1905.

WESTERN AUSTRALIA.

REPORT

OF THE

DEPARTMENT OF MINES

FOR THE YEAR

1904.

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

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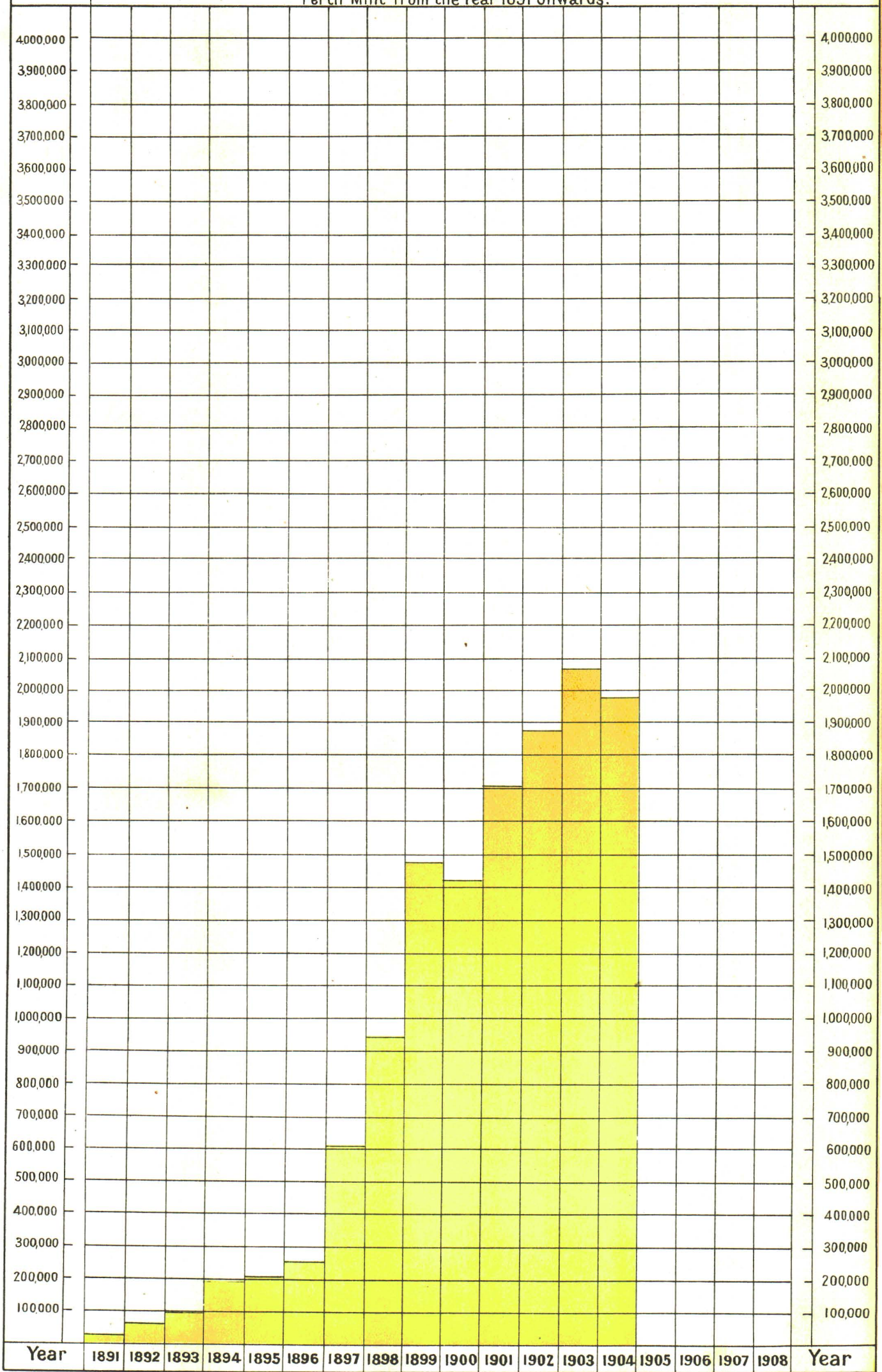
of Gold output showing the amount in fine ounces of Gold exported & received at the Perth Mint from the Year 1891 onwards.



1905.

COMMONWEALTH OF AUSTRALIA.

STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines for the State of Western Australia for the Year 1904.

To the Honourable the Minister for Mines.

SIR,

I have the honour to submit the Annual Report of the Department for the year 1904, 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 Government Geologist, State Mining Engineer, Superintendent of State Batteries, Chief Inspector of Machinery and Chairman Board of Examiners for Engine-drivers, Chief Inspector of Explosives and Government Analyst, Director of the School of Mines, and Engineer for Mines Water Supply, together with the Mining Statistics, are also submitted.

I have, etc.,

H. S. KING,
Secretary for Mines.

Department of Mines, Perth, 1st August, 1905.

DIVISION I.

Summary by the Secretary for Mines.

PART I.—GENERAL REMARKS.

As compared with the mineral output for 1903, the mineral output of Western Australia for 1904 shows a decrease in value of £348,350. This is mainly accounted for by the smaller gold production, which in the latter year fell off to the extent of £346,493.

Notwithstanding the lesser gold production, the dividends paid by gold mines amounted to £2,050,559, as against £2,024,152 in 1903 and £1,424,272 in 1902.

The State has, however, well maintained her position as the premier gold-producing State of Australasia, as nearly 47 per cent. of the total gold production of the five States of Australia and New Zealand must be credited to Western Australia.

GOLD.

The gold output for the year 1904 amounts to 1,983,230ozs., fine, valued at £8,424,226, a decrease of about four per cent. as compared with the output for 1903. The total gold output of the State since the year 1886, when gold mining first commenced, amounts to 12,916,371·00ozs., fine, valued at £54,865,256 11s. 9d.

The falling off has been general throughout the goldfields, with several exceptions, notably in the Murchison, East Murchison, and Yilgarn Goldfields, where slight increases appear. The decrease in the output may be accounted for by the falling off in the grade of the ore treated, the average value per ton being less by 10·1 shillings than in 1903. Notwithstanding this, it is satisfactory to note that the number of producing mines has increased in 1904; the dividends paid are substantially greater than in 1903, while the number of men employed is practically the same. These facts lead to the conclusion that it is becoming possible to treat lower-grade ore at a

Great Fingall Gold Mine, 1905 (Northern View).

DAY DAWN, MURCHISON GOLDFIELD.

profit, owing to extra efficiency of labour and improved machinery and methods. It is satisfactory to note that the output of the Yilgarn Goldfield shows a substantial increase. For some time this, one of our earliest goldfields, has been somewhat under a cloud, but vigorous prospecting has resulted in the discovery of new reefs, and improved machinery and economical management have led to the profitable working of ore bodies which, although previously known, had been supposed too poor to pay. The Black Range district, lying between Lawlers and Mount Magnet, and situated in the western part of the East Murchison Goldfield, also continues to open up in a most promising manner, and the result of prospecting to the north of the original discoveries points to the opening up of a very rich auriferous district.

The East Coolgardie Goldfield still continues to produce about half the gold output of the State, and although the value of the ore per ton treated is less than in 1903, the reduction in working costs goes far to compensate for the falling off. In most of the mines development is kept well ahead of the reduction plants; in the Great Boulder Proprietary the main shaft has reached a depth of 1,976 feet, and at least 13 shafts on producing mines in the East Coolgardie Goldfield alone are over 1,000 feet deep.

A considerable revival in mining has taken place on the north-easterly portion of the East Coolgardie Goldfield, the discovery of very rich ore in the Hidden Secret Mine having led to a considerable amount of successful prospecting. From the mine just mentioned, which is owned by a small party of miners, gold to the value of £4,293 has been produced during 1904.

Tons 313·65 yielding fine ozs. gold 1,010·75, besides 4,516·24ozs. of silver.

Gold valued	...	£4,293	making the value per ton of ore treated = £15 2s. 6d.
Silver @ 2s.	...	452	
		£4,745	

Tin.

Tin mining has more than held its own during the year, the increase in value of black tin raised amounting to £2,927. The Pilbarra field is responsible for the greater part of this increase, and as deposits both of lode and alluvial tin have been reported during the year there is every probability of increased prosperity in this branch of mining in the future.

Coal.

The Collie Coalfield is, as heretofore, the only coalfield being worked, and the output for the year has been 138,550 tons, showing, as compared with the year 1903, an increase of 5,123 tons.

Towards the latter end of the year the Government, in view of the many contradictory statements as to the value of the coal as a fuel, decided to appoint a Royal Commission to report on all matters in connection with the field, and Dr. R. Logan Jack, M. Inst. M.M., was appointed sole Commissioner. Dr. Jack made a most searching inquiry, and conducted a series of exhaustive tests. His report, presented early in 1905, was to the effect that very large deposits of coal existed in the Collie field, that while it was not equal in quality to Newcastle (N.S.W.) coal, it was a valuable fuel, and that it was clearly to the advantage of the State that its development should be encouraged. Boring, to test the coal measures lying to the east of Geraldton, and on the railway line from Geraldton to Cue, was commenced towards the latter end of the year, and is still proceeding.

Copper.

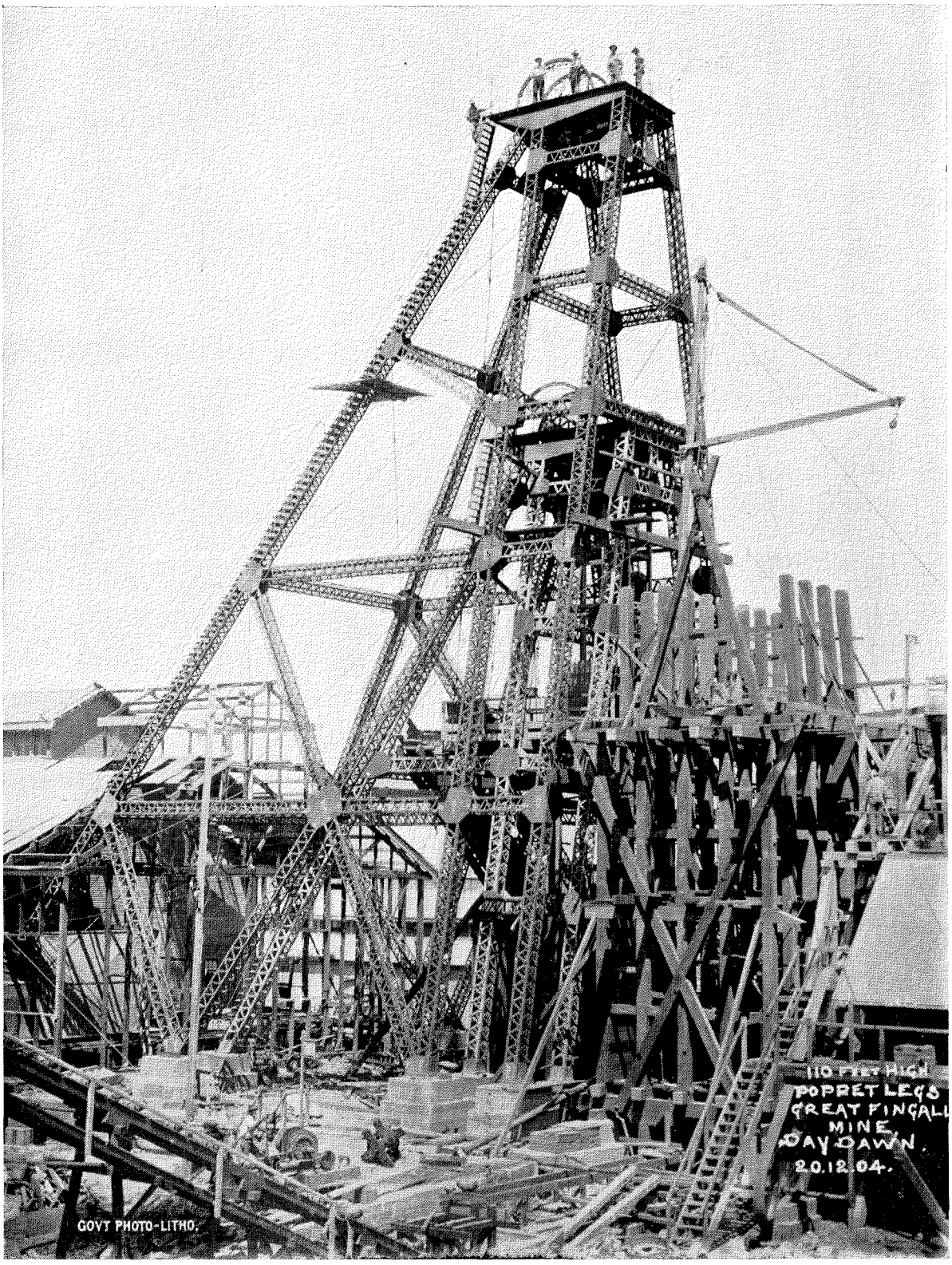
The quantity of copper ore raised during the year was 3,969 tons, valued at £25,180, showing a falling off, as compared with the previous year, of £31,361 in value. The decrease was entirely owing to the smaller output from the Mount Margaret Goldfield, the mine responsible for the output being, for a time at any rate, practically closed down. The Phillips River Goldfield, however, shows an increased output of 1,907 tons, valued at £13,296. The Government smelter, the erection of which was commenced early in the year, was started in October, and should stimulate the production for the year 1905.

Other Minerals.

The output of silver, which is obtained as a by-product, has more than doubled during the year, the total being 399,190ozs., as compared with 168,113ozs. in 1903.

The output of ironstone and limestone was 1,442 tons and 13,397 tons respectively, showing an increase in value of £489 and £1,521 respectively. The figures given only represent the amount used as flux, returns of the mineral raised for other purposes not being available.

No asbestos has been exported during the year, but it is reported that prospecting operations in the North-West have disclosed the presence of valuable deposits of the best variety, and as further prospecting work is being done it may lead to the opening up of commercially valuable deposits.



Poppet Legs 110ft. high, Great Fingall Gold Mine, 1905.

DAY DAWN, MURCHISON GOLDFIELD.

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 1904.

Fig.1

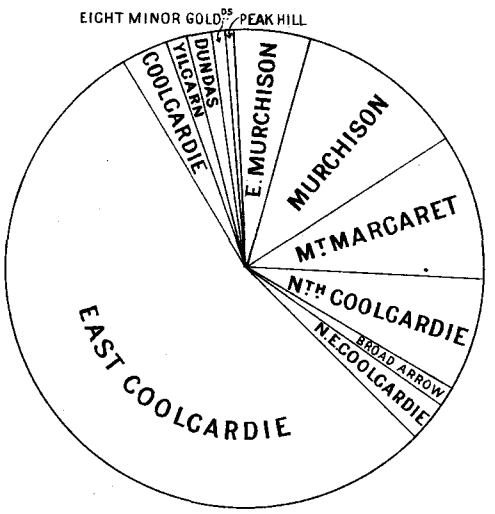


Fig.2

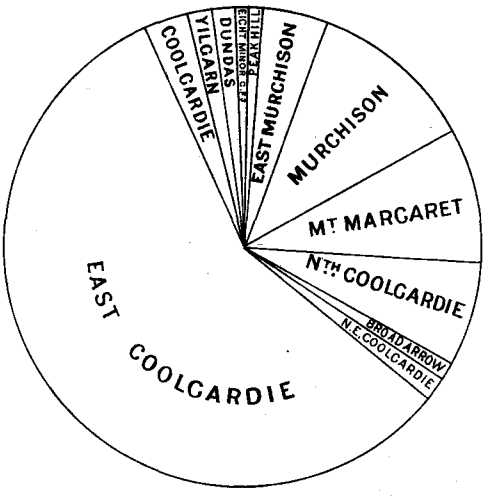


Fig.3

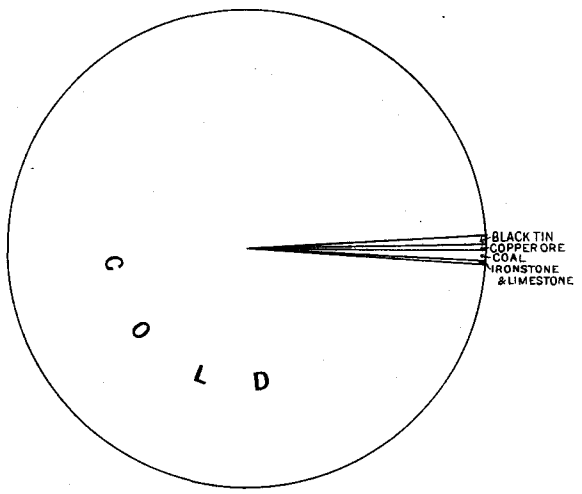


Fig.4

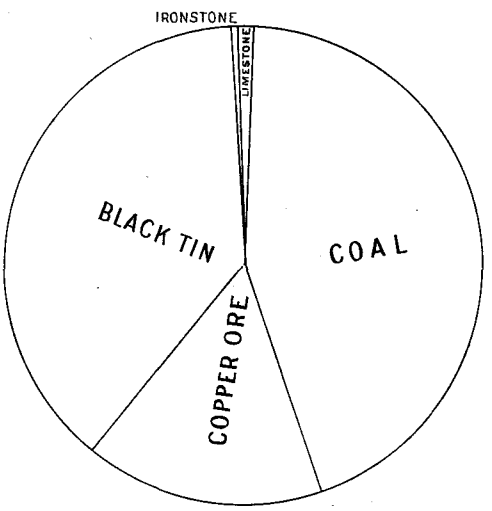


Fig.5

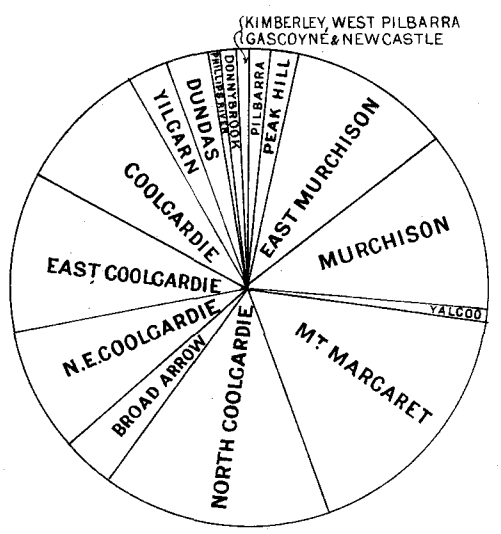
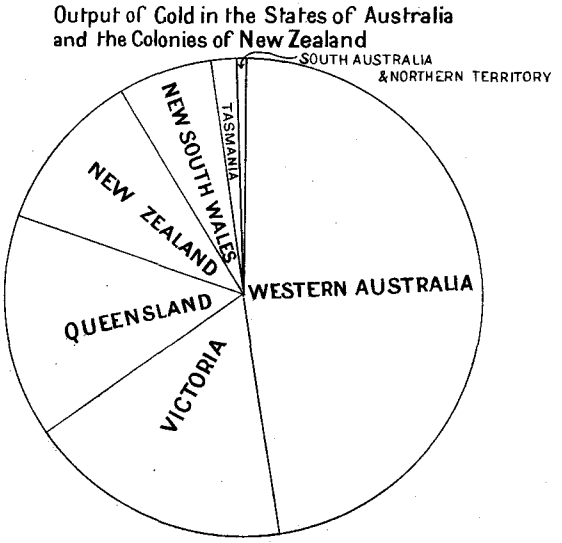


Fig.6

Output of Gold in the States of Australia and the Colonies of New Zealand



COMPARATIVE STATISTICAL DIAGRAMS.

EXPLANATORY NOTES.

Fig. 1.—Output of Gold from various Goldfields as reported to Mines Department.

