asbestos. Value.	Coal. Collie River Mf. Quantity.	Coal. Value.	Mica. State generally. Quantity.	Mica. Value.	Minerals not Elsewhere Included. Quantity.	Minerals not Elsewhere Included. Value.	Total Value of Minerals other than Gold exported to Date.	Year.
	tons.	£	tons.	£	tons	£	tons	£	£	
Brought forward	...	...	...	...	...	...	...	...	508,968	
1890	...	...	...	...	...	...	...	...	7,671	1890
1	...	...	...	...	...	...	...	...	14,912	1
2	...	...	...	...	[2]†	25	...	...	22,714	2
3	...	...	...	...	[2]†	4	...	...	11,744	3
4	...	...	...	...	...	...	...	...	15,274	4
5	...	...	...	...	[2]†	3	...	...	22,658	5
6	...	...	...	...	...	...	...	...	4,438	6
7	...	...	...	...	[2]†	209	...	...	4,532	7
8	...	...	1	1	...	...	...	...	7,060	8
9	[2]†	1	798	772	[2]†	50	...	...	66,611	9
1900	...	...	355	350	[2]†	3	5	85	95,261	1900
1	...	...	971	969	...	...	...	4	171,453	1
2	...	...	12	12	...	...	[6]†2	41	61,551	2
3	[5]†	10	110	127	...	...	[7]† 22	230	109,468	3
4	...	...	11	7	...	...	7	81	97,132	4
5	...	...	108	87	...	...	62	127	192,251	5
6	...	...	86	65	...	...	10	1,035	222,621	6
7	...	...	26 *1,447	28 1,138	...	...	[8]†96	1,447	402,906	7
8	[2]†	1,242	13 *9,612	11 7,747	[2]†	10	42	2,750	176,827	8
9	...	...	353 *85,647	183 93,781	...	...	[9]† 263	735	282,650	9
1910	...	...	3 *48,876	2 38,400	...	...	½	100	200,106	1910
1	...	...	*40,063	29,344	...	...	[10]†14	407	197,439	1
2	...	...	6 *42,602	6 30,721	...	...	[11]†	8	212,509	2
3	...	...	*54,228	39,125	...	...	5	17	336,155	3
4	...	...	*54,416	38,244	4	323	[12]† 9	635	182,996	4
5	...	...	1,667 *26,167	1,513 19,288	[2]†	26	[13]†	115	218,495	5
6	...	...	2,447 *37,590	1,857 28,387	[2]†	10	[14]†	713	265,043	6
7	...	...	*31,951	29,359	...	...	[15]†	440	343,167	7
8	1	25	*23,238	24,424	...	...	[16]† 5	97	360,895	8
9	36	752	*69,708	76,924	1	514	[17]†	116	244,050	9
1920	31	2,525	*78,788	104,665	[18]†	120	[19]†	223	377,416	1920
1921	141	6,205	*116,993	188,686	...	...	[20]†	257	293,771	1921
1922	143	5,746	*71,164	115,835	2	60	[21]†	1,083	243,512	1922
1923	71	3,830	5,313 *43,729	7,969 73,256	...	...	[22]†	303	226,996	1923
1924	32	1,586	*36,829	60,292	...	...	[23]† 20	160	212,003	1924
1925	23	687	66 *37,208	198 58,650	...	...	...	...	210,143	1925
1926	63	1,823	*50,986	82,810	4	8,328	[24]†	838	196,035	1926
Total	...	24,432	973,588	1,155,233	...	9,685	...	12,047	6,819,433	Total

* Bunker Coal. [2] †Weight not stated. [5] †4 cwts. [6] †Cobalt ore. [7] †Antimony ore. [12]†Bismuth. [16]†Molybdenite. [18]†7 cwts.

[8]†Includes—
Antimony ore, 25 tons = £630
N.E.I., 71 tons ... = 817
Total £1,447

[9]†Includes—
Other Concentrates, 29 tons = £108
N.E.I., 234 tons ... = 627
Total £735

[10]†Includes—
Iron ore, 9 tons ... = £7
Ores, N.E.I., 5 tons = 400
Total £407

[11]†Includes—
Manganese, 2 tons = £4
N.E.I. ... ... = 4
Total £8

[13]†Includes—
Bismuth, 1 ton ... = £37
Fireclay, 12 tons ... = 75
Manganese, 3 cwt. = 3
Total £115

[14]†Includes—
Antimony, 27 tons = £580
Bismuth, 4 cwt. ... = 133
Total £713

[15]†Includes—
Antimony, 12 tons = £258
Bismuth, 9cwt. ... = 24
Molybdenite, 14 tons = 158
Total £440

[17]†Includes—
Bismuth, 1 cwt. ... = £15
Corundum, 1 ton ... = 1
Molybdenite, 7 tons = 100
Total £116

[19]†Includes—
Antimony, 2½ tons = £45
Clay, 6 cwt. ... = 6
Gadolinite, 1 ton ... = 150
Iron Concentrates, 1 ton = 17
Molybdenite, 10 cwt. = 5
Total £223