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 Gold Mining on the various Goldfields.

Fig. 6.—Output of Gold in the States of Australia and the Colony of New Zealand.

PART II.—MINERALS RAISED.

TABLE 1.

Quantity and Value of all the Minerals produced during 1903 and 1904.

Description of Mineral.	1903.		1904.		Increase or Decrease for Year compared with 1903.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£
1. Antimony (exported), statute tons ...	22	230	...	...	— 22	— 230
2. Asbestos (exported) do. ...	†	10	...	...	— †	— 10
3. Black Tin (raised) do. ...	817	55,890	855	58,817	+ 38	+ 2,927
4. Coal (raised) do. ...	133,427	69,128	138,550	67,174	+ 5,123	— 1,954
5. Copper Ore (raised) do. ...	20,526	56,541	3,969	25,180	— 16,557c	— 31,361
6. Gold (export and mint), ounces (fine) ...	2,064,801	8,770,719	1,983,230	8,424,226	— 81,571	— 346,493
7. Ironstone (raised), statute tons ...	220	88	1,442	577	+ 1,222	+ 489
8. Limestone (raised) do. ...	1,280	178	13,397	1,699	+ 12,117	+ 1,521
9. Plumbago Ore (exported) do. ...	...	...	‡	2	‡	+ 2
10. Silver (exported), ounces (fine) ...	168,113	19,153	399,190	45,912	+ 231,077	+ 26,759
Total Values	...	8,971,937	...	8,623,587	...	— 348,350

† 4cwts. ‡ 1cwt.

The above table shows that the total value of the mineral production of the State has, as compared with the production for 1903, decreased by £348,350, but, with the exception of that for the latter year, it is the highest previously recorded, being over half a million in excess of the value for 1902. The decrease is almost entirely accounted for by the smaller gold output. The production of silver shows an increase of £26,759. The output of tin has slightly increased, while that of copper shows a substantial decrease.

TABLE 2.

Summary of Gold Exported and received at the Perth Branch of the Royal Mint during 1903 and 1904, compared with the yields reported to the Mines Department; also the percentage of the latter for the several Goldfields, and the average value of Gold per ton of Ore treated.

Goldfield.	Export and Mint.		Reported Yield.					
					Percentage for each Goldfield.		Average Value of Gold per ton of Ore milled.	
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.			shillings	shillings
1. Kimberley	434	32	645	206	·03	·01	45·14	24·34
2. Pilbarra	12,052	6,931	9,570	8,030	·49	·42	122·43	158·98
3. West Pilbarra	5,493	4,321	5,100	3,428	·26	·18	86·92	75·04
4. Ashburton	115	126	904	510	·05	·03	...	...
5. Gascoyne	31	11	...	...	...	...	...	...
6. Peak Hill...	29,599	17,475	31,750	14,113	1·62	·74	40·82	25·62
7. East Murchison	87,212	85,847	87,278	93,591	4·45	4·89	47·24	40·44
8. Murchison	208,361	217,916	204,182	214,403	10·41	11·20	95·46	87·52
9. Yalgoo	1,478	2,796	3,138	2,353	·16	·12	110·52	36·58
10. Mt. Margaret	190,853	183,071	182,764	183,523	9·31	9·59	47·25	52·50
11. North Coolgardie	168,502	141,133	162,139	145,064	8·26	7·58	64·53	53·02
12. Broad Arrow	23,446	20,980	26,021	22,180	1·33	1·16	55·50	66·62
13. North-East Coolgardie	40,455	33,317	54,459	50,955	2·78	2·66	58·37	55·82
14. East Coolgardie	1,151,238	1,139,597	1,062,898	1,050,923	54·16	54·91	93·27	77·62
15. Coolgardie	77,000	62,173	71,286	63,200	3·63	3·30	55·52	54·96
16. Yilgarn	22,761	29,994	19,277	25,509	·98	1·33	32·06	32·74
17. Dundas	35,217	33,181	33,846	31,830	1·72	1·67	107·14	77·72
18. Phillips River	7,578	2,984	7,051	4,017	·36	·21	70·71	53·20
19. Donnybrook	83	...	53	...	...	...	11·26	...
Goldfields generally	2,893	1,345	...	...	...	...	...	...
Totals and Averages ...	2,064,801	1,983,230	1,962,361	1,913,835	100·00	100·00	76·30	66·20

The discrepancy between the yield as reported to the department and that arrived at from the export and Mint figures, which is taken to represent the output of the State, still continues. As in previous reports, in comparing the outputs of the various goldfields, the reported yields are used.

The East Coolgardie Goldfield remains the largest producer, nearly 55 per cent. of the total reported yield being derived from that field. The Murchison Goldfield takes second place, with over 11 per cent., and is followed by the Mount Margaret field with $9\frac{1}{2}$ per cent. of the total yield. The yield of the East Murchison field shows a fair increase, which is encouraging, considering that it is not so well situated as regards transport as many of the other goldfields.

The average value per ton of ore milled has fallen off from 76·3 shillings in 1903 to 66·2 shillings in 1904; but it is satisfactory to note that, notwithstanding this, the dividends paid have increased.

The average value per ton in the Pilbarra field has increased from 122·4 shillings in 1903 to 159 shillings in 1904, but the tonnage treated is small, and, doubtless, as facilities are increased, large bodies of ore that do not now pay to treat will be worked at a profit.

TABLE 3.

Number of Gold-producing Mines in the several Goldfields and Districts during 1903 and 1904.

Goldfield.	District.	1903.		1904.		
		District.	Goldfield.	District.	Goldfield.	
Kimberley	...	...	1	...	1	
Pilbarra	Marble Bar	12	21	13	23	+ 2
	Nullagine	9		10		
West Pilbarra	...	...	2	...	2	—
Peak Hill	...	...	10	...	11	+ 1
East Murchison	Lawlers	67	77	68	111	+ 34
	Black Range	10		43		
Murchison	Cue	51	206	55	197	− 9
	Nannine	53		57		
	Day Dawn	21		19		
	Mt. Magnet	81		66		
Yalgoo	...	...	9	...	9	
Mt. Margaret	Mt. Morgans	23	151	31	179	+ 28
	Mt. Malcolm	49		66		
	Mt. Margaret	79		82		
North Coolgardie	Menzies	74	283	99	295	+ 12
	Ularring	62		59		
	Niagara	85		74		
	Yerilla	62		63		
Broad Arrow	...	...	28	...	37	+ 9
N.E. Coolgardie	Kanowna	46	81	36	72	− 9
	Bulong	32		32		
	Kurnalpi	3		4		
East Coolgardie	...	...	52	...	80	+ 28
Coolgardie	Coolgardie	70	106	82	119	+ 13
	Kunanalling	36		37		
Yilgarn	...	...	32	...	41	+ 9
Dundas	...	...	29	...	36	+ 7
Phillips River	...	...	14	...	15	+ 1
Donnybrook	...	...	3	...	...	− 3
		...	1,105	...	1,228	

It will be seen that the number of producing mines has increased by 123. The East Murchison field shows an increase of 34, and of these 33 are in the Black Range District.

Interior of Battery, Great Fingall Gold Mine, 1905.

DAY DAWN, MURCHISON GOLDFIELD.

In both the Mount Margaret and East Coolgardie Goldfields the producing mines have increased by 28, and only in the Murchison, North-East Coolgardie, and Donnybrook Goldfields has the number decreased.

TABLE 4.

Increase or Decrease in Output of certain large producing Mines in 1904, as compared with 1903.

	Goldfield.	District.	Name of Mine.	Production.		Increase or Decrease for Year, compared with 1903.
				1903.	1904.	
				fine ozs.	fine ozs.	fine ozs.
1.	Peak Hill	...	Peak Hill Goldfields, Ltd.	30,719·71	13,705·83	— 17,013·88
2.	East Murchison	Lawlers	East Murchison United, Ltd.	17,677·75	21,604·89	+ 3,927·14
3.	Do.	do.	Golden Age Consolidated, Ltd.	6,963·93	3,118·42	— 3,845·51
4.	Do.	do.	Gwalia Consolidated, Ltd.	1,562·63	3,624·64	+ 2,062·01
5.	Do.	do.	Leinster	10,661·53	4,811·23	— 5,850·30
6.	Do.	do.	Bellevue Proprietary, Ltd.	15,136·66	15,540·75	+ 404·09
7.	Murchison	Day Dawn	Great Fingall Consolidated, Ltd.	129,278·24	156,702·30	+ 27,424·06
8.	Do.	Mt. Magnet	Morning Star Quartz Co., N.L.	5,375·90	3,466·57	— 1,909·33
9.	Mt. Margaret	Mt. Morgans	Westralia Mt. Morgans G.M. Co., Ltd.	53,703·72	38,357·81	— 15,345·91
10.	Do.	Mt. Malcolm	Merton's Reward G.M. Co., Ltd.	...	4,772·78	+ 4,772·78
11.	Do.	do.	Mt. Malcolm Mines, Ltd.	1,764·31	3,180·17	+ 1,415·86
12.	Do.	do.	Sons of Gwalia, Ltd.	62,828·73	62,049·91	— 778·82
13.	Do.	Mt. Margaret	Craiggiemore Proprietary, Ltd.	4,382·42	3,958·59	— 423·83
14.	Do.	do.	Ida H. G.M. Co., Ltd.	12,856·44	12,369·96	— 486·48
15.	Do.	do.	Lancefield G.M. Co., Ltd.	7,068·29	10,734·01	+ 3,665·72
16.	North Coolgardie	Menzies	Lady Shenton G.Ms., Ltd.	13,587·07	675·87	— 12,911·20
17.	Do.	do.	Menzies Consolidated G.Ms., Ltd.	8,341·31	8,972·58	+ 631·27
18.	Do.	do.	Queensland Menzies G.M. Co., N.L.	10,029·75	6,874·46	— 3,155·29
19.	Do.	Ularring	Golden Pole G.M. Co., Ltd.	2,050·70	9,614·36	+ 7,563·66
20.	Do.	do.	Lady Gladys G.M. Co., N.L.	3,269·90	3,392·94	+ 123·04
21.	Do.	Niagara	Englishman: Cosmopolitan Proprietary, Ltd.	53,290·72	42,961·18	— 10,329·54
22.	N.E. Coolgardie	Kanowna	White Feather Main Reefs, Ltd.	12,062·94	11,236·71	— 826·23
23.	Do.	Bulong	Queen Margaret G.M. Co., Ltd.	5,420·24	7,220·00	+ 1,799·76
24.	East Coolgardie	...	Associated G.Ms. of W.A., Ltd.	65,034·52	72,409·40	+ 7,374·88
25.	Do.	...	Associated Northern Blocks (W.A.), Ltd.	50,384·08	36,134·74	— 14,249·34
26.	Do.	...	Golden Horseshoe Estates Co., Ltd.	194,650·52	179,222·43	— 15,428·09
27.	Do.	...	Great Boulder Main Reef, Ltd.	10,216·59	7,848·43	— 2,368·16
28.	Do.	...	Great Boulder Perseverance G.M. Co., Ltd.	169,421·89	137,117·09	— 32,304·80
29.	Do.	...	Great Boulder Proprietary G.M., Ltd.	133,751·24	132,473·23	— 1,278·01
30.	Do.	...	Ivanhoe Gold Corporation, Ltd.	129,996·35	126,252·00	— 3,744·35
31.	Do.	...	Kalgurli G.Ms., Ltd.	41,581·88	46,471·25	+ 4,889·37
32.	Do.	...	Lake View Consols, Ltd.	56,521·94	48,090·47	— 8,431·47
33.	Do.	...	Oroya-Brownhill Co., Ltd.	93,218·48	153,225·63	+ 60,007·15
34.	Coolgardie	Coolgardie	Burbanks Birthday Gift G.M., Ltd.	14,506·20	1,930·18	— 12,576·02
35.	Do.	do.	Bayley's G.Ms., Ltd.	474·14	2,611·41	+ 2,137·27
36.	Do.	do.	Westralia and East Extension Mines, Ltd.	19,823·10	16,482·23	— 3,340·87
37.	Yilgarn	...	British and Foreign Development Syndicate, Ltd.	3,543·18	5,836·88	+ 2,293·70
38.	Do.	...	Fraser South Extended G.M. Co.	5,124·49	3,230·03	— 1,894·46
39.	Do.	...	Hope's Hill G.M. Co., Ltd.	6,411·62	5,712·75	— 698·87
40.	Do.	...	Mt. Jackson G.Ms., Ltd.	449·86	5,723·95	+ 5,274·09
41.	Dundas	...	Cumberland G.M. Co., N.L.	129·65	5,724·46	+ 5,594·81
42.	Do.	...	Lady Mary G.M. Co., N.L.	595·95	1,214·41	+ 618·46
43.	Do.	...	Norseman G.Ms., Ltd.	1,450·61	138·04	— 1,312·57
44.	Do.	...	Princess Royal G.M. Co., N.L.	24,444·85	17,531·16	— 6,913·69
45.	Phillips River	...	Gilbert G.M., Ltd.	4,909·32	1,662·37	— 3,246·95
46.	Do.	...	Phillips River G.M. Co., N.L.	1,087·15	770·76	— 316·39
				1,495,760·50	1,456,759·26	— 39,001·24

Of the above 46 mines, 27 produced 180,980 fine ounces less, and 19 produced 141,979 fine ounces more than in 1903, being a net decrease of 39,001 fine ounces.

TABLE 5.

Averages of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State during 1903 and 1904.

GOLDFIELD.	1903.				1904.			
	Tons of Gold Ore raised and treated.		Fine Ounces of Gold produced therefrom.		Tons of Gold Ore raised and treated.		Fine Ounces of Gold produced therefrom.	
	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.	Per man employed under ground.	Per man employed above and under ground.
	tons.	tons.	fine ozs.	fine ozs.	tons.	tons.	fine ozs.	fine ozs.
1. Kimberley	...	296·67	...	157·67	100·00	60·00	28·67	17·20
2. Pilbarra	49·87	29·55	71·88	42·59	31·29	21·04	58·56	39·37
3. West Pilbarra	...	150·74	...	154·23	322·91	322·91	285·27	285·27
4. Ashburton	...	...	...	...	...	...	...	...
5. Gascoyne	...	...	...	...	...	...	...	...
6. Peak Hill	393·29	182·02	188·99	87·47	449·95	186·43	135·71	56·23
7. East Murchison	271·37	134·74	150·95	74·95	305·48	149·92	145·49	71·40
8. Murchison	222·43	115·50	249·94	129·78	277·14	133·11	285·55	137·15
9. Yalgoo	283·17	132·59	108·21	42·41	165·55	82·77	71·30	35·65
10. Mt. Margaret	225·10	136·70	151·68	92·11	271·76	150·50	167·96	93·02
11. North Coolgardie	181·70	109·95	138·02	83·52	231·90	132·78	144·78	82·90
12. Broad Arrow	160·66	92·81	104·96	60·63	153·27	86·44	120·22	67·80
13. North-East Coolgardie ...	149·37	91·90	102·63	63·14	156·43	102·99	102·80	67·68
14. East Coolgardie	310·37	158·00	340·74	173·46	353·11	183·42	322·64	167·59
15. Coolgardie	110·01	61·07	71·89	39·91	114·54	65·79	74·12	42·57
16. Yilgarn	296·04	133·22	111·72	50·27	366·90	167·64	141·45	64·62
17. Dundas	102·99	60·50	129·88	76·29	127·60	72·68	116·73	66·49
18. Phillips River	113·61	65·44	94·56	54·46	156·75	84·73	98·18	53·07
19. Donnybrook	14·81	9·09	1·96	1·20	...	...	...	...
Total averages ...	231·11	124·68	207·57	111·98	272·60	144·36	212·44	112·50

It will be seen from the above table that the amount of ore raised per man employed above and under ground is greater by 19⅔ tons than in 1903, while every such man has produced about ½oz. gold more.

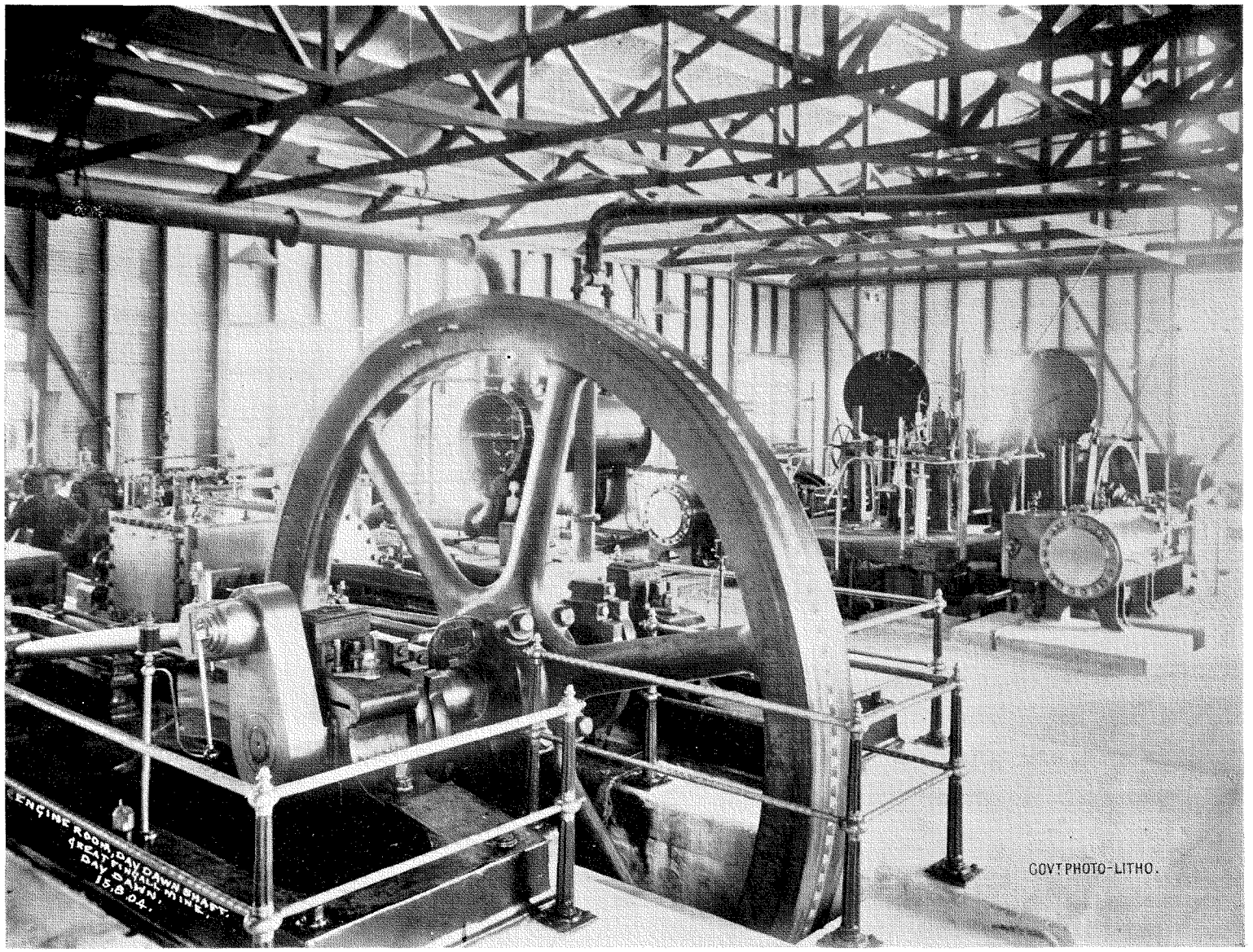
It follows that gold to the value of £478 was produced during 1904 for every man employed above and under ground.

TABLE 5A.

Output of Gold from the several States of Australia and the Colony of New Zealand during 1904.