[20]†Includes—
Barytes, 2 cwt. ... = £18
Corundum, ½ cwt. = 2
Felspar, 1 ton ... = 47
Jarosite, 12 cwt. ... = 5
Manganese, 16 tons = 145
Pottery Clay, 3½ tons = 40
Total £257

[21]†Includes—
Barytes, 19 tons ... = £73
Felspar, 60 tons ... = 485
Gypsum, 2 tons 4
Molybdenite, 51 tons ... 505
Pottery clay, 1 ton ... 16
Total £1,083

[22]†Includes—
Clay, 34 tons ... = £94
Iron Ore, 2 tons ... = 9
Manganese, 22 tons ... 200
Total £303

[23]†Manganese.

[24]†Includes—
Antimony, 4½ tons ... £85
Felspar, 8¼ tons 250
Manganese 82 tons ... 503
£838

PART III.—ALL MINES.

TABLE XXIX.

MILLING AND CYANIDING PLANTS ERECTED IN THE RESPECTIVE GOLDFIELDS, DISTRICTS, AND MINERAL FIELDS ON THE 31ST DECEMBER, 1926, AND THE TOTAL VALUE OF MINING MACHINERY.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	Milling.									Cyaniding.			Value of all Mining Machinery.
		Batteries.	Other Mills.											
		Number of Heads of Stampers.	Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	
	PILBARA GOLDFIELD.													
	MARBLE BAR DISTRICT.													
Bamboo Creek. G.M.L. (795)	Bulletin	10	...	...	...	...	...	...	...	...	...	...	...	...
↑	State Battery, Bamboo Creek	5	...	...	...	...	...	...	...	1	5	...	...	...
Lalla Rookh. R.C. 112	Lalla Rookh	10	...	...	...	...	...	...	...	...	5	...	...	...
Marble Bar. M.A. 37	Ironclad	10	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. (694)	Jo Jo	5	...	...	...	1	...	...	...	1	...	...	...	...
↑	State Battery, Marble Bar	5	...	...	...	...	...	...	...	1	...	...	...	...
	Total	45	...	...	...	1	...	...	...	3	10	...	...	£12,480
	NULLAGINE DISTRICT.													
Eastern Creek. M.A. 11L	Doherty's Reward	10	...	...	...	...	...	...	...	...	4	...	...	...
G.M.L. 219L	Shamrock	3	...	...	...	...	...	...	...	...	3	...	...	...
20-Mile Sandy. ↑	State Battery, 20-Mile Sandy	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	18	...	...	...	...	...	...	...	...	7	...	...	£2,192
	WEST PILBARA GOLDFIELD.													
Station Peak. M.A. 14	Pilgrim's Rest	10	...	...	...	...	...	...	...	...	...	...	...	...
	Total	10	...	...	...	...	...	...	...	...	...	...	...	£1,800
	PEAK HILL GOLDFIELD.													
Mount Egerton. ↑	State Battery, Mount Egerton	5	...	...	...	...	...	...	...	...	...	...	...	...
Peak Hill. T.A. 6P	Wind Power Cyanide Works	...	...	...	...	...	...	...	...	...	6	...	...	...
↑	State Battery, Peak Hill	5	...	...	...	...	...	...	...	...	3	...	...	...
	Total	10	...	...	...	...	...	...	...	...	9	...	...	£3,355
	EAST MURCHISON GOLDFIELD.													
	LAWLERS DISTRICT.													
Kathleen Valley. G.M.L. 382	Yellow Aster	5	...	...	...	...	...	...	...	...	4	...	...	...
Lawlers. M.A. 32	Great Eastern	5	...	...	...	...	...	...	...	1	6	...	...	...
M.A. 11	Sands Retreatment Works	...	...	...	...	...	...	...	...	...	4	...	...	...
G.M.L. (1234)	Vivien Gem	5	...	...	...	...	...	1	...	...	...	...	...	...
58, etc.	Waroonga G.M. Co., Ltd.	10	...	...	...	...	...	1	...	1	4	...	...	...
Sir Samuel. ↑	State Battery, Sir Samuel	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	30	...	...	...	...	...	2	...	2	18	...	...	£11,147
	WILUNA DISTRICT.													
Corboy's Find. 353J	Toscana	3	...	...	...	...	...	...	...	...	...	...	...	...
359J	Corboy's Reward North	5	...	...	...	...	...	...	...	...	...	...	...	...
Mt. Keith. ↑	State Battery, Mt. Keith	5	...	...	...	...	...	...	...	...	...	...	...	...
Wiluna. ↑	State Battery, Wiluna	10	...	...	...	...	...	...	...	...	6	...	...	...
	Total	23	...	...	...	...	...	...	...	...	6	...	...	£15,387
	Black Range District.													
Maninga Marley. 203B	Havilah	10	...	...	...	...	...	...	...	...	...	...	...	...
Sandstone. ↑	State Battery, Sandstone	10	...	...	...	...	...	...	...	...	6	...	...	...
Youanmi. ↑	State Battery, Youanmi	5	...	...	...	...	...	...	...	...	2	...	...	...
	Total	25	...	...	...	...	...	...	...	...	8	...	...	£7,093
	MURCHISON GOLDFIELD.													
	CUE DISTRICT.													
Cuddingwarra. G.M.L. 1860	Big Bell	10	...	...	...	...	...	...	1	...	12	2	...	...
Cue. G.M.L. 203	Cue, No. 1	20	...	...	...	...	...	...	...	1	...	...	...	...
↑	State Battery, Cue	5	...	...	...	...	...	...	...	...	5	...	...	...
Reedy's Find. 1977, etc.	Mararoa G.M. Co., N.L.	5	...	...	...	...	...	...	...	...	8	...	...	...
Tuckanarra. ↑	State Battery, Tuckanarra	10	...	...	...	...	...	...	...	...	...	...	...	...
	Total	50	...	...	...	...	...	...	1	1	25	2	...	£21,584

TABLE XXIX.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	MILLING.									CYANIDING.			Value of all Mining Machinery.
		Batteries.	Other Mills.											
		Number of Heads of Stampers.	Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	
	MURCHISON GOLDFIELD—*continued.*													
	MEEKATHARRA DISTRICT.													
Holden's Find. G.M.L. 1291	Waterloo	5	...	...	...	...	...	...	...	...	...	...	...	...
Meekatharra. G.M.L. 533N	Bright's Cyanide Works	...	...	...	...	...	...	...	...	...	3	...	...	...
G.M.L. 477N	Fenian	15	...	...	...	...	...	...	...	4	...	...	...	...
G.M.L. 475N	Ingliston Consols Extended	15	...	...	...	...	...	...	...	3	...	...	...	...
G.M.L. 1531N	Ingliston G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...
G.M.L. 533N	Marmont	10	...	...	...	...	...	...	...	...	...	...	...	...
〃	State Battery, Meekatharra	5	...	...	...	...	...	...	...	...	5	...	...	...
Nannine. G.M.L. 166N	Nannine	10	...	...	...	...	...	...	...	2	3	...	...	...
	Total	**70**	...	...	...	...	...	...	...	**9**	**11**	...	...	**£36,744**
	DAY DAWN DISTRICT.													
Lake Austin. G.M.L. 571D	Mainland Consols	3	...	...	...	...	...	...	...	...	...	...	...	...
	Total	**3**	...	...	...	...	...	...	...	...	...	...	...	**£1,000**
	MT. MAGNET DISTRICT.													
Lennonville. 964M	Empress	5	...	...	...	...	...	...	...	1	3	...	...	...
Mt. Magnet. 1215M	Hill 60	5	...	...	...	...	...	...	...	...	...	...	...	...
1156M	Leap Year	5	...	...	...	...	...	...	...	1	...	...	...	...
1075M	Hew Havelock	5	...	...	...	...	...	...	...	...	3	...	...	...
〃	State Battery, Boogardie	5	...	...	...	...	...	...	...	...	5	...	...	...
	Total	**25**	...	...	...	...	...	...	...	**2**	**11**	...	...	**£7,365**
	YALGOO GOLDFIELD.													
Field's Find. M.A. 23	Brown's Reward	5	...	...	...	...	...	...	...	...	6	...	...	...
Goodingnow. 〃	State Battery, Payne's Find	5	...	...	...	...	...	...	...	...	6	...	...	...
Noongal. 953	Revival	5	...	...	...	...	...	...	...	...	2	...	...	...
Messenger's Patch. 880	Brilliant G.M. Co., N.L.	10	...	...	...	...	...	1	...	2	8	...	...	...
Yalgoo. P.A. 718	Moxon	...	1	...	...	...	...	...	...	...	...	...	...	...
Warriedar. 〃	State Battery, Warriedar	5	...	...	...	...	...	...	...	...	6	...	...	...
	Total	**30**	**1**	...	...	...	...	**1**	...	**2**	**28**	...	...	**£23,138**
	MT. MARGARET GOLDFIELD.													
	MT. MORGANS DISTRICT.													
Linden. 〃	State Battery, Linden	10	...	...	...	...	...	...	...	...	6	...	...	...
341F	Torquay	5	...	...	...	...	...	...	...	...	4	2	...	...
Mt. Morgans. 5F	Westralia Mt. Morgan Mines, N.L.	10	...	...	...	...	...	...	...	3	...	3	1	...
	Total	**25**	...	...	...	...	...	...	...	**3**	**10**	**5**	**1**	**£5,495**
	MT. MALCOLM DISTRICT.													
Lake Darlot. 〃	State Battery, Lake Darlot	10	...	...	...	...	...	...	...	...	...	...	...	...
263C	Trump: Gwalia Central G.Ms., Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...
190C, etc.	Sons of Gwalia, Ltd.	30	...	...	...	...	...	...	4	...	...	4	1	...
〃	State Battery, Leonora	10	...	...	...	...	...	...	...	...	5	...	...	...
Mt. Clifford. 1329C	Victory No. 1	5	...	...	...	...	...	...	...	...	2	...	...	...
Pig Well. 1547C	Starlight	10	...	...	...	...	...	...	...	...	...	...	...	...
	Total	**70**	...	...	...	...	...	...	**4**	...	**7**	**4**	**1**	**£279,615**
	MT. MARGARET DISTRICT.													
Erlistoun. 2113T	Baneygo North	5	...	...	...	...	...	...	...	1	...	...	...	...
(2141T)	King of Creation	5	...	...	...	...	...	...	...	...	...	...	...	...
Laverton. 715T	Lancefield Treatment Syndicate	...	...	...	...	...	...	...	...	...	8	...	...	...
(1807T)	Mary Mac G.M. Co., N.L.	10	...	...	...	...	...	...	...	4	3	1	...	...
〃	State Battery, Laverton	10	...	...	...	...	...	...	...	...	5	...	...	...
	Total	**30**	...	...	...	...	...	...	...	**5**	**16**	**1**	...	**£5,977**