State.	Output of Gold.	Value.	Percentage of Total Value of Output.
	Fine ozs.	£	
1. Western Australia	1,983,230	8,424,226	46·99
2. Victoria	765,596	3,252,045	18·14
3. Queensland	639,149	2,714,934	15·14
4. New South Wales	269,817	1,146,109	6·39
5. Tasmania	65,921	280,015	1·56
6. South Australia	17,898	76,025	·69
6. and Northern Territory	11,212	47,623	
7. New Zealand	467,897	1,987,501	11·09
Total	4,220,720	17,928,478	100·00

From the above table it will be noticed that it only requires an increase of less than thirteen (13) per cent. on the value of the present output of gold from this State to equal the total value of the gold output of the Eastern States and New Zealand.



Engine Room, Great Fingall Gold Mine, 1905.

DAY DAWN, MURCHISON GOLDFIELD.

During the year 1904 £2,050,559 was paid in dividends, being £26,407 more than in 1903. The Great Fingall Consolidated heads the list of dividend-paying mines with the magnificent sum of £337,500, and several mines in the East Coolgardie Goldfield have paid over a quarter of a million during the year. The Golden Pole—a local company—appears for the first time as a dividend payer, with a total of £15,000.

TABLE 6.

Dividends paid by Western Australian Gold Mining Companies during 1903 and 1904.

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

Goldfield.	Name of Company.	Par Value of Shares.	Paid up to	Nominal Capital.	No. of Shares issued.	1903.		1904.	
						No. of Dividends paid.	Total Amount paid.	No. of Dividends paid.	Total Amount paid.
		£ s. d.	£ s. d.	£			£		£
Murchison	Great Fingall Consolidated Gold Mines, Ltd.	0 10 0	0 10 0	125,000	250,000	3	200,000	4	337,500
	Island Eureka G.M. Co., Ltd. ...	0 2 6	0 0 3½	10,000	80,000	1	1,000	...	...
Mount Margaret ...	Westralia Mount Morgans G.M. Co., Ltd.	0 5 0	0 5 0	125,000	480,000	4	60,000	3	30,000
	Lancefield G.M. Co., Ltd.	1 0 0	1 0 0	25,000	21,600	11	3,960	...	...
	Ida H. Gold Mining Co. (Laverton) ...	0 5 0	0 5 0	60,000	216,000	4	28,606	3	13,500
	Sons of Gwalia G.M. Co., Ltd. ...	1 0 0	1 0 0	350,000	325,000	2	79,500	2	97,500
Coolgardie ...	Burbanks Birthday Gift G.M. Co., Ltd.	1 0 0	1 0 0	180,000	180,000	...	4,500	...	...
North Coolgardie ...	Queensland Menzies G.M. Co., N.L. ...	0 5 0	0 5 0	33,000	132,000	6	19,800	...	...
	Cosmopolitan Proprietary, Ltd. ...	1 0 0	1 0 0	400,000	400,000	3	60,000	1	20,000
	Menzies Alpha G.M. Co., Ltd. ...	Ord., £1 Pref., £1	1 0 0 0 10 0	120,000	100,002 ord. 19,998 pref.	1	*1,000	...	...
	Golden Pole G.M. Co.	0 2 0	0 2 0	20,000	200,000	...	...	3	15,000
North-East Coolgardie	White Feather Main Reef, Ltd. ...	1 0 0	1 0 0	160,000	160,000	2	8,000	1	4,000
	Queen Margaret G.M. Co., Ltd. ...	1 0 0	1 0 0	100,000	95,050	...	...	1	4,752
East Coolgardie ...	Great Boulder Proprietary G.M., Ltd.	0 2 0	0 2 0	175,000	1,750,000	4	262,500	4	284,375
	Ivanhoe Gold Corporation, Ltd. ...	5 0 0	5 0 0	1,000,000	200,000	4	180,000	4	225,000
	Golden Horseshoe Estates Co., Ltd. ...	5 0 0	5 0 0	1,500,000	300,000	3	270,000	3	270,000
	Associated Northern Blocks, Ltd. ...	1 0 0	1 0 0	350,000	350,000	1	†87,500	...	...
	Kalgurli Gold Mines, Ltd.	1 0 0	1 0 0	120,000	120,000	4	60,000	4	60,000
	Great Boulder Perseverance G.M. Co., Ltd.	1 0 0	1 0 0	1,500,000	1,400,000	4	350,000	3	245,000
	Oroya-Brownhill Co., Ltd.	1 0 0	1 0 0	450,000	450,000	4	191,250	4	281,250
	Associated Gold Mines of W.A., Ltd.	1 0 0	1 0 0	500,000	495,408	1	49,536	2	111,457
	Brown Hill Extended G.M. Co., Ltd.	1 0 0	1 0 0	100,000	100,000	2	45,000	1	5,000
	Golden Ridge G.M. Co., N.L.	1 0 0	0 16 0	31,200	30,900	...	...	5	1,925
	Lake View Consols, Ltd.	1 0 0	257,312 fully paid, 92,688 paid to 5s.	350,000	350,000	...	...	1	26,250
	Hainault G.M., Ltd.	1 0 0	1 0 0	130,000	121,000	...	...	1	6,050
Dundas	Princess Royal G.M. Co., N.L. ...	0 10 0	35,000 fully paid, 45,000 con. (6s. 6d. paid)	40,000	80,000	8	32,000	3	12,000
Peak Hill	Peak Hill Goldfield Co., Ltd.	1 0 0	1 0 0	300,000	300,000	2	30,000	...	...
	Totals	...	...	...	...	...	2,024,152	...	2,050,559

* On preference shares. † This amount is exclusive of 1s. per share paid in fully paid shares in the Northern Blocks Syndicate (May, 1903). If the cash equivalent (£17,500) be added, the distribution for the year 1903 will be increased to £105,000, and the total accordingly.

TABLE 7.

Quantity and Value of Minerals, other than Gold, reported to the Mines Department during 1904.

Goldfield, District, or Mineral Field.	Quantity.	Value.	Increase or Decrease for year compared with 1903.	
			Quantity.	Value.
	tons.	£	tons.	£
BLACK TIN.				
Greenbushes Mineral Field	533·64	34,462	+ 8·70	+ 100
Pilbarra Goldfield (Marble Bar District) ...	320·86	24,355	+ 28·75	+ 2,827
Total	854·50	58,817	+ 37·45	+ 2,927
COPPER ORE.				
Mt. Margaret Goldfield (Mt. Malcolm District)	500·00	900	— 18,465·00	— 44,657
Phillips River Goldfield	3,468·89	24,280	+ 1,907·56	+ 13,296
Total	3,968·89	25,180	— 16,557·44	— 31,361
IRONSTONE.				
From State generally	1,441·50	577	+ 1,221·50	+ 489
LIMESTONE.				
Yilgarn Goldfield	...	...	— 102·00	— 75
From State generally	13,397·20	1,699	+ 12,219·70	+ 1,596
Total	13,397·20	1,699	+ 12,117·70	+ 1,521

It will be seen that the output of tin at Greenbushes has been practically stationary, an increase of only 8·7 tons being shown. The average number of men employed during the year on this field is less by 53 men than in 1903. In the Pilbarra Goldfield the average number of men employed is 43 more than in 1903, and the output of tin has slightly increased.

Little copper has been produced on the Mount Margaret field during the year, but further prospecting in the locality of the Anaconda mine is in progress. On the Phillips River field, however, a steady increase in the output has taken place for several years past: this has been stimulated by the erection of smelting works by the State. Reports on the operation of these works will be found in another part of this report.

TABLE 8.

Quantity of Coal raised during 1903 and 1904, 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	1903	133,427	69,128	94	308	433	332
	1904	138,550	67,174	75	283	490	387

The output of coal on the Collie field has been greater by 5,123 tons than in 1903, and it will be noticed that the output per man employed above and under ground shows an increase of 55 tons per man.

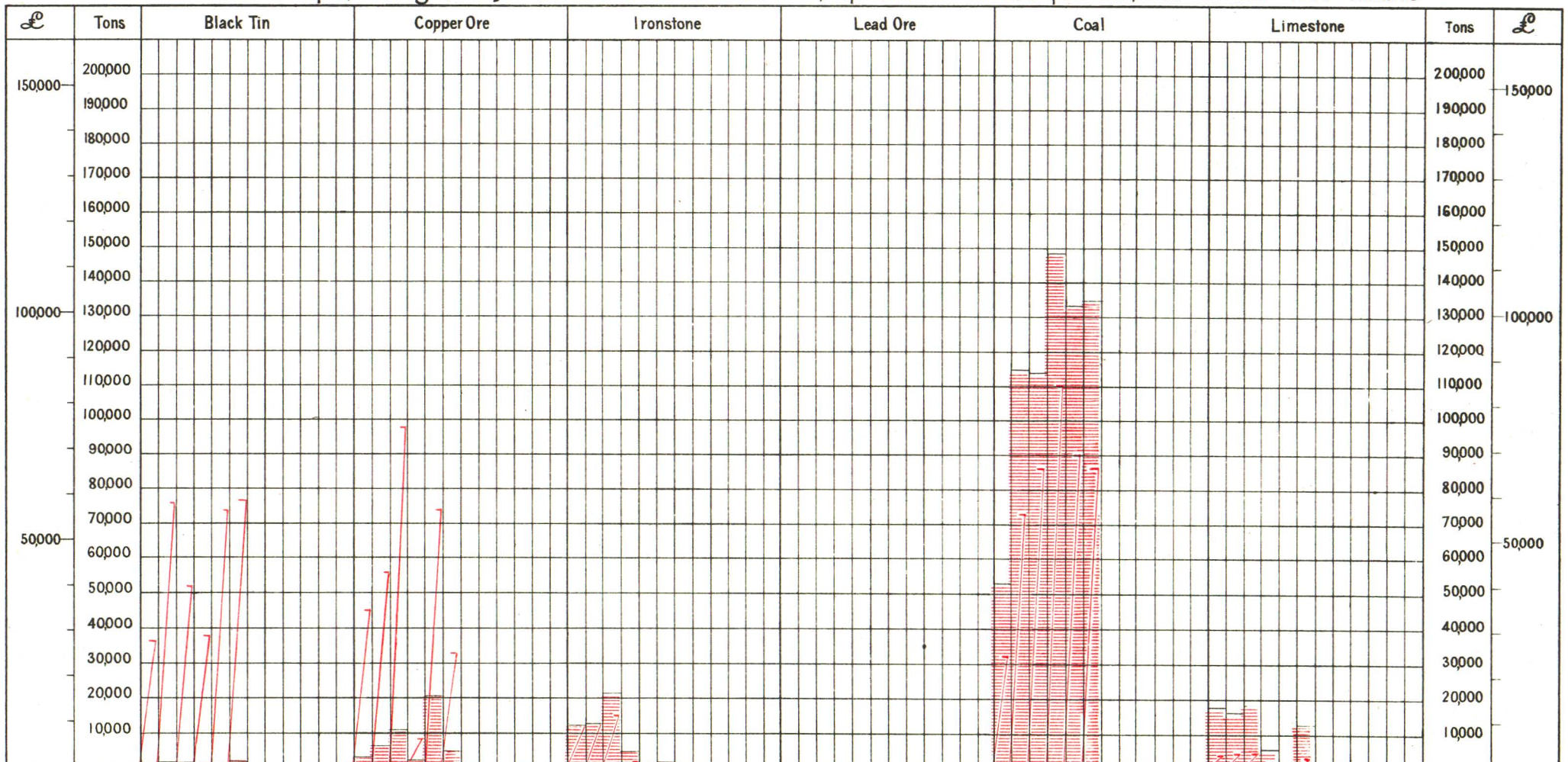
Great Fingall Gold Mine.

MURCHISON GOLDFIELD.

(Opening of Railway to Cue, 1897.)

DIAGRAM

of the Mineral Output, showing Quantity & Value of Minerals other than Gold, reported to the Mines Department, from the Year -1899- onwards



NOTE. *Pink hatching denotes Quantities produced, and diagonal lines Values thereof.*

Previous to 1899 the Quantity and Value of the various Minerals exported amounted to:—

	Tons	£
Black Tin	1738	76227
Copper Ore	10641	166855
Lead Ore (Pig)	33601	364418
	607	12228
Total Value		£619728

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

TABLE 9.

Total Number and Acreage of Leases held for Mining on 31st December, 1903 and 1904.

Description of Leases.	1903.		1904.	
	No.	Acreage.	No.	Acreage.
Gold mining leases on Crown land	2,308	30,173	2,471	32,362
" " " private property ...	20	242	17	168
Mineral leases on Crown land	244	33,083	180	23,589
	2,572	63,498	2,668	56,119

Although the total number of leases held for mining has increased, as compared with 1903, the area leased is smaller by 7,379 acres. This is more than accounted for by the falling off in number and acreage of coal mining leases on the Collie field.

Gold mining leases on Crown land have increased, as compared with the year 1903, by 163 in number, and 2,189 acres in area, while gold mining leases on private property show a falling off both in number and area.

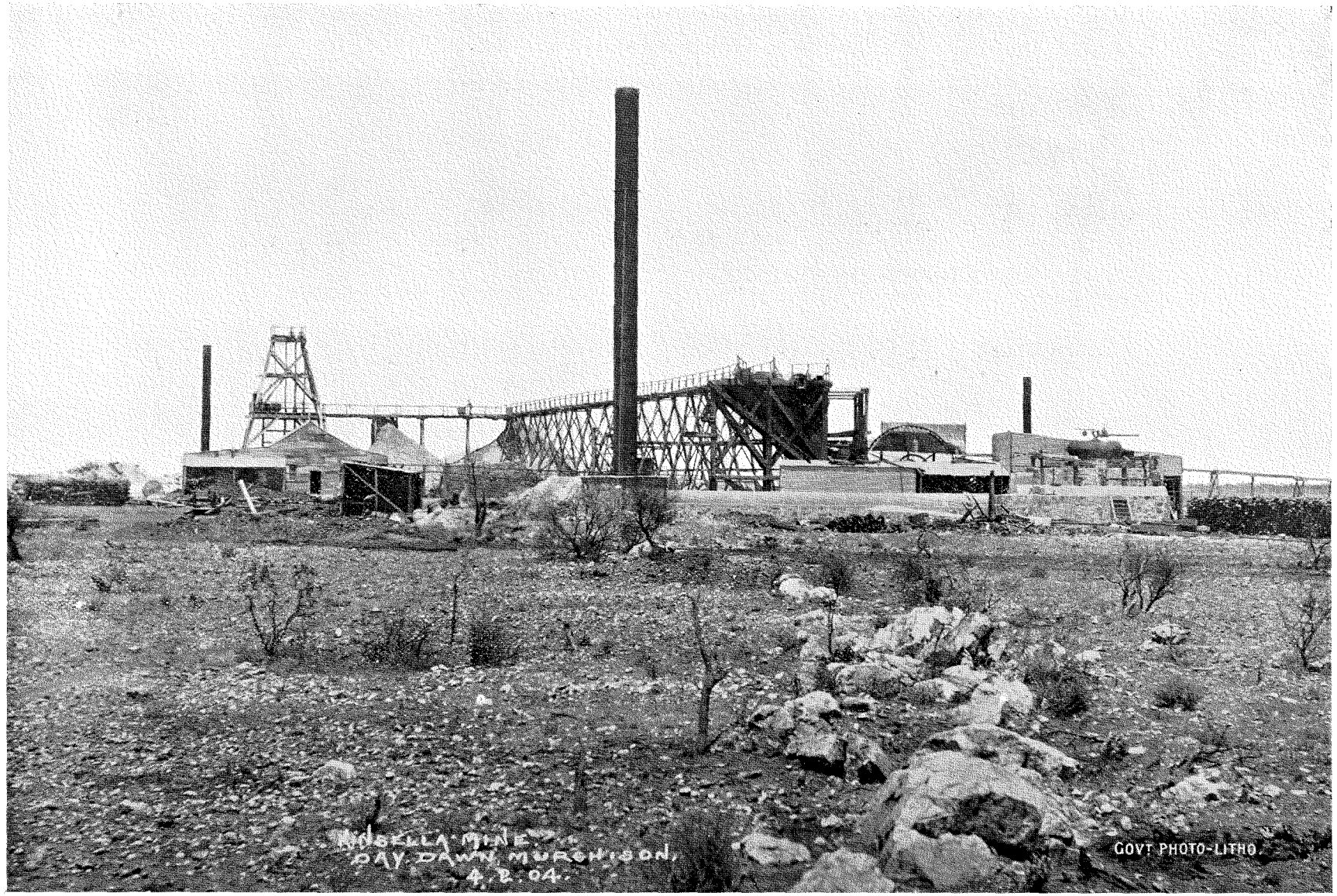
TABLE 10.

Number and Acreage of Gold Mining Leases in force each year for the Five Years ending 31st December, 1904.

GOLDFIELDS.		DISTRICTS.		1900.		1901.		1902.		1903.		1904.		Percentage of Total Acreage.		Increase or Decrease for 1904 compared with 1903.		GOLDFIELDS.
Name.	Proclaimed.	Name.	Proclaimed.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	1903.	1904.	Increase.	Decrease.	
Kimberley ...	20-5-86	... ...	...	4	38	3	19	3	19	3	19	2	13	·06	·04	...	6	Kimberley
Yilgarn	1-10-88	... ...	...	48	765	32	497	37	584	74	985	62	861	3·24	2·65	...	124	Yilgarn
Pilbarra	1-10-88	Marble Bar ...	6-11-96	43	379	36	316	28	256	27	258	20	204	1·65	1·50	...	12	Pilbarra
		Nullagine ...	6-11-96	16	150	16	193	22	252	20	244	24	236	...				
Ashburton ...	11-12-90	... ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	Ashburton
Murchison ...	24-9-91	Cue	10-1-96	70	678	92	800	95	933	89	810	113	1,007	...	12·02	...	59	Murchison
		Nannine ...	7-12-94	110	1,266	75	891	82	973	93	1,114	98	1,187	...				
		Day Dawn ...	10-1-96	63	679	96	1,099	117	1,281	112	1,209	98	1,058	13·05				
		Mount Magnet	7-12-94	95	906	91	840	116	1,044	94	834	77	656	...				
Dundas	31-8-93	... ...	...	93	1,164	85	986	68	733	72	793	88	913	2·61	2·80	120	...	Dundas
Coolgardie ...	6-4-94	Coolgardie ...	1-9-97	212	2,786	197	2,464	188	2,274	170	2,076	167	2,104	9·80	9·18	2	...	Coolgardie
		Kunanalling ...	1-9-97	123	1,570	96	1,195	86	1,097	73	908	72	822					
East Coolgardie ...	21-9-94	... ...	...	382	6,368	295	4,665	254	3,936	231	3,469	246	3,579	11·40	11·00	110	...	East Coolgardie
Yalgoo	23-1-95	... ...	...	39	480	41	512	35	417	28	365	27	284	1·20	·87	...	81	Yalgoo
North Coolgardie	28-6-95	Menzies ...	20-3-96	86	1,183	95	1,155	100	1,364	129	1,508	135	1,649	17·90	15·63	...	352	North Coolgardie
		Ularring ...	23-9-96	133	1,707	129	1,766	85	1,105	81	937	77	909					
		Yerilla ...	20-3-96	46	725	48	852	49	838	96	1,539	81	1,232					
		Niagara ...	12-3-97	88	1,028	109	1,312	119	1,431	121	1,455	111	1,297					
East Murchison ...	28-6-95	Lawlers ...	...	147	2,064	151	2,133	190	2,960	192	2,746	164	2,392	9·03	10·48	663	...	East Murchison
		Black Range ...	...	...	...	...	...	...	...	...	...	89	1,017					
West Pilbarra ...	20-9-95	... ...	...	13	161	3	36	7	96	6	66	5	78	·21	·20	12	...	West Pilbarra
North-East Coolgardie	20-3-96	Kanowna ...	13-11-96	133	1,625	112	1,336	112	1,322	89	1,118	82	1,073	6·68	8·51	742	...	N.E. Coolgardie
		Bulong ...	13-11-96	38	509	59	798	73	887	67	909	74	1,084					
		Kurnalpi ...	13-11-96	8	133	5	73	4	54	...	...	27	612					
Broad Arrow ...	17-11-96	... ...	...	113	1,445	97	1,251	89	1,151	86	1,098	88	1,144	3·61	3·51	46	...	Broad Arrow
Peak Hill ...	19-3-97	... ...	...	120	1,744	98	1,334	66	747	59	693	62	719	2·28	2·21	26	...	Peak Hill
Mount Margaret	12-3-97	Mount Margaret	12-3-97	123	2,510	222	3,970	169	2,767	132	2,089	159	2,454	14·93	17·77	1,232	...	Mt. Margaret
		Mount Malcolm	12-3-97	154	2,990	161	2,939	140	2,515	103	1,836	143	2,384					
		Mount Morgans	2-4-02	...	...	...	...	41	720	33	614	55	933					
Gascoyne	25-6-97	... ...	...	5	72	1	12	2	36	2	36	5	66	·11	·21	30	...	Gascoyne
Donnybrook ...	11-11-99	Crown Land ...	...	36	575	10	141	8	123	8	123	5	56	1·08	·58	...	141	Donnybrook
		Private Property	...	15	210	21	306	18	236	16	206	13	132					
Phillips River ...	21-9-00	... ...	...	5	114	27	607	21	419	17	298	15	229	·98	·73	...	69	Phillips River
Greenbushes ...	...	... ...	...	...	...	...	...	...	...	1	24	...	...	·07	...	...	24	Greenbushes
Newcastle ...	...	Private Property	...	...	...	...	...	..	...	4	36	4	36	·11	·11	...	...	Newcastle
Totals ...	...	... ...	...	2,561	36,024	2,503	34,498	2,424	32,570	2,328	30,415	2,488	32,530	100·00	100·00	2,983	868	

160 Leases: 2,115 acres increase for 1904.

As compared with 1903, the area held under gold mining lease has increased to the extent of 2,115 acres, the number of leases having increased by 160. The largest acreage is held in the Mount Margaret Goldfield, the land under lease representing



Kinsella Gold Mine, 1904.

DAY DAWN, MURCHISON GOLDFIELD.

17·77 per cent. of the total area under gold mining lease; the North Coolgardie Goldfield comes next with 15·63 per cent., followed by the Murchison and East Coolgardie fields with 12·02 and 11 per cent. respectively.

TABLE 11.

Number and Acreage of Mineral Leases in force 31st December each year, for the Five Years ending 31st December, 1904.

Mining Districts.		Sub-Districts.		1900.		1901.		1902.		1903.		1904.		Increase or Decrease for 1904, compared with 1903.		Districts.
Name.	Proclaimed.	Name.	Proclaimed.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Increase.	Decrease.	
														acres.	acres.	
Kimberley ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Ashburton ...	11-12-90	...	...	...	...	2	80	7	286	...	...	...	...	...	...	
Murchison ...	24-9-91	Cue ...	7-12-94	...	...	...	...	...	...	...	...	...	...	...	...	
		Nannine ...	7-12-94	...	...	...	...	...	...	...	...	...	...	...	...	
		Day Dawn ...	10-1-96	3	15	3	16	...	...	...	...	1	6	6	...	
		Mount Magnet	7-12-94	1	5	2	10	2	10	2	10	...	...	...	10	
Greenbushes ...	7-4-92	...	...	51	1,179	100	2,259	54	1,192	38	703	30	597	...	106	
Pilbarra	16-6-92	Marble Bar ...	16-6-92	21	756	20	655	7	176	3	80	4	180	100	...	
		Nullagine ...	6-11-96	...	...	1	10	1	10	...	...	...	...	...	...	
Yalgoo	23-1-95	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Yilgarn	22-3-95	...	...	3	30	3	30	3	21	1	6	1	60	54	...	
Coolgardie ...	22-3-95	Coolgardie ...	22-3-95	4	40	2	14	1	12	2	22	3	42	20	...	
		Kunanalling ...	1-9-97	...	...	...	...	...	...	...	...	...	...	...	...	
East Coolgardie ...	22-3-95	...	...	35	360	20	156	15	110	13	180	11	130	...	50	
East Murchison ...	28-6-95	...	...	2	4	1	2	3	14	1	2	3	14	12	...	
North Coolgardie	16-8-95	Menzies ...	15-4-96	3	20	1	12	1	12	1	12	1	12	...	...	
		Ularring ...	15-4-96	1	80	...	...	...	...	...	...	1	10	10	...	
		Yerilla ...	15-4-96	...	...	...	...	...	...	...	...	...	...	...	...	
		Niagara ...	1-3-97	...	...	1	10	...	...	1	1	...	...	...	1	
West Pilbarra ...	1-11-95	...	...	20	551	20	564	10	358	8	284	3	194	...	90	
Dundas	27-12-95	...	...	1	6	1	6	1	6	1	6	1	6	...	...	
Collie	21-2-96	...	...	98	30,743	96	29,785	94	29,145	94	29,145	68	20,975	...	8,170	
North-East Coolgardie	15-4-96	Kanowna ...	15-4-96	2	17	...	...	...	...	...	...	...	...	...	...	
		Bulong ...	15-4-96	...	...	...	...	...	...	...	...	...	...	...	...	
		Kurnalpi ...	15-4-96	...	...	1	12	1	12	...	...	...	...	...	...	
Broad Arrow ...	20-11-96	...	...	...	...	1	20	1	20	...	...	1	20	20	...	
Northampton ...	1-1-97	...	...	6	65	6	68	4	50	5	125	1	20	...	105	
Peak Hill ...	1-4-97	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Mount Margaret	1-4-97	Mt. Margaret	1-4-97	3	26	1	3	3	11	2	6	1	3	...	3	
		Mt. Malcolm ...	1-4-97	18	374	21	452	20	538	14	317	10	145	...	172	
		Mt. Morgans ...	2-4-02	...	...	...	...	1	6	1	6	...	...	..	6	
Gascoyne ...	15-4-97	...	...	...	...	...	...	...	...	...	...	...	...	...	...	
Yandanooka ...	1-12-97	...	...	2	40	1	20	2	90	13	855	1	65	...	790	
Phillips River ...	1-7-99	...	...	53	2,265	65	2,099	67	2,122	39	1,093	31	839	...	254	
Donnybrook ...	27-11-99	...	...	...	..	4	78	4	78	...	...	2	31	31	...	
Crown Land ...	...	Cane River ...	...	4	140	...	...	1	40	...	...	...	...	...	...	
		Other Localities	...	...	...	1	50	5	420	5	230	6	240	10	...	
Totals ...	...	...	...	331	36,716	374	36,411	308	34,739	244	33,083	180	23,589	263	9,757	

64 leases; 9,494 acres decrease for 1904.

As compared with the previous year, a decrease of 64 in the number, and 9,494 acres in the area of mineral leases appears. It will be seen that at Collie at the close of the year the area held for coal mining had decreased by 8,170 acres, a number of leases on the outskirts of the coal-bearing area having been abandoned. At Yandanooka and Phillips River the acreage held for copper had decreased by 790 acres and 254 acres respectively.

TABLE 12.

Number and Acreage of Mineral Leases in force on 31st December, 1904, showing Minerals for which they are worked.

MINERALS.	Ashburton.		Murchison.		Greenbushes.		Pilbarra.				Yilgarn.		Coolgardie.		East Coolgardie.		East Murchison.		North Coolgardie.				Dundas.		West Pilbarra.		Peak Hill.	
	Uaroo.		Day Dawn.				Marble Bar.		Nullagine.				Coolgardie.						Menzies.		Ularring.							
	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.
Antimony	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gypsum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper	...	...	...	...	...	...	1	50	...	...	...	...	...	...	1	50	...	...	1	12	1	10	...	...	3	194	...	...
Ironstone	...	...	...	...	...	...	...	...	...	...	1	60	...	...	...	...	...	...	...	...	...	...	1	6	...	...	...	...
Limestone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper, Silver, and Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper and Ironstone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tin	...	...	...	...	30	597	3	130	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Silver	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Silver and Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper and other Minerals	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper and Silver	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Clay	...	...	1	6	...	...	...	...	...	...	...	...	1	12	8	55	2	12	...	...	...	...	...	...	...	...	...	...
Building Stone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	25	...	...	...	...	...	...	...	...	...	...	...	...
Building Stone and Mica	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lime	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	2	...	...	...	...	...	...	...	...	...	...
Copper and Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper, Lead, and Blend	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Opal	...	...	...	...	...	...	...	...	...	...	...	...	1	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Graphite	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Mica	...	...	...	...	...	...	...	...	...	...	...	...	1	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Asbestos	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals	...	...	1	6	30	597	4	180	...	...	1	60	3	42	11	130	3	14	1	12	1	10	1	6	3	194	...	...

MINERALS.	Collie.		North-East Coolgardie.		Broad Arrow.		North-ampton.		Mt. Margaret.						Yandanooka.		Phillips River.		Donnybrook.		Crown Lands outside proclaimed Mining Districts.		Total acreage.	Increase or Decrease for 1903 compared with 1902.	
			Kurnalpi.						Mt. Margaret.		Mt. Malcolm.		Mt. Morgans.											Increase.	Decrease.
	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.	Leases.	Acres.			
Antimony	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...			80
Gypsum	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	80	80	...	...
Coal	68	20,975	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20,975	...	8,170
Copper	...	...	...	...	1	20	1	20	...	...	5	115	...	...	1	65	30	836	...	...	1	150	1,522	...	956
Ironstone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	60	60	...
Limestone	...	...	...	...	...	...	...	...	...	...	2	20	...	...	...	...	1	3	...	...	...	...	29	...	11
Copper, Silver, and Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper and Ironstone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tin	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	727	...	56
Silver	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Silver and Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper and other Minerals	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	155
Copper and Silver	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	45
Clay	...	...	...	...	...	...	...	...	1	3	3	10	...	...	...	...	...	...	...	...	...	...	98	...	21
Building Stone	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	31	...	...	56	50	...
Building Stone and Mica	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lime	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	10
Copper and Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	125
Copper, Lead, and Blend	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Lead	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Opal	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	20	20	...
Graphite	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	10	10	10	...
Mica	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...
Asbestos	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5
Totals	68	2,0975	...	...	1	20	1	20	1	3	10	145	...	...	1	65	31	839	2	31	6	240	23,589	140	9,634

Salisbury Gold Mine, 1905.

CUE, MURCHISON GOLDFIELD.

TABLE 13.

Claims and Authorised Holdings under the Goldfields Acts and Regulations, existing on 31st December, 1903 and 1904.

Claims, etc.	*Kimberley.		Yilgarn.		Pilbarra.				*Ashburton.		Murchison.								Dundas.		Coolgardie.				East Coolgardie.		Yalgoo.		North Coolgardie.							
					Marble Bar.		Nullagine.				Cue.		Day Dawn.		Nannine.		Mt. Magnet.				Coolgardie.		Kunanalling.						Menzies.		Ularring.		Yerilla.		Niagara.	
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.
Water Rights ...	...	...	10	9	1	1	9	7	...	...	10	11	22	24	4	4	1	3	28	27	36	36	46	49	54	45	...	...	33	30	15	15	6	9	23	22
Area of Water Rights	...	...	36	35	6	1	9	7	...	...	24	31	113	68	8	4	1	8	218	197	198	198	134	142	1102	1055	...	...	852	815	76	59	13	19	57	59
Quartz Claims ...	...	...	...	...	28	8	14	26	...	...	2	2	2	...	2	3	15	2	32	11	113	114	35	38	55	4	2	4	10	2	2	2	1	...	5	...
Alluvial Claims ...	...	...	...	...	...	...	...	...	...	...	1	1	2	2	2	1	1	...	...	...	...	...	...	...	22	27	...	...	1	1	...	...	...	...	...	...
Reward Claims ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Prospecting Areas...	...	...	...	7	1	3	...	...	...	...	3	5	2	5	15	14	3	4	12	11	...	18	...	3	29	42	7	18	4	51	1	13	1	24	3	32
Residence Areas ...	...	...	23	23	13	9	10	9	...	...	12	12	8	7	18	13	23	20	71	35	3	3	...	...	698	615	*14	8	124	119	...	...	...	...	6	6
Business Areas ...	...	...	14	13	12	14	4	5	...	...	7	6	1	...	21	13	9	6	17	3	11	10	22	22	58	48	14	14	9	7	55	47	91	80	9	6
Machinery Areas ...	...	...	...	...	3	5	4	2	...	...	3	3	2	3	1	1	1	3	6	4	12	10	10	11	10	6	2	2	1	...	1	1	2	2	5	3
Tailings Areas ...	...	...	11	12	...	...	2	1	...	...	2	2	1	1	2	3	3	2	5	4	5	4	1	1	2	5	1	2	...	...	...	...	1	1	4	4
Garden Areas ...	...	...	...	4	14	11	4	3	...	...	5	5	8	7	6	6	9	7	1	...	23	23	...	...	68	46	...	1	5	4	...	...	...	...	12	8
Tunnelling Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Poultry Farms ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6
Lode Claims ...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	3	...	2	...	...	...	...	...	20	...	...	...	2	...	...	...	3	...	7

Claims, etc.	East Murchison.				West Pilbarra.		North-East Coolgardie.						Broad Arrow.		Peak Hill.		Mount Margaret.						Gascoyne.		Donnybrook.		Phillips River.		Outside Goldfields.		Total.		Increase or Decrease for 1904 compared with 1903.	
	East Murchison.		Black Range.				Kanowna.		Bulong.		Kurnalpi.						Mount Margaret.		Mount Malcolm.		Mount Morgans.															
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	In-crease.	De-crease.
Water Rights	20	27	...	3	2	2	9	9	3	10	1	...	13	15	14	13	25	31	59	58	19	20	...	...	...	...	9	11	...	...	472	491	19	...
Area of Water Rights	54	48	...	3	10	13	33	52	5	43	2	...	40	51	151	143	84	115	326	208	89	92	...	...	...	...	40	57	...	...	3681	3523	...	158
Quartz Claims	14	7	...	...	...	...	60	73	27	48	8	16	10	17	...	...	8	5	122	29	7	11	...	...	...	...	2	6	...	...	576	428	...	148
Alluvial Claims	3	...	...	3	...	...	201	211	4	41	2	3	4	...	...	...	3	4	...	...	...	2	...	...	...	...	1	2	...	...	247	298	51	...
Reward Claims	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	1	1	...	...
Prospecting Areas	13	6	...	9	...	...	74	72	2	13	...	20	3	9	...	...	90	23	42	51	20	11	...	1	...	...	8	13	200	...	533	479	...	54
Residence Areas	32	19	...	...	...	6	9	10	61	61	1	4	...	...	24	16	110	92	44	31	...	...	...	...	...	...	16	...	...	...	1320	1118	...	202
Business Areas	47	27	...	3	4	...	11	13	3	5	2	5	15	16	6	3	76	47	40	38	6	6	...	1	...	...	53	1	...	...	617	459	...	158
Machinery Areas	7	7	...	2	...	...	9	9	2	6	2	2	5	6	2	1	6	6	1	1	1	1	...	...	...	...	1	1	...	...	99	98	...	1
Tailings Areas	3	4	...	...	...	...	3	3	...	2	...	...	4	4	1	...	2	2	2	1	...	...	...	...	...	...	...	...	...	...	55	58	3	...
Garden Areas	24	23	...	2	1	...	2	3	...	...	...	...	3	4	3	3	8	8	19	14	3	3	...	...	...	...	16	15	...	...	234	200	...	34
Tunnelling Areas	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Poultry Farms	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	6	...
Lode Claims	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	1	...	...	...	42	42	...

* No returns received.

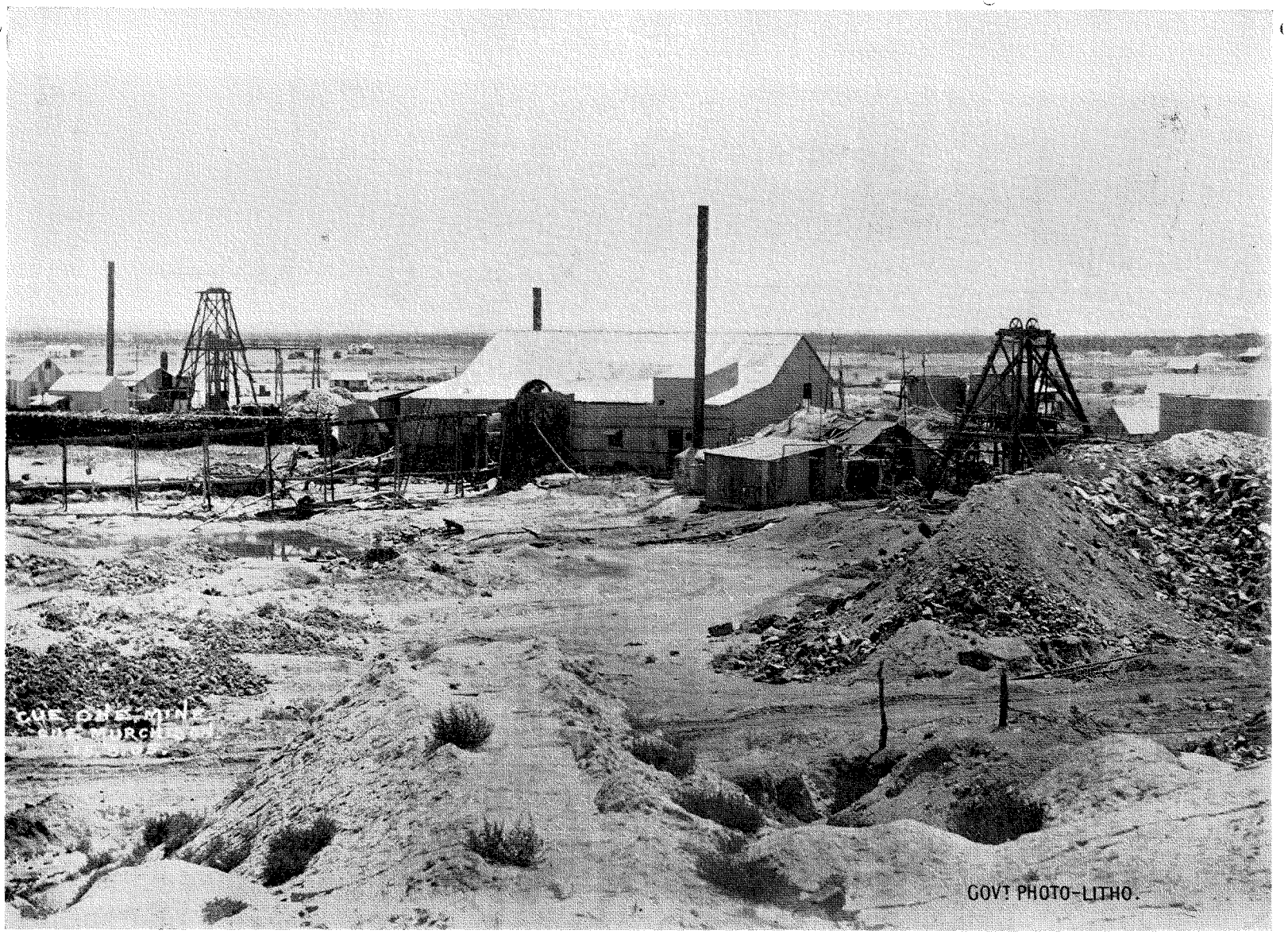
Table 14.