TABLE XXIX.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	MILLING. Batteries. Number of Heads of Stampers.	MILLING. Other Mills. Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	CYANIDING. Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	Value of all Mining Machinery.
	NORTH COOLGARDIE GOLDFIELD.													
	MENZIES DISTRICT.													
Comet Vale. 5217Z	Gladsome	10	...	...	...	...	...	...	...	2	...	...	...	...
Menzies. M.A. 65Z	Lady Harriet	5	...	...	...	...	...	...	...	...	4	...	...	...
4931Z	Menzies Consolidated G.Ms., Ltd.	20	...	...	...	...	...	...	...	9	14	4	1	...
(3100Z)	Menzies Mining and Exploration Corp., Ltd. ...	10	...	...	...	...	...	...	...	...	...	...	...	...
Mt. Ida. ↑	State Battery, Mt. Ida	5	...	...	...	...	...	...	...	...	...	...	...	...
5481Z	Unexpected South	5	...	...	...	...	...	...	...	1	...	...	...	...
	Total	55	...	...	...	...	...	...	...	12	18	4	1	£14,933
	ULARRING DISTRICT.													
Mulline. M.A. 11U	No. 1 North Coolgardie Consols G.M., Ltd. ...	10	...	...	...	...	...	...	...	1	...	...	...	...
↑	State Battery, Mulline	10	...	...	...	...	...	...	...	...	...	...	...	...
	Total	20	...	...	...	...	...	...	...	1	...	...	...	£1,672
	NIAGARA DISTRICT.													
Kookynie. 769G	Two D's	...	...	1	...	...	...	...	...	2	...	...	...	...
Niagara. ↑	State Battery, Niagara	10	...	...	...	...	...	...	...	...	...	...	...	...
Tampa. M.A. 62G	Grafter	5	...	...	...	...	...	...	...	1	...	...	...	...
	Total	15	...	1	...	...	...	...	...	3	...	...	...	£2,045
	YERILLA DISTRICT.													
Edjudina. 1011R	Neta	10	...	...	...	...	...	...	...	1	...	...	...	...
Yarri. ↑	State Battery, Yarri	10	...	...	...	...	...	...	...	...	5	...	...	...
	Total	20	...	...	...	...	...	...	...	1	5	...	...	£3,995
	BROAD ARROW GOLDFIELD.													
Bardoc. 1833W	Zoroastrian	5	...	...	...	...	...	...	...	...	...	...	...	...
Siberia. 1399W, etc.	Associated Northern Blocks (W.A.), Ltd. ...	...	...	1	...	2	3	...	...	10	...	7	2	...
1371W	Gimblet South	10	...	...	...	...	...	...	...	...	...	...	...	...
1289W	Lady Evelyn	5	...	...	...	...	...	...	...	...	4	...	...	...
(1736W)	Pole	5	...	...	...	...	...	...	...	...	...	...	...	...
↑	State Battery, Ora Banda	5	...	...	...	...	...	...	...	...	5	...	...	...
↑	State Battery, Siberia	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	35	...	1	...	2	3	...	...	10	9	7	2	£63,181
	NORTH-EAST COOLGARDIE GOLDFIELD.													