Claims and Authorised Holdings under the Mineral Lands Acts and Regulations, existing on 31st December, 1903 and 1904.

Claims, etc.	Kimberley.		Ashburton.		Murchison.		Geeenbushes.		Pilbarra.		Yalgoo.		Yilgarn.		Coolgardie.		East Coolgardie.		East Murchison.		North Coolgardie.		West Pilbarra.		Dundas.	
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.
Water Rights	...	...	...	...	...	...	50	47	1	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Area of Water Rights	...	...	...	...	...	...	31	35	2	...	...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...
Lode Claims	...	...	...	...	...	...	...	...	5	...	...	...	...	...	...	...	2	2	...	...	...	...	...	...	...	...
Alluvial Claims ...	...	...	...	...	...	...	52	47	2	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Reward Claims ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Prospecting Areas ...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...	3	3	1	...	...	...	...	...	...	...
Residence Areas ...	...	...	...	...	...	...	50	44	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Business Areas ...	...	...	...	...	...	...	3	3	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Machinery Areas ...	...	...	...	...	...	...	4	7	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tailings Areas ...	...	...	...	...	...	...	5	6	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Garden Areas	...	...	...	...	...	...	3	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Washing Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pipe Tracks	...	*	...	*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

Claims, etc.	Collie.		North-East Coolgardie.		Broad Arrow.		Northampton.		Peak Hill.		Mt. Margaret.		Gascoyne.		Yandanooka.		Phillips River.		Donnybrook.		Crown Lands.		Totals.		Increase or Decrease for 1904, compared with 1903.	
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	Increase.	Decrease.
Water Rights	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	52	47	...	5
Area of Water Rights	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	43	35	...	8
Lode Claims	...	...	...	...	1	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	8	3	...	5
Alluvial Claims ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	54	48	...	6
Reward Claims ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Prospecting Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	17	...	...	12	10	28	30	2	...
Residence Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	50	44	...	6
Business Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	3	...	...
Machinery Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	7	3	...
Tailings Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	6	1	...
Garden Areas	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	4	...	...
Washing Areas ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Pipe Tracks	...	...	...	...	...	...	...	...	...	...	...	...	...	*	...	...	...	...	...	...	2	...	2	...	...	2

* No returns received.



Cue One Gold Mine, 1905.

CUE, MURCHISON GOLDFIELD.

TABLE 15.

Miners' Rights, and Mining, Business, and Quarry Licenses issued during 1903 and 1904.

PLACE OF ISSUE.	MINING ACTS.						MINERAL LANDS ACTS.							
	Miners' Rights.		Consolidated Miners' Rights.		Business Licenses.		Mining Licenses.		Consolidated Mng. Licenses.		Quarry Licenses.		Business Licenses.	
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.
Albany	...	8	...	...	...	...	4	...	...	...	...	...	...	...
Ashburton	20	37	...	...	1	...	...	...	...	...	...	...	...	...
Black Range	...	102	...	...	...	...	...	...	...	...	...	...	...	...
Broad Arrow	267	230	...	...	5	...	3	1	...	...	...	...	...	...
Broome	3	...	...	...	...	...	1	...	...	...	...	...	...	...
Bulong	219	193	1	1	6	...	...	...	...	...	...	...	...	...
Bunbury	3	3	..	...	...	...	1	...	...	...	4	...	...	...
Busselton	3	1	...	...	...	...	5	...	...	...	...	...	...	...
Carnarvon	5	16	...	...	...	...	...	...	...	...	...	...	...	...
Collie	6	11	...	...	...	...	1	...	...	...	...	...	...	...
Coolgardie	443	497	...	...	8	1	...	...	...	...	...	...	...	...
Cue	334	375	...	...	10	2	1	2	...	...	5	...	...	...
Derby	...	4	...	...	...	...	...	...	...	...	...	...	...	...
Esperance	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Gascoyne *	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Geraldton	7	8	...	...	...	...	3	...	...	...	...	...	...	...
Greenbushes	11	187	...	1	...	...	276	51	...	...	2	...	3	...
Kalgoorlie	1,223	1,210	...	...	6	1	21	2	...	...	...	...	...	...
Kanowna	362	433	...	...	15	...	...	...	...	...	...	...	...	...
Katanning	7	5	...	...	...	...	...	...	...	...	...	...	...	...
Kimberley	22	26	...	...	1	1	...	...	...	...	...	...	...	...
Kookynie	313	427	...	...	21	...	...	...	...	...	...	...	...	...
Kurnalpi	46	44	...	...	...	...	...	...	...	...	...	...	...	...
Lawlers	588	352	...	...	51	8	2	...	...	...	13	...	...	...
Marble Bar	110	282	...	...	15	1	100	6	...	...	...	...	...	...
Menzies	298	300	...	...	6	...	1	...	...	...	...	...	...	...
Mt. Magnet	345	234	...	...	12	3	1	...	...	...	...	...	...	...
Mt. Malcolm	310	307	...	1	22	2	10	1	...	...	...	...	...	...
Mt. Margaret	329	383	...	...	25	2	3	...	...	...	...	...	...	...
Mt. Morgans	171	230	...	...	2	1	...	...	...	...	...	...	...	...
Nannine	113	245	...	...	17	3	...	...	...	...	1	1	...	...
Newcastle	7	1	...	...	...	...	...	...	...	...	...	...	...	...
Norseman	278	286	...	...	20	5	...	...	...	...	...	...	...	...
Northam	6	4	...	...	...	...	...	...	...	...	...	...	...	...
Northampton	...	...	...	...	...	...	6	...	...	...	...	...	...	...
Nullagine †	114	137	...	...	3	...	...	...	...	...	...	...	...	...
Peak Hill	83	91	...	...	5	...	...	...	...	...	...	...	...	...
Perth	114	135	...	...	...	...	29	3	...	...	...	...	...	...
Phillips River	60	116	...	...	2	...	49	2	...	...	...	...	...	...
Pinjarra	5	1	...	...	...	...	...	...	...	...	...	...	...	...
Southern Cross	116	151	...	...	12	1	...	...	...	...	...	...	...	...
Ularring	70	114	...	...	12	1	...	...	...	...	...	...	...	...
West Pilbarra	106	53	...	...	8	1	7	1	...	...	...	...	...	...
Williams	...	31	...	...	...	...	...	...	...	...	...	...	...	...
Yalgoo	37	81	...	...	9	...	...	...	...	...	...	...	...	...
York	...	2	...	...	...	...	2	...	...	...	...	...	...	...
Total	6,554	7,353	1	3	294	33	526	69	...	...	25	1	3	...

* Ashburton. † *See* Marble Bar.

NOTE.—Since 1st March, 1904, Business Licenses, Mining Licenses, Consolidated Mining Licenses, and Quarry Licenses have ceased to be issued by the Department.

Under the new Mining Act, Mining Licenses, which were issued under the Mineral Lands Acts, were abolished, and a Miner's Right gives the same privileges. In 1903 the total number of Miners' Rights and Mining Licenses issued was 7,080; while in 1904 the total was 7,422.

TABLE 16.

Number and Acreage of Miners' Homestead Leases in force on 31st December, 1903 and 1904.

Goldfield.	District.	1903.		1904.		Increase.		Decrease.	
		Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.	Leases.	Acreage.
Dundas	... ...	17	964	17	804	...	...	...	160
Broad Arrow	.. ..	3	70	6	140	3	70	...	...
Yilgarn	... ...	2	23	7	118	5	95	...	...
Mt. Margaret ...	Mt. Morgans ...	1	20	3	140	2	120	...	...
	Mt. Malcolm ...	8	1,530	14	2,540	6	1,010	...	...
	Mt. Margaret ...	5	310	6	320	1	10	...	...
Murchison ...	Cue	8	1,395	7	1,373	...	...	1	22
	Day Dawn	4	57	6	80	2	23	...	...
	Nannine	14	1,930	17	2,470	3	540	...	...
Coolgardie ...	... ...	36	4,869	36	3,830	...	...	...	1,039
	Kunanalling ...	...	...	1	20	1	20	...	...
East Coolgardie ...	... ...	23	894	38	1,884	15	990	...	...
Phillips River ...	... ...	27	2,413	35	3,273	8	860	...	...
Peak Hill	... ...	9	1,788	10	1,793	1	5	...	...
North-East Coolgardie	Kanowna	15	290	20	655	5	365	...	...
North Coolgardie	Menzies	1	20	5	650	4	630	...	...
	Yerilla	...	...	1	5	1	5	...	...
	Niagara	4	365	7	410	3	45	...	...
East Murchison	... ...	3	565	4	545	1	...	...	20
	Black Range ...	...	...	2	560	2	560	...	....
		180	17,503	242	21,610	63	5,348	1	1,241

Increase for 1904—62 leases, 4,107 acres.

In every goldfield but four the acreage held under Miner's Homestead Lease has increased: in the goldfields as a whole the acreage has increased by 4,107 acres.

Long Reef Gold Mine, 1904.

LENNONVILLE, MURCHISON GOLDFIELD.

PART IV.—MEN EMPLOYED.

TABLE 17.

Average Number of Men engaged in Mining during 1903 and 1904.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1903.	1904.	1903.	1904.	1903.	1904.
1. Kimberley		3	5	11	12	14	17
2. Pilbarra	Marble Bar	76	59	121	46	197	105
	Nullagine	113	118	15	27	128	145
3. West Pilbarra		31	11	100	104	131	115
4. Ashburton		...	...	35	22	35	22
5. Gascoyne		...	...	...	...	...	...
6. Peak Hill		363	251	7	6	370	257
7. East Murchison	Lawlers, Black Range	1,150	1,300	626	196	1,776	1,496
8. Murchison	Cue	243	231	18	15	261	246
	Nannine	239	204	44	161	283	365
	Day Dawn	619	715	31	23	650	738
	Mt. Magnet	457	399	14	20	471	419
9. Yalgoo		74	66	12	14	86	80
10. Mt. Margaret	Mt. Morgans	505	476	...	6	505	482
	Mt. Malcolm	798	780	45	29	843	809
	Mt. Margaret	678	705	38	47	716	752
11. North Coolgardie	Menzies	652	575	26	19	678	594
	Ularring	282	273	53	66	335	339
	Niagara	683	581	68	49	751	630
	Yerilla	300	307	112	*135	412	442
12. Broad Arrow		386	305	161	90	547	395
13. North-East Coolgardie	Kanowna	627	486	87	80	714	566
	Bulong	138	184	178	†211	316	395
	Kurnalpi	7	12	61	68	68	80
14. East Coolgardie		6,119	6,255	1,200	262	7,319	6,517
15. Coolgardie	Coolgardie	1,305	1,130	232	175	1,537	1,305
	Kunanalling	428	329	53	36	481	365
16. Yilgarn		380	394	...	3	380	397
17. Dundas		429	460	25	25	454	485
18. Phillips River		125	74	14	9	139	83
19. Donnybrook		44	...	...	...	44	...
Goldfields generally		75	163	...	...	75	163
	Total—Gold Mining	17,329	16,848	3,387	1,956	20,716	18,804
MINERALS OTHER THAN GOLD.							
Tin	Greenbushes M.D.	...	...	‡168	‡115	168	115
	Marble Bar D.	...	...	‡126	‡169	126	169
Copper	Mt. Malcolm D.	128	75	...	...	128	75
	Northampton D.	1	...	...	...	1	...
	Phillips River Gf.	64	94	...	...	64	94
Coal	Collie River Coal M.D.	402	358	...	...	402	358
Limestone	Yilgarn Gf.	1	...	...	...	1	...
	Total—Other Minerals	596	527	294	284	890	811
	GRAND TOTAL	17,925	17,375	3,681	2,240	21,606	19,615

* Alluvial rush at Mt. Howe. † Alluvial rush at Woodline. ‡ Classified elsewhere as employed at mines.

It will be seen that the number of men engaged in mining is less by 1,991 than in the year 1903. The decrease occurs principally in gold mining, the falling off amounting to 1,912 men, while in mining for other minerals the decrease only amounts to 79 men. It will be seen that 1,431 have abandoned alluvial gold digging, and that the number of men working reefs has only decreased by 481.

TABLE 18.

Average Number of Men employed at Mines during 1904.

Mineral.	Above ground.	Under ground.	Total.	Percentage of total men employed.	Increase or decrease compared with 1903.
Tin	*232	52	284	1·61	— 10
Coal	75	283	358	2·03	— 44
Copper	89	80	169	·95	— 24
Gold	7,926	8,922	16,848	95·41	— 481
Limestone	...	...	...	...	— 1
Total	8,322	9,337	17,659	100·00	— 560

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

The above table shows the number of men employed on wages, or working their own mines, classified according to the mineral for which they were working. During 1903, 95·41 per cent. were employed on gold mines, so it will be seen that this percentage is slightly greater this year.

TABLE 19.

Average Number of Men employed at Gold Mines during 1904, 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 1903.	Percentage of total men employed.	
					1903.	1904.
1. Kimberley	2	3	5	+ 2	·02	·03
2. Pilbarra	58	119	177	— 12	1·09	1·05
3. West Pilbarra	...	11	11	— 20	·18	·06
4. Ashburton	...	...	...	...	...	...
5. Gascoyne	...	...	...	...	...	...
6. Peak Hill	147	104	251	— 112	2·09	1·49
7. East Murchison	662	638	1,300	+ 150	6·64	7·72
8. Murchison	805	744	1,549	— 9	8·99	9·19
9. Yalgoo	33	33	66	— 8	·43	·39
10. Mt. Margaret	875	1,086	1,961	— 20	11·43	11·64
11. North Coolgardie	742	994	1,736	— 181	11·06	10·30
12. Broad Arrow	133	172	305	— 81	2·23	1·81
13. North-East Coolgardie ...	233	449	682	— 90	4·46	4·05
14. East Coolgardie	3,006	3,249	6,255	+ 136	35·31	37·13
15. Coolgardie	621	838	1,459	— 274	10·00	8·66
16. Yilgarn	214	180	394	+ 14	2·19	2·34
17. Dundas	198	262	460	+ 31	2·48	2·73
18. Phillips River	34	40	74	— 51	·72	·44
19. Donnybrook	...	...	...	— 44	·25	...
Goldfields generally	163	...	163	+ 88	·43	·97
Total	7,926	8,922	16,848	— 481	100·00	100·00

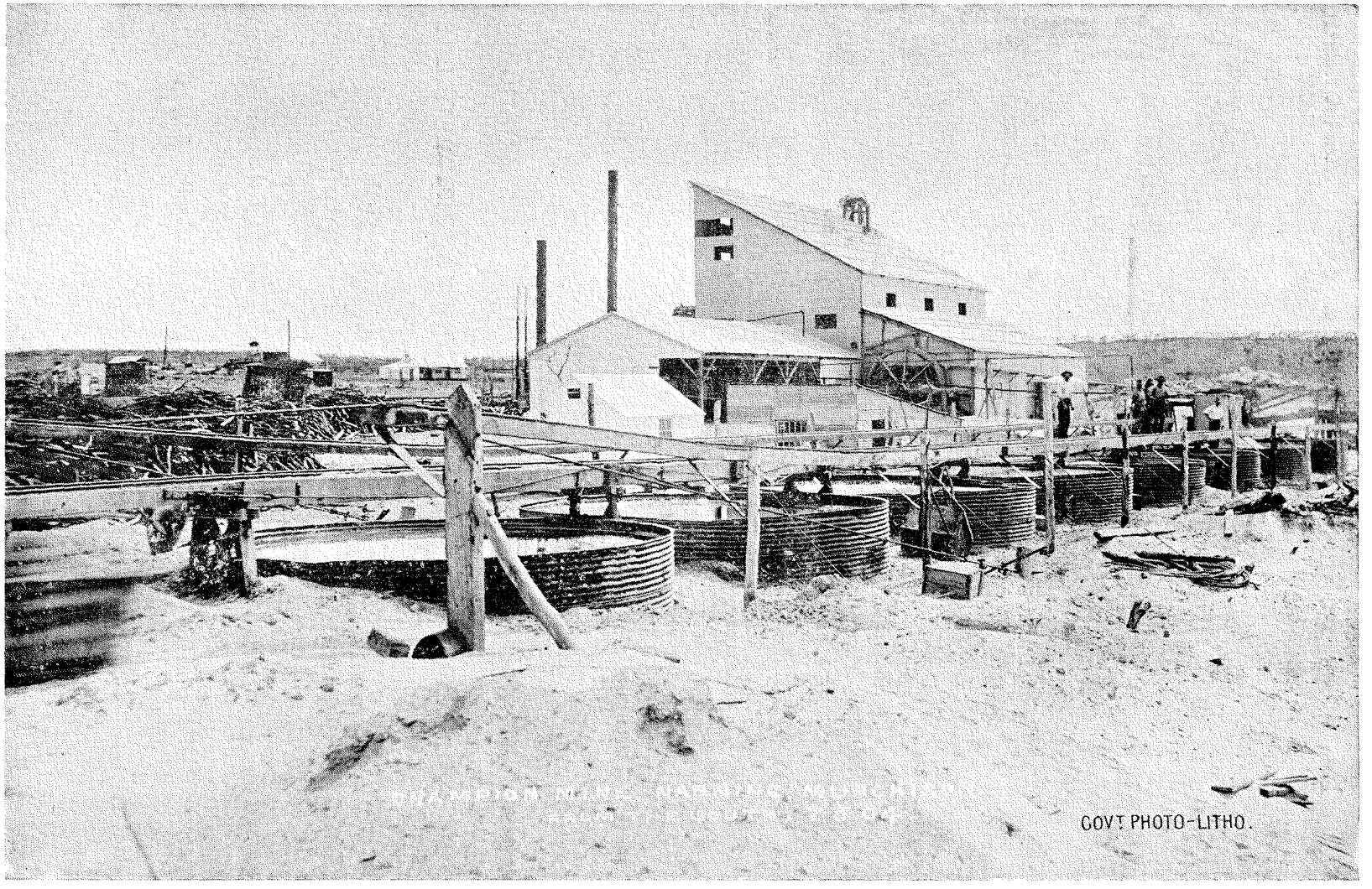
It will be seen that the number of employees on gold mines decreased by 481 as compared with the number in 1903. While the number substantially increased on the East Coolgardie and East Murchison goldfields, and to a lesser extent on the Kimberley, Dundas, and Yilgarn fields, a falling off appears in all the other goldfields, notably in the Coolgardie and North Coolgardie goldfields.

TABLE 20.

Alluvial (Gold) Workers.

Goldfield.	1903.	1904.	Increase or decrease compared with 1903.
1. Kimberley	11	12	+ 1
2. Pilbarra	136	73	— 63
3. West Pilbarra	100	104	+ 4
4. Ashburton	35	22	— 13
5. Gascoyne	...	...	...
6. Peak Hill	7	6	— 1
7. East Murchison	*626	196	— 430
8. Murchison	107	219	+ 112
9. Yalgoo	12	14	+ 2
10. Mt. Margaret	83	82	— 1
11. North Coolgardie	259	269	+ 10
12. Broad Arrow	161	90	— 71
13. North-East Coolgardie	326	359	+ 33
14. East Coolgardie	1,200	262	— 938
15. Coolgardie	285	211	— 74
16. Yilgarn	...	3	+ 3
17. Dundas	25	25	=
18. Phillips River	14	9	— 5
19. Donnybrook	...	...	...
Total	3,387	1,956	— 1,431

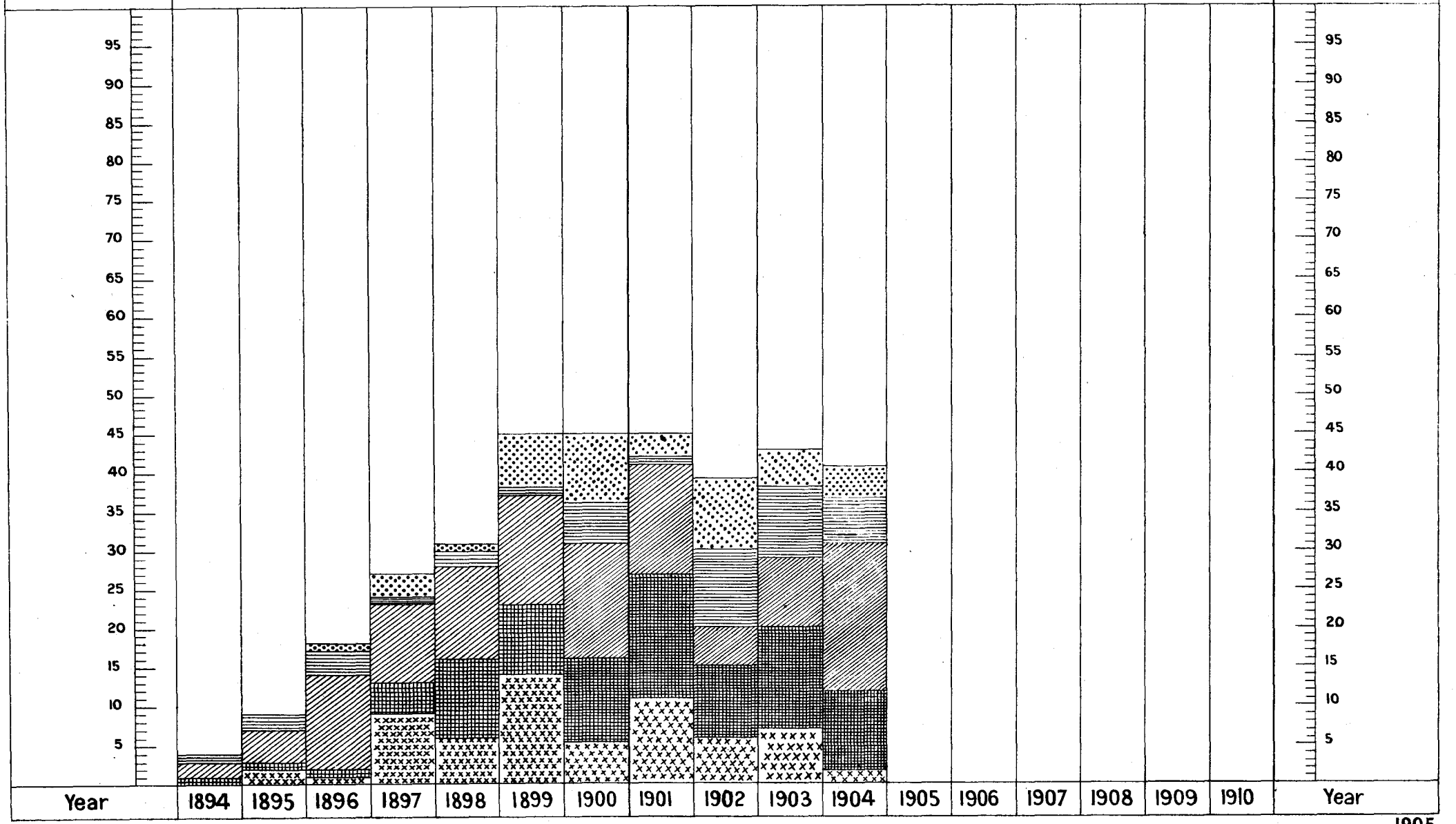
* Accounted for by rush at Black Range.



Champion Gold Mine, 1904.

NANNINE, MURCHISON GOLDFIELD.

DIAGRAM SHEWING THE NUMBER OF DEATHS FROM ACCIDENTS ARRANGED IN FIVE CLASSES, IN THE MINES OF WESTERN AUSTRALIA DURING THE YEARS 1894 AND ONWARDS.



1905.

While the number of alluvial workers was greater in 1903 than for several years past, the number engaged in this class of mining during 1904 is smaller than for some years. The North-East Coolgardie field supports the largest number of alluvial diggers, 359; then follow North Coolgardie and East Coolgardie with 269 and 262 men respectively. The decrease of alluvial diggers in East Murchison is noticeable; doubtless many men have turned their attention to reefing.

PART V.—ACCIDENTS.

TABLE 21.

Men Killed and Injured in Mining Accidents during 1903 and 1904.

GOLDFIELD.	Killed.		Injured.		Total Killed and Injured.	
	1903.	1904.	1903.	1904.	1903.	1904.
1. Kimberley	...	...	...	...	...	...
2. Pilbarra	2	...	...	...	2	...
3. West Pilbarra	...	...	...	...	...	...
4. Ashburton	...	...	...	...	...	...
5. Gascoyne	...	...	...	...	...	...
6. Peak Hill	...	1	3	2	3	3
7. East Murchison	4	2	8	4	12	6
8. Murchison	4	3	11	12	15	15
9. Yalgoo	...	1	...	...	...	1
10. Mt. Margaret { on Gold Mines	4	3	19	18	23	21
10. Mt. Margaret { on Copper Mines	...	...	4	...	4	...
11. North Coolgardie	4	6	15	13	19	19
12. Broad Arrow	4	...	2	1	6	1
13. North-East Coolgardie... ...	1	2	5	9	6	11
14. East Coolgardie	14	20	90	76	104	96
15. Coolgardie	3	1	9	9	12	10
16. Yilgarn	1	...	1	2	2	2
17. Dundas	...	2	...	2	...	4
18. Phillips River	...	...	...	1	...	1
19. Donnybrook	...	...	...	...	...	...
MINING DISTRICTS.						
Northampton	...	...	...	...	...	...
Yandanooka	...	...	...	...	...	...
Greenbushes	1	1	4	...	5	1
Collie	1	...	8	4	9	4
Total	43	42	179	153	222	195

It will be noted that the number of fatalities has decreased by one, as compared with the year 1903; while the number of men injured has decreased by 26.

A terrible accident in the Great Boulder mine, in which five men were killed in a shaft accident, unduly swelled the number of fatalities.

It may be mentioned that since the year 1902, for the purposes of these statistics, only accidents through which a man has been incapacitated for over 14 days have been taken into account.

TABLE 22.

Deaths from Accidents at Mines during 1903 and 1904.

KIND OF MINES.	1903.						1904.					
	Number of Persons killed.			Death Rate per 1,000 Persons employed.			Number of Persons killed.			Death Rate per 1,000 Persons employed.		
	Above ground.	Under ground.	Total.	Above ground.	Under ground.	Total.	Above ground.	Under ground.	Total.	Above ground.	Under ground.	Total.
Coal	...	1	1	...	3·25	2·49	...	...	...	...	...	...
Gold	7	34	41	·88	3·64	2·37	4	37	41	·50	4·15	2·43
Other mines	...	1	1	...	6·33	2·05	...	1	1	...	7·58	2·21
Total for all mines ...	7	36	43	·83	3·77	2·36	4	38	42	·48	4·07	2·38

It will be seen that no fatal accidents occurred in collieries during the year 1904. In gold mines the number of fatalities (41) was the same as in 1903; while in other mines one fatality took place in both years. Owing to the smaller number of men employed the death rate per thousand is slightly higher.

TABLE 23.

Deaths from Accidents in Gold Mines during 1904, and the Death Rate per 1,000 Men employed, and per 1,000 Tons of Gold Ore raised, in the different Goldfields during 1903 and 1904.

GOLDFIELD.	Number of Deaths.			Death Rate per 1,000 Men employed.				Number of Deaths per 1,000 Tons of Gold Ore raised.	
	1904.			1904.			1903.		
	Above ground.	Under ground.	Total.	Above ground.	Under ground.	Total.	Total.	1904.	1903.
1. Kimberley	...	...	...	...	...	...	...	...	...
2. Pilbarra	...	...	...	...	...	...	10·58	...	·36
3. West Pilbarra	...	...	...	...	...	...	...	...	...
4. Ashburton	...	...	...	...	...	...	...	...	...
5. Gascoyne	...	...	...	...	...	...	...	...	...
6. Peak Hill	...	1	1	...	9·62	3·98	...	·02	...
7. East Murchison	...	2	2	...	3·13	1·54	3·48	·01	·03
8. Murchison	1	2	3	1·24	2·69	1·94	2·57	·02	·02
9. Yalgoo	...	1	1	...	30·30	15·15	...	·18	...
10. Mt. Margaret	...	3	3	...	2·76	1·53	2·02	·01	·01
11. North Coolgardie	...	6	6	...	6·04	3·46	2·09	·01	·02
12. Broad Arrow	...	...	...	...	...	...	10·36	...	·11
13. N.E. Coolgardie	...	2	2	...	4·45	2·93	1·30	·03	·01
14. East Coolgardie	2	18	20	·67	5·54	3·20	2·29	·02	·01
15. Coolgardie	1	...	1	1·61	...	·69	1·73	·01	·03
16. Yilgarn	...	...	...	...	...	...	2·63	...	·02
17. Dundas	...	2	2	...	7·63	4·35	...	·06	...
18. Phillips River	...	...	...	..	...	...	...	...	...
19. Donnybrook	...	...	...	...	...	...	...	...	...
Totals and Averages ...	4	37	41	·50	4·15	2·43	2·37	·02	·02

The death rate per thousand for gold miners is slightly higher than for 1903. It is to be regretted that the number of deaths from accidents in the East Coolgardie goldfield shows an increase over those in 1903, and is somewhat above the average rate for the whole of the State; but it will be noticed that the number of deaths on this goldfield per 1,000 tons of ore raised (·02) is the same as the average for the State.

Comparing the accidents during the year 1904 with those in 1903:—

Fatalities, by explosives, show a decrease of five (5). Injuries, a decrease of twelve (12).

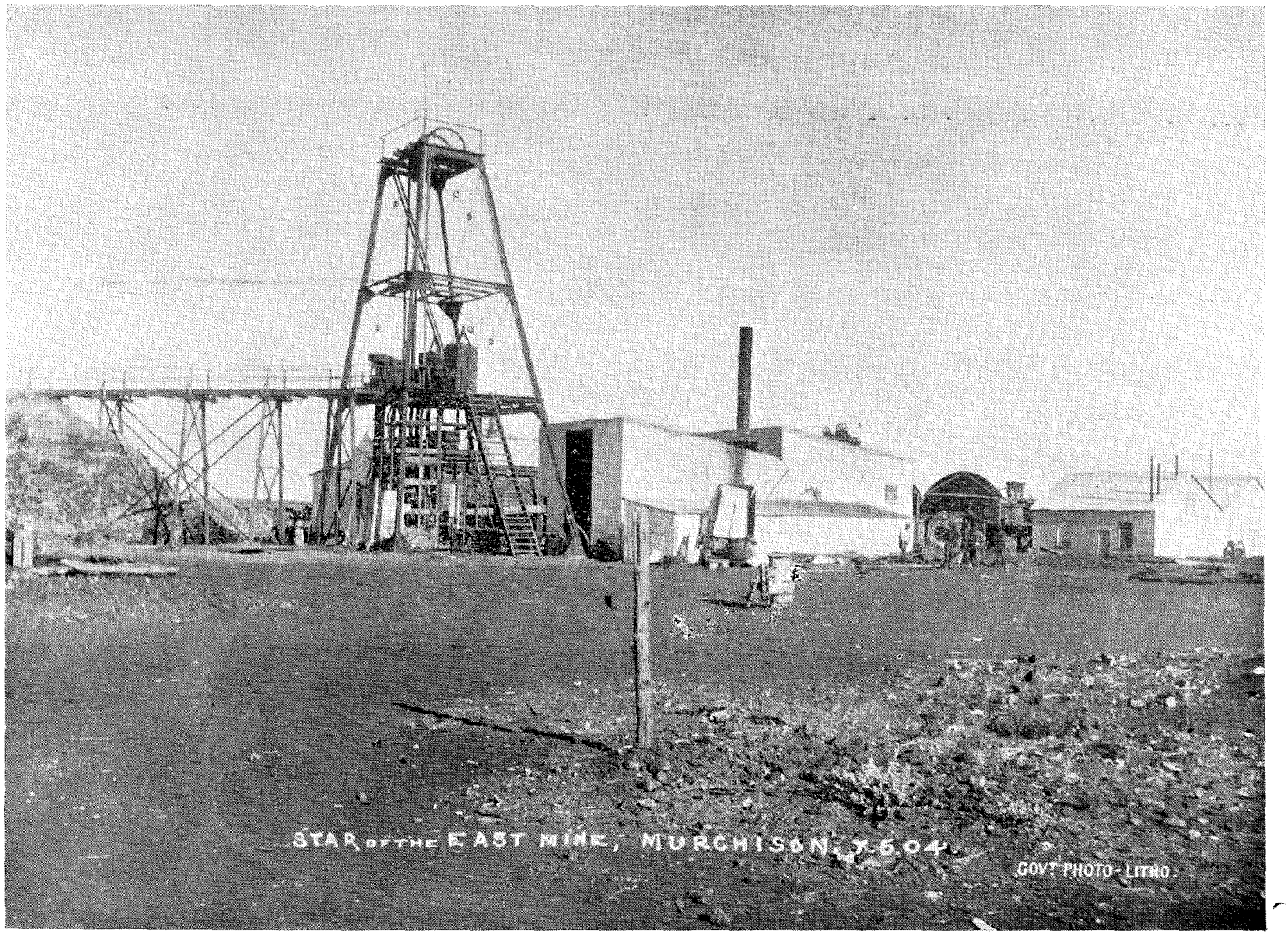
Fatalities, by falls of ground, a decrease of three (3); the number of injuries, an increase of one (1).

Fatalities, in shafts, show an increase of 11; and injuries, an increase of 15.

In Miscellaneous underground accidents three men less were killed in 1904, and 25 less injured.

On surface, one man less was killed, and five less injured.

More detailed references to accidents will be found in the report of the State Mining Engineer, and in the Mining Statistics, attached.



Star of the East Gold Mine, 1904.

NANNINE MURCHISON GOLDFIELD.

Part VI.—STATE AID TO MINING.

The expenditure in State aid—direct and indirect—to mining may be classified under the following heads:—(1) State Batteries; (2) State Smelting Works; (3) Assistance under the Mining Development Act, under which advances are made to assist companies and persons in developing and equipping mines, and boring for lodes and alluvial is carried out; (4) Water supply and track cutting; (5) Expenditure on the Geological survey.

State Batteries.

The first State battery was started towards the latter end of 1898, and since then the erection of batteries has been steadily proceeded with. At the close of 1904 there were 22 occupied in milling gold ores, and one in treating tin ore.

In connection with the above batteries 13 cyanide plants and one plant for the treatment of slimes have been erected, and were working at the end of the year.

Since the inception of the system 229,158 tons of gold ore have been crushed, of an average value of 1·18oz., giving a total value of £1,011,615; 104,022 tons of tailings have been treated by cyanide and gold recovered of a value of £94,718, while the tin ore treated has produced tin to the value of £9,761; the total value, therefore, of gold and tin turned out by these plants is £1,116,094.

During the year 1904, 71,617 tons of gold ore have been crushed, yielding £78,309; cyanide plants have treated 43,251 tons of tailings, returning 8,033ozs. of gold; and 2,337 tons of stanniferous ore have been crushed, returning 80 tons of black tin.

It is generally concluded that State Batteries have done a great deal towards opening up new goldfields in the State, and enabling prospectors to make a living, and sometimes a competence, in places where under other conditions this would have been impossible; they have also in a few cases led to the opening up of what promise to be permanent mines. When the system was first initiated it was supposed that the batteries would enable reefs to be thoroughly tested, and that once tested the owners would erect their own mills. Though this object has been attained in a few cases, the majority of the State Batteries are regularly used by the miners in the surrounding district for crushing their ore. They are in fact "customs" works, and do the work that in most other countries is undertaken by private enterprise.

From a commercial standpoint, the battery system cannot be said to have been a success; but it does not therefore follow that the expenditure has not been of great indirect benefit to the State. At the same time, it is open to argument whether, when a battery has ceased to be a testing plant and has become a "customs works," the charges should not be framed on such a scale as to cover working expenses and upkeep, and provide a reasonable amount for depreciation.

The following balance-sheet and profit and loss account show, approximately, the results to the end of 1904:—

State Batteries Balance-sheet, from inception of Scheme to 31st December, 1904.

To Capital Expenditure—	£	s.	d.	By Batteries Cyanide—	£	s.	d.
From Loan Funds	120,000	0	0	Plants, etc., as per valuation, 31st December, 1904	100,450	0	0
Do. Revenue	68,317	5	0	Gross Loss	123,819	5	3
Net Loss	35,952	0	3				
	£224,269	5	3		£224,269	5	3

Profit and Loss Account.

To Working Expenses—	£	s.	d.	By Stores on Hand—	£	s.	d.
Head Office and all batteries	248,534	9	6	Approximate value	6,000	0	0
Interest at 3½% and Sinking Fund 1% on expenditure from Loan Funds ...	21,223	5	2	Revenue received	229,604	19	8
Interest at 3½% on Capital Expenditure from Revenue	1,799	5	3	Balance (loss)	123,819	5	3
Depreciation on Plants as per balance-sheet	87,867	5	0				
	£359,424	4	11		£359,424	4	11

Full details of the year's work will be found in the report of the Superintendent of State Batteries.

State Smelting Works.

Early in the year the erection of a Government Smelter at Ravensthorpe, in the Phillips River Goldfield, was begun. Smelting commenced in October, and should stimulate the production of copper for the year 1905. Full details of the work of this smelter are given in Appendix 3 to the report of the State Mining Engineer.

Assistance under the Mining Development Act.

The following statement shows the sums that have been expended during the year under the Mining Development Act.

Advances made under "The Mining Development Act, 1902."