	KANOWNA DISTRICT.													
Gordon. 1467X	Sirdar	...	1	...	...	1	...	...	...	...	2	...	...	...
Kanowna. 1389X	Golden Valley	5	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 19X	Martin's Battery	15	...	...	...	...	...	...	...	...	...	...	...	...
12X	North White Feather G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...
1299X	Orion Mines, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...
	Total	50	1	...	...	1	...	...	...	...	2	...	...	£7,250
	KURNALPI DISTRICT.													
Kurnalpi. M.A. 7K	Success Battery	5	...	...	...	...	...	...	...	...	2	...	...	...
Mulgabbie. M.A. 4K	Simmon's Battery	...	1	...	...	...	...	...	...	...	...	...	...	...
	Total	5	1	...	...	...	...	...	...	...	2	...	...	£200
	EAST COOLGARDIE GOLDFIELD.													
	EAST COOLGARDIE DISTRICT.													
Boulder. 38E, etc.	Associated G.Ms. of W.A., Ltd.	...	...	7	...	...	...	1	...	20	...	6	7	...
66E, etc.	Boulder Perseverance, Ltd.	...	...	8	...	...	...	4	2	17	...	24	13	...
351E, etc.	Golden Horseshoe Estates Co., Ltd. ...	100	...	1	...	...	3	6	15	5	20	22	14	...
M.A. 71E	Great Boulder No. 1, Ltd.	10	...	...	...	...	...	...	...	...	2	...	...	...
16E, etc.	Great Boulder Proprietary G.Ms., Ltd. ...	...	1	6	...	...	2	4	...	20	...	22	7	...
946E, etc.	Ironsides North	10	...	...	...	...	...	...	...	...	...	...	...	...
31E, etc.	Lake View and Star, Ltd.	10	...	7	...	...	...	...	3	3	15	26	6	...
281E, etc.	North Kalgurli (1912), Ltd.	20	...	...	...	...	...	2	...	1	4	...	...	...
410E, etc.	Oroya Links, Ltd.	50	...	11	...	...	1	...	3	18	...	7	3	...
1208E, etc.	South Kalgurli Consolidated, Ltd.	...	...	4	...	...	...	...	1	6	...	6	6	...
Hampton Plains Block 48, P.P.L. 86	Golden Hope	10	...	...	...	...	...	...	...	2	...	2	1	...
Block 50, P.P.L. 9	Hampton Celebration W.A., Ltd.	10	...	...	...	...	...	1	1	...	...	6	2	...
Block 45	Hampton Properties, Ltd...	10	...	...	...	...	...	...	...	...	6	2	1	...
Block 48, P.P.L. 1	Hopeful Syndicate, Ltd.	10	...	...	...	...	...	1	...	2	6	2	...	...
Kalgoorlie. M.A. 7E	Hannans Central Battery	20	...	...	...	...	...	...	...	...	8	4	...	...
4527E	Hannans Reward	5	...	...	...	...	...	...	...	1	4	4	1	...
(5370E)	Hard-up	...	...	...	...	1	...	...	...	...	...	...	...	...
L.C. 353E	Lone Hand	...	...	...	...	1	...	...	...	1	7	...	...	...
Wombola. 4766E	Great Hope	...	...	...	...	1	...	1	...	1	3	...	...	...
	Total	265	1	44	...	3	6	20	25	97	75	133	61	£680,241