	£	s.	d.
1. Advances for Pioneer Mining, Part 2 of Act	996	16	1
2. Advances to Miners for Prospecting, Part 3 of Act	922	11	10
3. Subsidies to Private Crushing Plants, Part 4 of Act	2,207	13	1
4. Assistance for Boring, Part 5 of Act	1,053	5	5
5. Providing Camels and other means of transport for Prospectors, Part 6 (*d*) of Act	994	10	1
6. Drainage of Areas, Part 6 (*a*) of Act	57	0	9
7. Purchase of Boring Plants, Part 6, Sec. 26	1,089	5	2
	£7,321	2	5

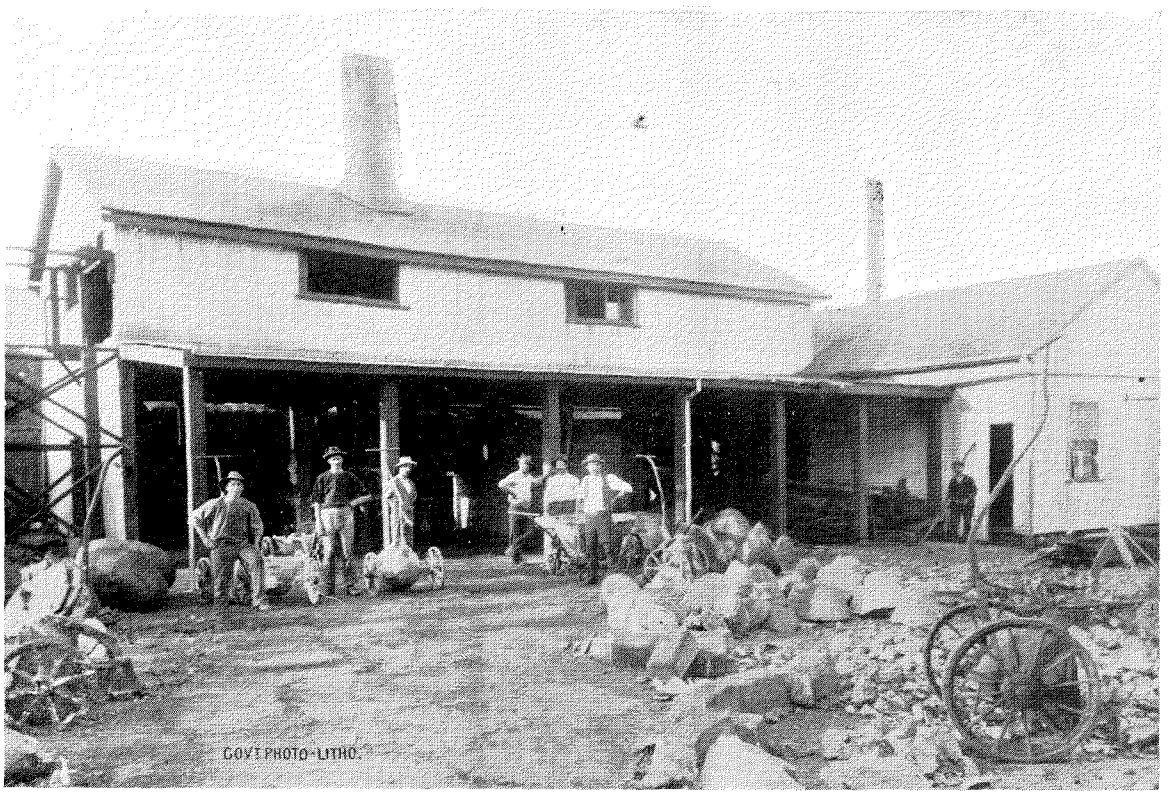
The sum of £65 was also paid to two parties on the Eastern field to assist them in making the necessary connections to the Coolgardie Water Scheme mains.

Full particulars concerning the various cases in which assistance has been given will be found in the report of the State Mining Engineer.

To the end of 1904 the total amount advanced and paid under this Act has been £20,245 0s 1d., and it cannot be said that the results are at all commensurate with the expenditure. So far no case can be pointed out in which money advanced for pioneer mining or to prospectors has resulted in opening up a good mine; and the boring done has disclosed no extensive deposits of alluvial. Further, in no case has the money advanced yet been repaid, though several small amounts have been realised by sale of plant taken as security.

Subsidies to private crushing plants have resulted in cheaper crushing charges to miners who otherwise would have been unable to test their reefs.

The camels belonging to the Department have been loaned to parties of prospectors who have otherwise equipped themselves, but though belts of mineral country have frequently been reported, so far no new mining centres have been opened up. It is quite probable, however, that the money spent in this way will bear fruit in the future, for information about promising localities becomes disseminated among prospectors, who will, when the country becomes more opened up, return to prospect the more promising mineral belts.



State Smelter, 1905.
PHILLIPS RIVER GOLDFIELD.

Creek close to State Smelter.
PHILLIPS RIVER GOLDFIELD.

PART VII.—REMARKS ON THE GOLDFIELDS AND MINING DISTRICTS, AND SUMMARIES OF WARDENS AND OTHER OFFICERS' REPORTS.

ASHBURTON GOLDFIELD.

The output for this field was 510 fine ounces, as against 904 fine ounces for the preceding year. Very little work or prospecting is being done.

BROAD ARROW GOLDFIELD.

The output of gold for the year under review was 22,180 fine ounces, as against 26,021 fine ounces for the preceding year; a decrease of 3,841ozs.

The only companies which did development work of note were the Slug Hill G.M. Co., Ltd., at Vettersburg, and the Broad Arrow Consols G.M. Co., N.L. Payable returns were obtained by tributers in two of the leases at Paddington, belonging to the New Standard Exploration Co., Ltd., and in the Hill End Mine at Broad Arrow. Mining matters in this field are, on the whole, quiet.

COLLIE MINING DISTRICT.

The output of coal for the year was 138,550 tons, as against 133,427 tons for the previous year; or an increase of 5,123 tons.

Three serious accidents occurred during the year, none of which were fatal.

COOLGARDIE GOLDFIELD.

The total output of this field was 63,200 fine ounces, as against 71,286 fine ounces for the previous year; a decrease of 8,086ozs. This is accounted for by the non-appearance for the year of the Burbanks Birthday Mine in the list of gold producers. Although the return of gold is smaller, there are now more leases and claims contributing to the output.

A considerable number of men continue to make a living obtaining alluvial gold.

The State Battery began operations during the year.

Very little work was done in prospecting for minerals other than gold.

It is expected that in the coming year the number of producing mines will be considerably increased.

DONNYBROOK GOLDFIELD.

Mining is still practically at a standstill in this field. No gold has been reported as won. The only company holding leases is the Donnybrook Goldfields, Ltd., and it is expected that this will shortly be wound up.

DUNDAS GOLDFIELD.

The progress during the year has been steady, and good development work has been carried out on nearly all the principal mines; but there were no new finds of any importance.

The gold output was 31,830 fine ounces, as against 33,846 fine ounces for the previous year; a decrease of 2,016ozs.

The State Battery treated during the year 3,213 tons for 4,085ozs., and 2,673 tons of sands were cyanided for 470ozs. fine gold. In April a townsite was proclaimed at Princess Royal, five miles north of Norseman. Several large companies are operating at this centre. The prospects of the field are good.

East Coolgardie Goldfield.

The gold output for the year was 1,050,923 fine ounces, as against 1,062,898 fine ounces for the preceding year; a decrease of 11,975ozs. A noticeable feature is the increase in the output of silver from the mines of this field, during the year 123,780 fine ounces of silver being reported.

The most sensational discovery was in the Hidden Secret lease, situated about three-quarters of a mile east of Kalgoorlie. It was formerly held by an English Company, and, after being abandoned by them, lay idle for a considerable time. At the beginning of 1903 it was taken up by a working syndicate, and after prospecting for about 18 months without obtaining payable results, their efforts were rewarded by the discovery of a very rich ore body at a comparatively shallow depth. The ore is of a refractory nature, necessitating its being sent to the Fremantle Smelters for treatment. There is a very large proportion of silver in the ore. The production from this lease for the year was 314 tons for 1,011ozs. gold and 4,516ozs. of silver. This discovery has led to vigorous prospecting of all the leases at the northern end of the field, and it is expected the results will be satisfactory.

Good progress has been made at Boorara, and the outlook for this centre is most promising.

East Murchison Goldfield.

The output for this field was 93,591 fine ounces, as against 87,278 fine ounces for the previous year; an increase of 6,313ozs.

During the year Black Range was declared a separate district, and a Mining Registrar's office opened there, which has been a great assistance to prospectors. The prospects of Black Range are very good. A promising discovery was made about 50 or 60 miles north from there, and near the Montague Range. A battery has been erected, and the outlook is promising.

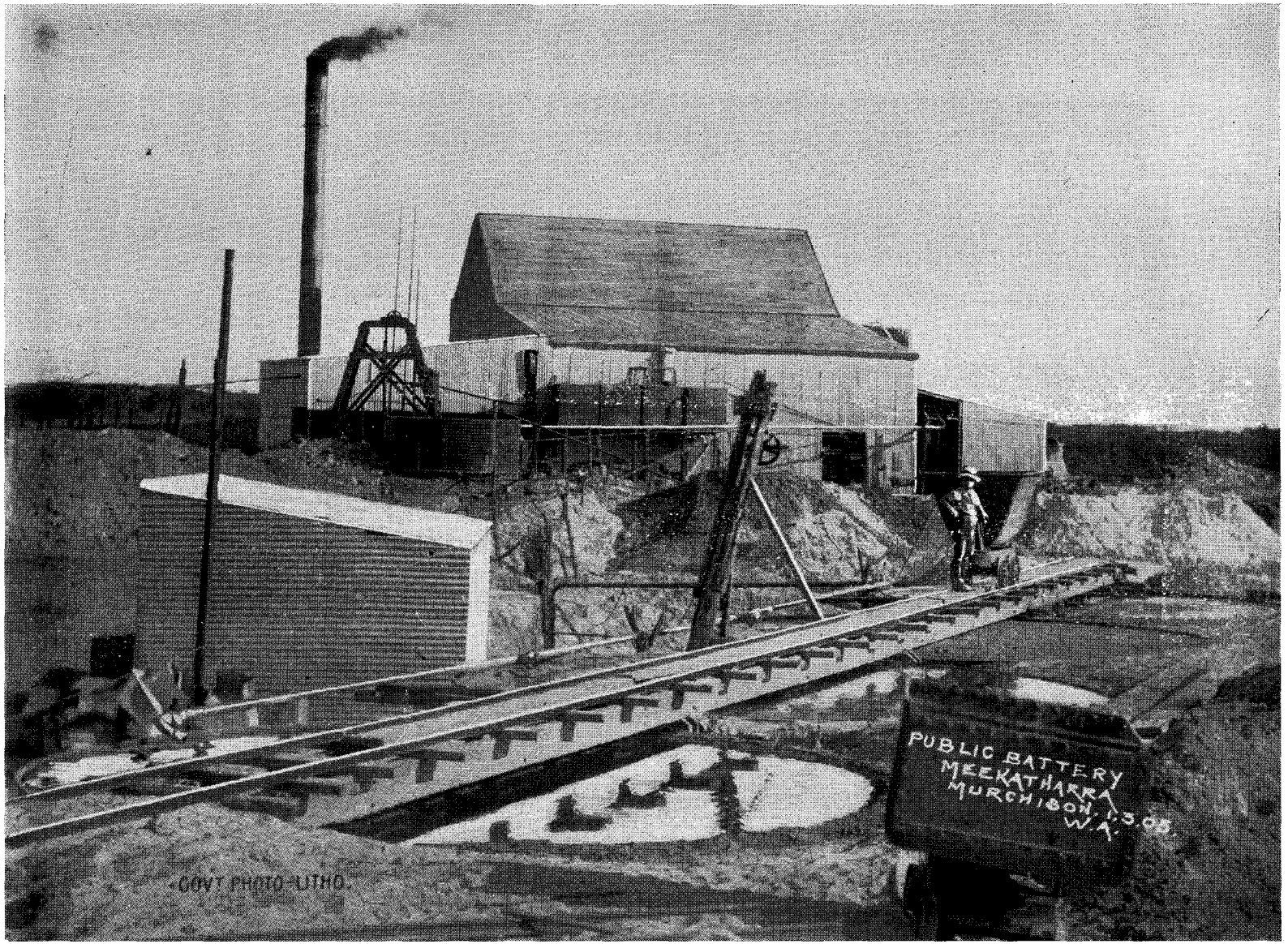
Gascoyne Goldfield.

No gold was reported for this or the preceding year, and the amount of prospecting carried on is very limited.

Greenbushes Mining District.

The output of block tin for the year was 534 tons valued at £34,462, as against 525 tons valued at £34,362 for the preceding year; an increase of 9 tons in the output. The local smelter shut down during the year, and has not since been reopened, which necessitates the miners having to send their tin away, and thus wait longer for their money, which has a detrimental effect on business generally. During the year there has been a marked improvement in the appliances used for extracting the tin from the wash dirt.

A syndicate has acquired a property at Three Seas Gully, about two miles south of Greenbushes, with a view to treating the low-grade sand (which exists in large



State Battery, 1905.

MEEKATHARRA, MURCHISON GOLDFIELD.

quantities) on a large scale. If they can treat the quantity of sand which they expect to, it should add materially to the output of tin.

The prospects of the field are encouraging, the claims and leases are principally in the hands of working owners, and good work is being done.

Kimberley Goldfield.

The output from this field was 206 fine ounces, as against 645 fine ounces for the preceding year.

Mining is practically at a standstill in this field.

Mount Margaret Goldfield.

The progress of this goldfield during the year has been satisfactory, the output being 183,523 fine ounces, as against 182,764 fine ounces for the previous year; an increase of 759ozs. Each year in its history this field has shown an advancement on its predecessor.

The largest and most consistent producing mines were the Sons of Gwalia, at Leonora, Hill's Mine at Murrin Murrin, the Westralia Mount Morgans at Mt. Morgans, and the Lancefield and Ida H. at Laverton. The Sons of Gwalia has attained a depth of 1,800 feet on the underlay. Prospecting has been vigorously carried out, and the results are apparent in the increasing number of leases being taken up. State batteries are in operation at Leonora, Laverton, and Burtville, and have been of considerable assistance to prospectors. Another is in course of erection at Duketon.

In every centre there has been good progress, and the outlook for the field is most promising.

Murchison Goldfield.

The output for the year was 214,403 fine ounces as against 204,182 fine ounces for the previous one, an increase of 10,221ozs.

Taken generally, there is no great variation in the business done.

The Great Fingall is still the premier producer, its output for the year being 156,702 fine ounces. Towards the end of the year several sensational crushings were reported from Meekatharra, and this has given a great impetus to prospecting in this locality. The employment of large numbers of men on the erection of the rabbit-proof fence has resulted in a certain amount of prospecting of the country passed through, and several promising discoveries have been made. The future prospects of this field are good.

Northampton and Yandanooka Mining Districts.

The mineral leases have now dwindled down to one at Geraldine, and no work has been done since March.

Inquiries have been made from time to time for likely copper and lead properties, but the inquirers are not willing to spend the amount of money necessary for the thorough examination of one mine. The prospects are not good unless a fair amount of capital be introduced.

North Coolgardie Goldfield.

The gold output for the year was 145,065 fine ounces as against 162,139 fine ounces for the previous one, a decrease of 17,074 ounces. This decrease is mainly attributable to the closing down of the Lady Shenton Mine. The State Batteries at Menzies, Mulwarrie, Mulline, Niagara, and Yundamindera have done good work. The one at Mt. Ida has not been kept going full time, and matters in that district are quiet.

Batteries are in course of erection at Yarri and Yerilla, the result of which, it is hoped, will be increased prosperity to both centres.

At Pingin, which at one time was practically deserted, mining has been active, and the prospects are encouraging. In September the discovery of a new goldfield 105 miles north-easterly from Victoria Springs was reported, but its remoteness and the scarcity of water prevents further investigation until next winter.

At Davyhurst matters have been very bright, and this district is a very promising one. The outlook for the field is good.

North-East Coolgardie Goldfield.

The output of this field was 50,955 fine ounces, as against 54,459 fine ounces for the preceding year, a decrease of 3,504 ounces. In the Kanowna district there has not been much alteration in mining matters since the close of the preceding year. Boring operations on the Main North Lead were still in progress at the end of the year.

In the Bulong district the general condition of mining has been much the same as the preceding year. In December an alluvial rush broke out at a spot about six miles north of the township, and at one time fully 500 men were on the spot. A large quantity of alluvial gold is supposed to have been recovered.

At Randall's mining has been active, and it is confidently anticipated that, when the proposed State Battery has been completed, a good future is assured.

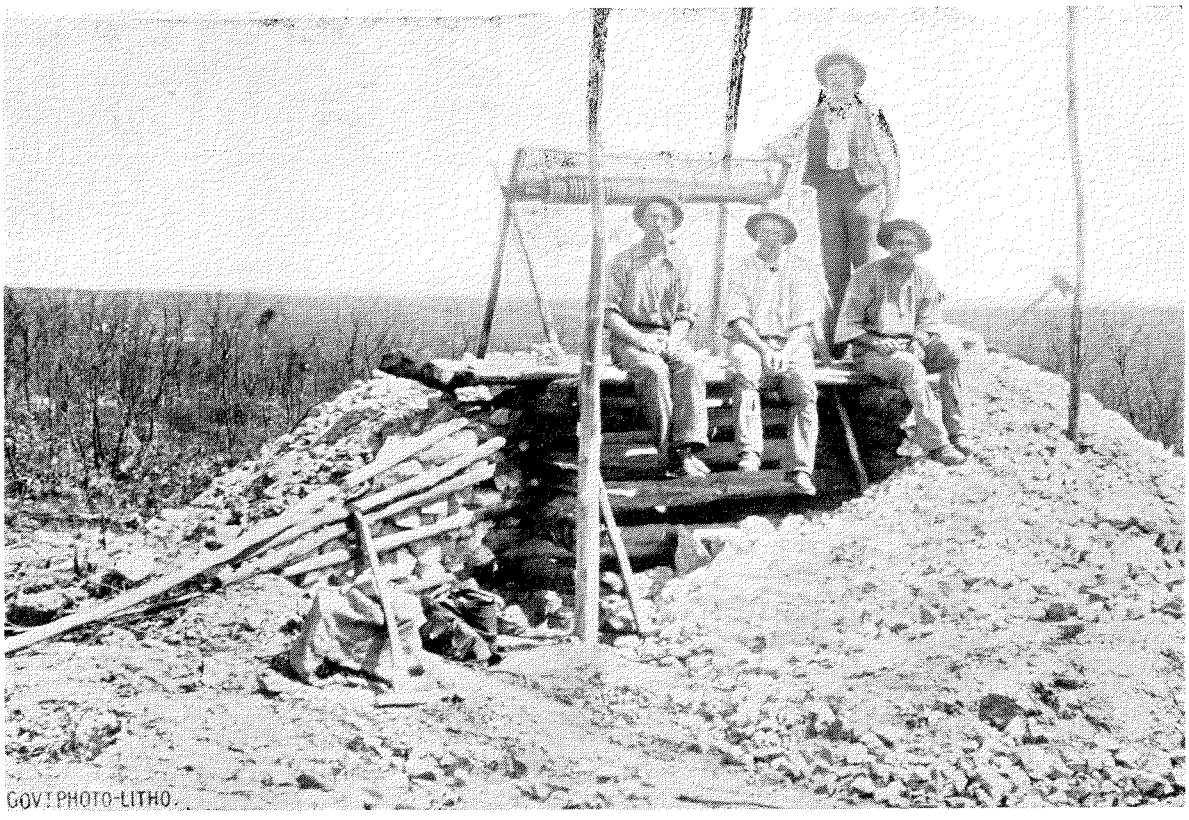
Peak Hill Goldfield.

The output from this field was 14,114 fine ounces, as against 31,750 fine ounces for the preceding year, a decrease of 17,636 ounces. There has not been any advance in mining during the year. The decrease in the gold production is attributable partly to the decreased production of the Peak Hill Goldfields, and partly to the State Battery being closed down for the greater part of the year, and to the ore mined being lower grade.

At the Horseshoe Mine there was a slight revival for a time, but it did not last long, and at present mining there is confined to one or two leases, in addition to which a few dryblowers are at work. It is hoped that the ensuing year will be more prosperous.