TABLE XXIX.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Mining Centre and Lease or Area.	Name of Mine, Company, or Works.	MILLING. Batteries. Number of Heads of Stampers.	Other Mills. Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	CYANIDING. Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	Value of all Mining Machinery.
	BULONG DISTRICT.													
Bulong. 1191Y	Sweet Nell	5	...	...	...	...	...	...	...	...	3	...	...	...
	Total	**5**	...	...	...	...	...	...	...	...	**3**	...	...	**£1,000**
	COOLGARDIE GOLDFIELD.													
	COOLGARDIE DISTRICT.													
Coolgardie. 4567	Griffiths Gold Mine	10	...	...	...	...	...	...	...	...	6	...	...	...
M.A. 11	New Bayley's Mines, Ltd.	...	...	...	...	...	...	...	...	...	...	4	...	...
↑	State Battery, Coolgardie	10	...	...	...	...	...	...	...	...	6	...	...	...
Gibraltar. 4580	Lloyd George G.M. Co., N.L.	10	...	...	...	...	...	...	...	2	18	...	...	...
4603	Reform	5	...	...	...	...	...	...	...	...	5	...	...	...
St. Ives 4720	Ives Reward G.Ms., N.L.	10	...	...	...	...	...	...	...	2	...	...	...	...
4732	Ives Reward Junction	...	...	...	...	1	...	...	...	...	...	...	...	...
↑	State Battery, St. Ives	5	...	...	...	...	...	...	...	...	5	...	...	...
Widgiemooltha. M.A. 63	Highgate	3	...	...	...	...	...	...	...	1	...	...	...	...
M.A. 280H	Imperial	5	...	...	...	...	...	...	...	...	...	...	...	...
	Total	**58**	...	...	...	**1**	...	...	...	**5**	**40**	**4**	...	**£27,086**
	KUNANALLING DISTRICT.													
Carbine. 338	Carbine	10	1	...	...	...	...	...	...	2	...	...	...	...
25-Mile. 696S	Blue Bell	5	...	...	...	...	...	...	...	...	7	...	...	...
645S	Star of Fremantle	10	...	...	...	...	...	...	...	...	2	...	...	...
897S	Nick of Time	...	...	...	...	...	...	...	...	1	...	...	...	...
	Total	**25**	**1**	...	...	...	...	...	...	**3**	**9**	...	...	**£6,075**
	YILGARN GOLDFIELD.													
Bullfinch. 914	Bullfinch Proprietary (1919), Ltd.	20	...	...	...	...	...	...	2	2	...	4	3	...
Forrestonia. (2909)	Great Southern	5	...	...	...	...	...	...	...	...	...	...	...	...
Golden Valley. 3248	Manxman Battery	5	...	...	...	...	...	...	...	1	3	...	...	...
2994	Radio	5	...	...	...	...	...	...	...	...	3	...	...	...
Greenmount. M.A. 25	Transvaal	10	...	...	...	...	...	...	...	...	...	...	...	...
Kennyville. (911)	Edna May Battler G.M. Co., N.L.	10	...	...	...	...	...	...	...	2	5	...	...	...
Marvel Loch. 3069	Banker: Golden Butterfly G.M. Co., N.L. ...	10	...	...	...	...	...	...	...	...	5	...	...	...
719	Great Victoria G.Ms., N.L.	10	...	...	...	...	...	...	1	...	...	4	1	...
M.A. 23	Howlett's Battery	5	...	...	...	...	...	...	...	...	4	...	...	...
852	May Queen	5	...	...	...	...	...	...	...	...	...	...	...	...
3281	Resurrection	...	...	...	...	...	...	...	...	...	3	...	...	...
Mt. Jackson. (1933)	Butcher Bird No. 1	5	...	...	...	...	...	...	...	...	...	...	...	...
Parker's Range. 2901	Scots Greys	5	...	...	...	...	...	...	...	...	...	...	...	...
724	Spring Hill	10	...	...	...	...	...	...	...	1	4	...	...	...
Westonia. M.A. 27	Recovery Battery	5	...	...	...	...	...	...	...	1	...	...	...	...
	Total	**110**	...	...	...	...	...	...	**3**	**7**	**27**	**8**	**4**	**£49,060**
	DUNDAS GOLDFIELD.													
Norseman. 1291	Mararoa No. 1	10	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 17	Rawlings & Bullen	10	...	...	...	...	...	...	...	...	4	...	...	...
↑	State Battery, Norseman	5	...	...	...	...	...	...	...	...	6	...	...	...
	Total	**25**	...	...	...	...	...	...	...	...	**10**	...	...	**£4,541**
	PHILLIPS RIVER GOLDFIELD.													
Kundip. 184	Gem	5	...	...	...	...	...	...	...	...	...	...	...	...
151	Gem Consolidated	5	...	...	...	...	...	...	...	...	...	...	...	...
M.L. 52	Harbour View Gold & Copper Co., Ltd. ...	10	...	...	...	...	...	...	...	...	...	...	...	...
T.A. 6	Two Boys	10	...	...	...	...	...	...	...	...	...	...	...	...
Ravensthorpe. P.A. 199	De Lany	...	...	...	...	...	...	...	...	...	4	...	...	...
	Total	**30**	...	...	...	...	...	...	...	...	**4**	...	...	**£2,425**
	STATE GENERALLY ...	...	...	1	...	...	...	1	...	...	...	...	...	...
	Total	...	...	**1**	...	...	...	**1**	...	...	...	...	...	**£27,090**

TABLE XXIX.—*Milling and Cyaniding Plants erected in the respective Goldfields, Districts, etc.*—continued.

Goldfield.	District.	Milling.									Cyaniding.			Value of all Mining Machinery.
		Batteries.	Other Mills.											
		Number of Heads of Stampers.	Prospecting Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Puddlers.	Other Crushers.	Flint Mills.	Grinding Pans.	Leaching Vats.	Agitating Vats.	Vacuum Filters and Presses.	
	GOLD MINING.													£
Kimberley	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pilbara	Marble Bar	45	...	...	...	1	...	...	...	3	10	...	...	12,480
	Nullagine	18	...	...	...	...	...	...	...	...	7	...	...	2,192
West Pilbara	... ...	10	...	...	...	...	...	...	...	...	...	...	...	1,800
Ashburton	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gascoyne	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...
Peak Hill	... ...	10	...	...	...	...	...	...	...	...	9	...	...	3,355
East Murchison...	Lawlers	30	...	...	...	...	...	2	...	2	18	...	...	11,147
	Wiluna	23	...	...	...	...	...	...	...	...	6	...	...	15,387
	Black Range	25	...	...	...	...	...	...	...	...	8	...	...	7,093
Murchison ...	Cue	50	...	...	...	...	...	...	1	1	25	2	...	21,584
	Meekatharra	70	...	...	...	...	...	...	...	9	11	...	...	36,744
	Day Dawn	3	...	...	...	...	...	...	...	...	...	...	...	1,000
	Mt. Magnet	25	...	...	...	...	...	...	...	2	11	...	...	7,365
Yalgoo	... ...	30	1	...	...	...	...	1	...	2	28	...	...	23,138
Mt. Magaret ...	Mt. Morgans	25	...	...	...	...	...	...	...	3	10	5	1	5,495
	Mt. Malcolm	70	...	...	...	...	...	...	4	...	7	4	1	279,615
	Mt. Margaret	30	...	...	...	...	...	...	...	5	16	1	...	5,977
North Coolgardie	Menzies	55	...	...	...	...	...	...	...	12	18	4	1	14,933
	Ularring	20	...	...	...	...	...	...	...	1	...	...	...	1,672
	Niagara	15	...	1	...	...	...	...	...	3	...	...	...	2,045
	Yerilla	20	...	...	...	...	...	...	...	1	5	...	...	3,995
Broad Arrow	... ...	35	...	1	...	2	3	...	...	10	9	7	2	63,181
N.E. Coolgardie	Kanowna	50	1	...	...	1	...	...	...	...	2	...	...	7,250
	Kurnalpi	5	1	...	...	...	...	...	...	...	2	...	...	200
East Coolgardie	East Coolgardie	265	1	44	...	3	6	20	25	97	75	133	61	680,241
	Bulong	5	...	...	...	...	...	...	...	...	3	...	...	1,000
Coolgardie ...	Coolgardie	58	...	...	...	1	...	...	...	5	40	4	...	27,086
	Kunanalling	25	1	...	...	...	...	...	...	3	9	...	...	6,075
Yilgarn	... ...	110	...	...	...	...	...	...	3	7	27	8	4	49,060
Dundas	... ...	25	...	...	...	...	...	...	...	...	10	...	...	4,541
Phillips River	... ...	30	...	...	...	...	...	...	...	...	4	...	...	2,425
State generally	... ...	...	...	1	...	...	...	1	...	...	...	...	...	27,090
	Total, Gold Mining Machinery ...	**1,182**	**5**	**47**	**...**	**8**	**9**	**24**	**33**	**166**	**370**	**168**	**70**	**£1,325,166**
	LEAD MINING.													
Northampton M.F. ...	... ...	...	...	...	...	...	...	9	...	...	...	...	...	60,682
	Total, Lead Mining Machinery ...	...	...	...	...	...	...	**9**	...	...	...	...	...	**£60,682**
	TIN MINING.													
Pilbara	Marble Bar	...	...	...	...	...	1	2	...	...	...	...	...	2,791
Greenbushes Tinfield ...	... ...	...	...	...	...	...	...	3	...	...	...	...	...	14,190
	Total, Tin Mining Machinery ...	...	...	...	...	...	**1**	**5**	...	...	...	...	...	**£16,981**
	COPPER MINING.													
West Pilbara	... ...	...	...	...	...	...	...	5	2	1	...	...	...	60,000
Phillips River	... ...	...	...	5	...	...	...	10	2	...	...	3	1	79,250
	Total, Copper Mining Machinery	...	...	**5**	...	...	...	**15**	**4**	**1**	...	**3**	**1**	**£139,250**
	COAL MINING.													
Collie Coalfield	... ...	...	...	...	...	...	...	...	...	...	...	...	...	108,213
	Total, Coal Mining Machinery ...	...	...	...	...	...	...	...	...	...	...	...	...	**£108,213**
	ASBESTOS MINING.													
Pilbara	Nullagine	...	...	...	...	...	...	1	...	...	...	...	...	2,750
	Total, Asbestos Mining Machinery	...	...	...	...	...	...	**1**	...	...	...	...	...	**£2,750**
Total, Machinery other than Gold Mining		...	...	**5**	...	...	**1**	**30**	**4**	**1**	...	**3**	**1**	**327,876**
Total, all Mining Machinery		**1,182**	**5**	**52**	...	**8**	**10**	**54**	**37**	**167**	**370**	**171**	**71**	**£1,653,042**

APPENDIX.

ROYAL MINT, PERTH BRANCH.

Subject to the Regulations, any person may deposit gold at the Mint in his own name. Those who cannot attend personally for the purpose may send the gold by an agent, under Police escort, or by Post.

Arrangements can be made for the insurance of gold sent by post. Particulars upon application to the Mint.

A circular can be obtained from the Deputy Master of the Mint giving all necessary information for intending depositors, Coining Regulations, etc., etc.

Forms for use in connection with gold sent to the Mint by post can be obtained at the Mint.

Charges for Assaying, Refining, and Coinage.

Gross weight of Deposit in ounces.	Mint Charge.	Gross weight of Deposit in ounces.	Mint Charge.	Gross weight of Deposit in ounces.	Mint Charge.
Up to and including—	£ s. d.	Up to and including—	£ s. d.	Up to and including—	£ s. d.
24	0 5 0	400	4 3 4	1,300	10 4 2
30	0 6 3	410	4 5 5	1,400	10 16 8
40	0 8 4	420	4 7 6	1,500	11 9 2
50	0 10 5	430	4 9 7	1,600	12 1 8
60	0 12 6	440	4 11 8	1,700	12 14 2
70	0 14 7	450	4 13 9	1,800	13 6 8
80	0 16 8	460	4 15 10	1,900	13 19 2
90	0 18 9	470	4 17 11	2,000	14 11 8
100	1 0 10	480	5 0 0	2,100	15 4 2
110	1 2 11	490	5 2 1	2,200	15 16 8
120	1 5 0	500	5 4 2	2,300	16 9 2
130	1 7 1	520	5 6 8	2,400	17 1 8
140	1 9 2	540	5 9 2	2,500	17 14 2
150	1 11 3	560	5 11 8	2,600	18 6 8
160	1 13 4	580	5 14 2	2,700	18 19 2
170	1 15 5	600	5 16 8	2,800	19 11 8
180	1 17 6	620	5 19 2	2,900	20 4 2
190	1 19 7	640	6 1 8	3,000	20 16 8
200	2 1 8	660	6 4 2	3,100	21 9 2
210	2 3 9	680	6 6 8	3,200	22 1 8
220	2 5 10	700	6 9 2	3,300	22 14 2
230	2 7 11	720	6 11 8	3,400	23 6 8
240	2 10 0	740	6 14 2	3,500	23 19 2
250	2 12 1	760	6 16 8	3,600	24 11 8
260	2 14 2	780	6 19 2	3,700	25 4 2
270	2 16 3	800	7 1 8	3,800	25 16 8
280	2 18 4	820	7 4 2	3,900	26 9 2
290	3 0 5	840	7 6 8	4,000	27 1 8
300	3 2 6	860	7 9 2	4,100	27 14 2
310	3 4 7	880	7 11 8	4,200	28 6 8
320	3 6 8	900	7 14 2	4,300	28 19 2
330	3 8 9	920	7 16 8	4,400	29 11 8
340	3 10 10	940	7 19 2	4,500	30 4 2
350	3 12 11	960	8 1 8	4,600	30 16 8
360	3 15 0	980	8 4 2	4,700	31 9 2
370	3 17 1	1,000	8 6 8	4,800	32 1 8
380	3 19 2	1,100	8 19 2	4,900	32 14 2
390	4 1 3	1,200	9 11 8	5,000	33 6 8

For every additional 100ozs. the charge is increased by 12s. 6d.

NOTE.—Additional charges are collected when base metals in a deposit exceed 2 per cent. of its weight.

The following table illustrates the operation of these charges in case of gold of the value of £3 17s. 10½d. an ounce:—

Weight of Deposit.	Rate of Charge per ounce.	Amount of Charge.	Net Value of Deposit.
ozs.	d.	£ s. d.	£ s. d.
50	2.5	0 10 5	194 3 4
100	2.5	1 0 10	388 6 8
600	2.3	5 16 8	2,330 8 4
1,000	2.0	8 6 8	3,885 8 4
5,000	1.6	33 6 8	19,435 8 4
10,000	1.55	64 11 8	38,872 18 4

NOTE.—A proportion of silver in deposits of gold is paid for by the Mint as follows:—

In deposits under 1,000ozs. gross: all silver in excess of 8 per cent. of the weight of the deposit after melting.

„ from 1,000 „ to 5,000 „ „ 6 „ „ „ „ „

„ „ 5,000 „ „ 10,000 „ „ 5 „ „ „ „ „

„ „ 10,000 „ upwards „ „ 4 „ „ „ „ „

The rate at which payment for silver is made is liable to fluctuation.

RATES FOR CARRIAGE OF GOLD ON GOVERNMENT RAILWAYS.

	Distance not over—									
	10 miles.	25 miles.	50 miles.	100 miles.	150 miles.	200 miles.	250 miles.	300 miles.	400 miles.	500 miles.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Bullion or unmanufactured Gold, per 100 ozs. ...	3 9	4 6	5 3	6 9	8 3	9 9	11 3	12 9	15 0	17 3

1s. 6d. per 100ozs. for every additional 100 miles or part thereof.

Consignments of Gold Bullion in lots exceeding in the aggregate 30,000 ozs. despatched on any one day will be allowed a reduction of 33⅓ per cent. with a minimum charge as for 30,000 ozs. Consignors may combine to make up the required quantity, but each consignment must be charged for separately.

To find the value per ounce of gold sent from a mine to the Mint.—Divide the standard gold by the weight before melting, and multiply the result by £3 17s. 10½d. For instance, supposing the Mint return to show:—

	Ozs.
Weight before melting	47.41
Standard gold	38.19

The calculation would be as follows:—

```
4741)3819.0(.805                 .805 × £3 17s. 10½d. =
     3792.8                      .805 × £3.894
     ------                                .805
       26200                           -------
       23705                             19470
       -----                            311520
        2495                          --------
        ----                         £3.134(670)
                                            .20
                                         -----
                                      s. 2.680
                                            12
                                          ----
                                      d. 8.160 = £3 2s. 8d., value per ounce of gold as
                                         ----        produced; at the mine.
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By Authority: FRED. WM. SIMPSON, Government Printer, Perth.