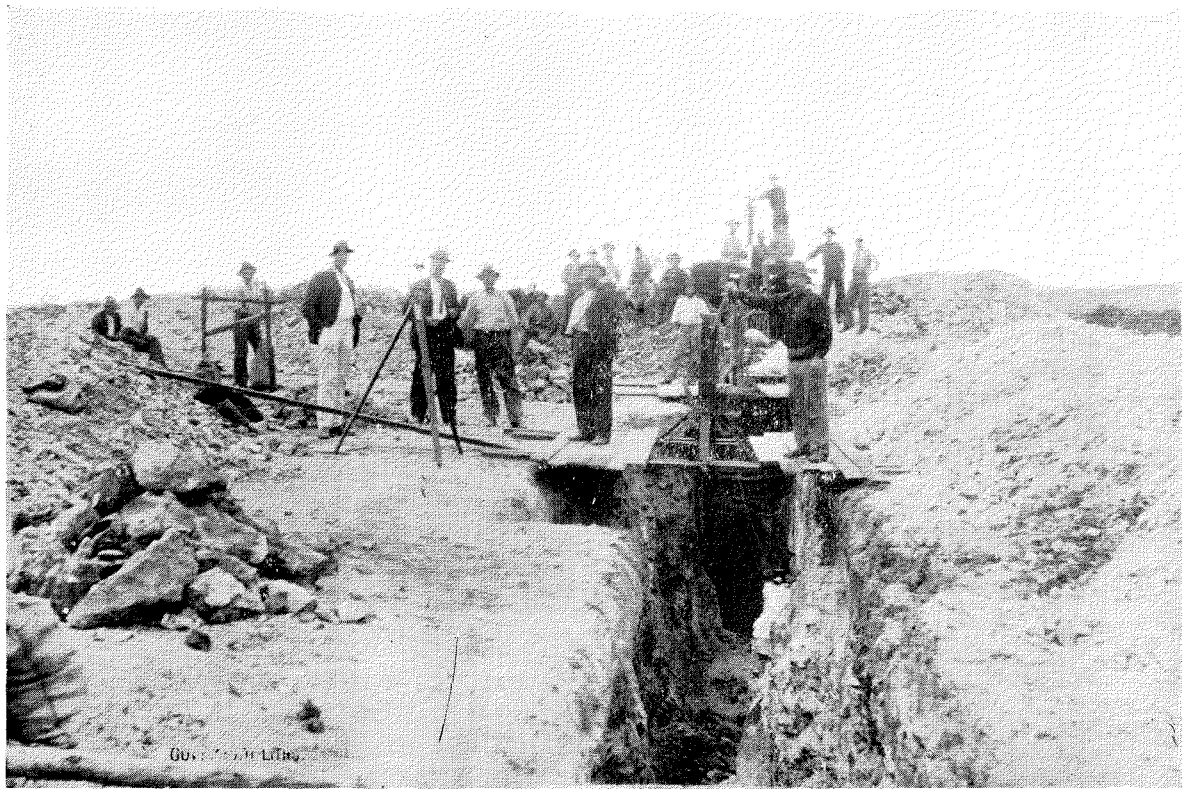
Phillips River Goldfield.

Gold mining during the year has, for various reasons, been quiet. The output was 4,017 fine ounces, as against 7,051 fine ounces for the preceding year, a decrease of 3,034 ounces. This field is principally dependent on its copper deposits. During the year the Government erected smelting works, and the treatment of ore was begun on the 18th October. On 31st December about 5,230 tons of ore had been purchased, and 1,415 tons smelted. The output of copper for the year was 3,469 tons, valued at



Grafter Gold Mine, 1905.

PHILLIPS RIVER GOLDFIELD.



Elverdton Copper Mine, 1905.

PHILLIPS RIVER GOLDFIELD.

£24,280, as against 1,561 tons, valued at £10,984 for the preceding year. Most of the leases are in the hands of prospectors, and the future prospects of the field are encouraging.

Pilbarra Goldfield.

The output of gold from this field was 8,030 fine ounces, as against 9,570 ounces for the previous year, a decrease of 1,540 ounces. This decrease is in a large measure attributable to the fact that the policy of the "British Exploration Co. of Australia, Ltd.," has, during the year, been directed to development work and the erection of additional plants on some of their mines that were hitherto producers. Also, the mines between Mosquito Creek and Nullagine have been handicapped, the want of natural feed for teams and stock preventing the carting of stone to the batteries, excepting at prohibitive prices. Tin mining was the mainstay of the district, the output being 321 tons, valued at £24,355, as against 292 tons, valued at £21,528, for the previous year. The market prices of the metal were also higher than in previous years. Prospecting for various minerals has been vigorously carried on. The population has remained about the same.

A State Battery is in course of erection at Twenty-Mile Sandy, and is expected to commence operations early in the new year. The outlook for the field is an encouraging one.

West Pilbarra Goldfield.

The output for this field was 3,428 fine ounces, as against 5,100 fine ounces for the previous year. Mining is very quiet.

Yalgoo Goldfield.

The output of gold from this field was 2,353 fine ounces, as against 3,138 fine ounces for the previous one, a decrease of 785 ounces. Mining matters have been very quiet, but hopes are entertained that the prospecting at present going on will result in an impetus being given to this district.

Yilgarn Goldfield.

The output of gold for the year was 25,509 fine ounces, as against 19,277 fine ounces for the previous one, an increase of 6,232 ounces. During the year several new finds were made, giving hopeful results. Most of the old mines near Southern Cross have practically stopped work, but the general opinion is, that with energetic development and the expenditure of capital, they would prove payable.

Reward leases to prospectors have been granted at Koolyanobbing, 35 miles North-East of Southern Cross, and at a spot 16 miles South-East of Southern Cross: they are reported to be good shows. The outlook for this field is a very encouraging one.

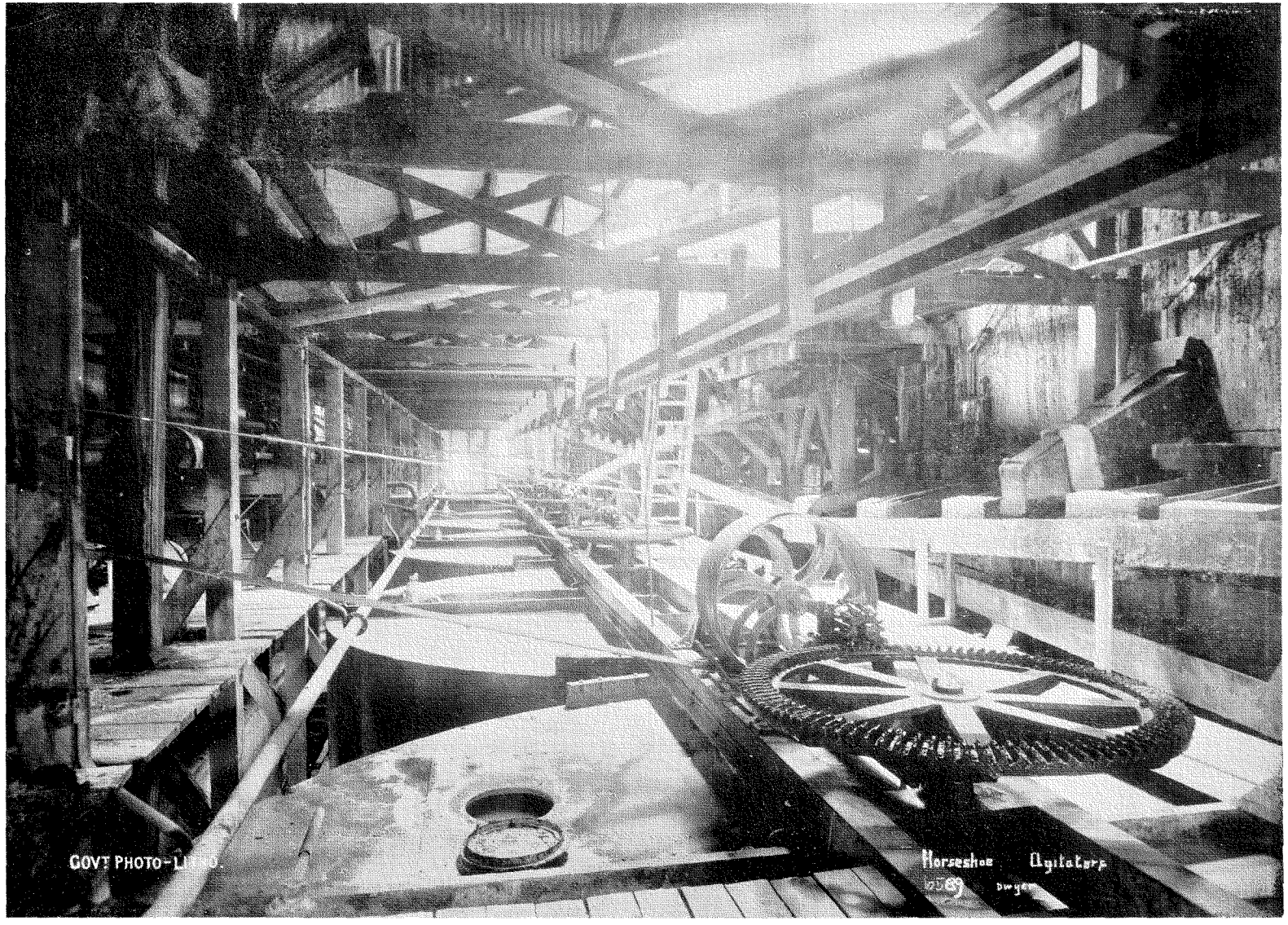
TABLE 24.

Value of Mining Machinery and Number of Stamps and other Mills, erected on the 31st December, 1904, compared with the previous Year.

Goldfield.	District.	Value of Mining Machinery.		Number of Stamps.		Number of other Mills.																						
						1903.											1904.											
		1903.	1904.	1903.	1904.	Ball Mills.	Griffin Mills.	Huntington Mills.	Prospecting Mills.	Tremain Mills.	Salford Mills.	Langley Mills.	Crushing Rollers.	Dry Crushers.	Puddlers.	Krupp Ball Mills.	Flint Mills.	Ball Mills.	Griffin Mills.	Huntington Mills.	Prospecting Mills.	Tremain Mills.	Salford Mills.	Langley Mills.	Crushing Rollers.	Dry Crushers.	Puddlers.	Krupp Ball Mills.	Flint Mills.
		£	£	£	£																							
1. Kimberley		5,500	5,500	25	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2. Pilbarra	Marble Bar	20,909	19,266	55	45	...	...	...	2	2	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
	Nullagine	20,162	15,900	50	40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3. West Pilbarra		4,700	3,500	20	20	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
4. Ashburton		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5. Gascoyne		...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Peak Hill		107,699	106,242	50	50	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
7. East Murchison	Lawlers	319,055	277,485	240	245	1	...	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...
	Black Range	8,725	11,106	10	15	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...
8. Murchison	Cue	52,384	41,650	110	90	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Nannine	98,040	93,789	199	204	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...
	Day Dawn	222,778	277,845	140	175	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Mt. Magnet	64,900	71,719	100	120	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...
9. Yalgoo		29,470	30,560	80	75	...	...	3	1	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...
10. Mt. Margaret	Mt. Morgans	258,362	163,012	90	90	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Mt. Malcolm	185,002	177,930	206	266	...	...	1	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...
	Mt. Margaret	142,398	105,455	195	150	...	...	...	2	...	...	...	...	1	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
11. North Coolgardie	Menzies	138,408	143,511	160	180	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	...	...	...	...
	Ularring	48,602	48,150	60	80	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Niagara	142,394	148,940	135	120	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	2	...	...
	Yerilla	28,187	32,163	45	55	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
12. Broad Arrow		118,212	91,855	210	220	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...	...	1	1	1	...
13. North-East Coolgardie	Kanowna	98,145	88,596	200	195	...	...	3	2	...	1	...	...	...	5	...	...	...	...	2	5	...	...	...	...	...	5	...	...
	Bulong	15,798	16,240	30	40	...	...	1	...	...	...	...	...	...	...	...	...	...	1	1	...	...	...	...	...	...	...	...	...
	Kurnalpi	550	250	5	5	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
14. East Coolgardie		1,699,702	1,711,935	590	655	28	32	4	...	...	...	...	8	1	1	...	6	11	25	8	1	...	...	...	6	1	4	39	13
15. Coolgardie	Coolgardie	219,972	220,564	376	359	...	...	...	2	...	...	...	2	1	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
	Kunanalling	33,985	36,087	135	140	2	...	...	1	1	...	...	...	...	...	...	...	2	...	...	1	1	...	...	...	1	...	...	...
16. Yilgarn		89,755	88,543	200	170	...	4	...	1	...	...	...	...	1	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...
17. Dundas		103,272	101,970	130	120	2	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	1	...	2	...	...	...
18. Phillips River		27,700	32,150	40	45	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
19. Donnybrook		11,500	10,000	5	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
State generally		96,000	65,000	60	...	1	...	...	1	...	...	...	3	1	...	...	...	1	...	...	...	...	...	...	2	1	...	...	...
Total Gold-extracting Machinery		4,412,266	4,236,913	3,951	3,999	36	36	13	24	9	2	...	13	5	6	*	6	14	29	15	23	6	1	1	8	6	12	40	13
Total Machinery, other than Gold-extracting		120,471	108,067	5	10	...	...	1	...	...	...	...	2	1	7	...	...	...	...	...	...	...	...	...	3	...	12	...	...
TOTAL MINING MACHINERY		4,532,737	4,344,980	3,956	4,009	36	36	14	24	9	2	...	15	6	13	*	6	14	29	15	23	6	1	1	11	6	24	40	13

* Krupp Ball Mills were shown in 1903 as Ball Mills.

NOTE.—The cause of decrease in the value of the Mining Machinery in 1904 may be put down to the fact that a considerable number of plants, notably the Seabrook Battery, at Northam, were dismantled, and either sold for re-erection elsewhere or stored. This return deals only with plants *fully* erected.



Agitators, Golden Horseshoe Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD.

Table 25.

Mining Revenue for the Years ending 31st December, 1903 and 1904.

Goldfields and Mining Districts.	Revenue-collecting Centres.	Lease Rental under Goldfields Acts.		Other Rentals under Goldfields Acts.		Receipts from all other sources under Goldfields Acts.		Lease Rental under Mineral Lands Acts.		Other Rentals under Mineral Lands Acts.		Receipts from all other sources under Mineral Lands Acts.		Survey Fees for Leases, Areas, etc.	
		1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.
		£ 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.
Kimberley ...	... ...	13 0 0	13 0 0	13 0 0	25 0 0	1 10 0	...	...	...	...	...	...	...	...	...
Yilgarn	... ...	1,150 8 0	755 4 0	184 1 6	117 2 9	53 2 0	67 12 0	5 8 0	15 0 0	...	...	...	...	525 12 0	163 11 0
Pilbarra ...	M'ble Bar, Nullagine	494 10 9	447 2 9	253 17 9	211 10 6	51 18 6	73 11 6	37 7 6	34 10 0	50 7 6	4 5 0	2 2 6	0 5 0	183 11 0	103 10 0
Ashburton ...	... ...	12 19 0	...	14 17 6	11 5 0	0 5 0	...	...	...	...	...	...	...	...	0 2 0
Murchison	Cue, Nannine, DayDawn, Mt.M'gnet	4,411 19 0	3,114 17 3	751 15 3	496 16 6	291 16 0	405 5 7	2 10 0	3 17 6	4 0 0	2 12 6	1 0 0	...	977 1 0	947 7 0
Dundas	... ...	854 19 6	875 11 6	327 6 11	199 12 0	71 17 6	69 0 0	1 13 0	1 10 0	...	...	...	...	281 7 0	170 3 0
Coolgardie ...	Coolgardie	3,240 14 9	2,815 9 0	398 8 0	322 14 9	223 10 0	254 17 3	4 14 0	10 15 0	0 5 0	1 10 0	...	...	694 11 0	454 0 0
E. Coolgardie ...	Kalgoorlie	3,591 14 9	3,386 6 3	1,165 13 9	771 14 6	317 2 6	363 8 5	42 5 6	35 2 6	10 10 0	1 0 0	4 8 0	...	485 15 0	636 10 0
Yalgoo	... ...	321 14 3	258 11 9	73 2 6	77 10 3	39 17 6	17 16 6	...	...	...	0 5 0	...	...	58 11 0	48 10 0
N. Coolgardie	Menzies, Ularring, Yerilla, Niagara	5,247 3 6	4,421 15 6	949 15 6	645 10 0	541 15 6	233 5 6	15 4 3	19 13 0	0 10 0	0 5 0	0 12 6	0 12 6	1,105 15 0	842 13 6
E. Murchison	Lawlers, B'k Range	3,017 7 9	3,218 1 0	652 17 3	363 5 3	148 8 0	259 10 0	1 5 0	3 6 0	4 10 0	0 10 0	2 0 0	...	848 18 0	686 3 0
W. Pilbarra ...	... ...	72 12 0	90 19 6	106 10 0	48 15 0	2 13 0	0 7 0	75 15 0	51 8 6	3 10 0	0 14 6	2 5 0	0 5 0	21 0 0	20 10 0
N.E. Coolgardie	Kanowna, Bulong, Kurnalpi	2,501 4 9	1,899 17 0	487 11 8	309 6 6	268 16 9	242 1 9	...	...	...	...	...	...	803 11 0	471 10 0
Broad Arrow ...	... ...	1,111 12 0	1,002 7 0	204 13 3	136 10 3	180 17 6	65 4 0	...	14 0 0	1 0 0	0 10 0	...	1 6 6	136 0 0	154 10 0
Peak Hill ...	... ...	766 15 0	548 14 7	239 7 0	178 15 0	42 2 6	157 14 0	16 0 0	...	...	...	...	...	66 13 0	95 0 0
Mt. Margaret	Laverton, Malcolm, Morgans	2,223 12 9	1,720 0 6	359 15 3	317 1 0	174 10 6	166 13 6	3 0 0	1 13 0	1 10 0	...	...	0 5 0	548 4 0	436 3 0
	Malcolm ...	2,157 12 9	2,042 14 9	405 3 2	464 0 1	143 10 9	119 14 0	87 9 9	38 15 6	5 0 0	0 10 0	6 0 0	3 12 6	378 3 0	527 0 0
	Morgans ...	723 17 6	640 13 6	182 14 9	156 8 3	19 10 6	78 7 6	1 13 0	...	...	...	...	...	154 10 0	285 6 0
Gascoyne ..	... ...	...	11 5 0	...	4 5 0	...	0 12 0	...	...	...	...	...	...	...	13 10 0
Phillips River ...	... ...	397 19 9	275 0 0	68 5 0	60 12 0	35 5 0	24 1 6	385 11 9	213 13 0	28 12 9	3 5 0	38 15 6	27 18 6	255 10 0	145 0 0
Greenbushes ...	... ...	329 11 6	133 12 6	5 10 0	3 0 0	...	1 5 0	244 12 3	162 0 9	194 3 6	131 9 6	62 13 6	71 6 0	164 0 0	156 10 0
Collie	... ...	1 0 0	0 6 0	3 0 0	2 15 0	1 5 0	0 2 6	1,089 0 6	1,033 16 0	3 0 0	...	2,350 2 11	1,807 15 7	35 0 0	15 10 0
Northampton ...	... ...	...	...	...	...	...	0 7 6	229 8 9	14 0 0	3 10 0	...	13 7 6	4 6 0	169 10 0	8 0 0
Head Office, Perth	... ...	54 0 0	18 10 0	89 13 6	59 8 0	34 6 0	46 16 0	10 10 0	74 0 0	27 12 6	14 7 6	...	2 15 0	104 10 0	74 10 0
Totals ...	... ...	32,696 9 3	27,689 19 4	6,936 19 6	4,982 17 7	2,644 0 0	2,647 13 0	2,253 8 3	1,727 9 0	338 1 3	161 4 0	2,483 7 5	1,920 7 7	7,997 12 0	6,457 6 6

TABLE 25.—*Mining Revenue for the Years ending 31st December, 1903 and 1904*—continued.

Goldfields and Mining Districts.	Revenue-collecting Centres.	Examination fees Underground Surveyors and Engine-drivers.		Exemption fees Leases, Areas, etc.		Fees under Boiler Inspection Act.		Receipts from Public Batteries.		Receipts from all other sources.		Total.		Increase or Decrease for 1904 compared with 1903.	
		1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	Increase.	Decrease.
		£ 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.
Kimberley ...	... ...	...	...	1 0 0	...	...	...	...	...	...	0 4 6	28 10 0	**38 4 6**	9 14 6	...
Yilgarn ...	... ...	8 15 0	5 17 6	54 8 0	62 12 0	...	54 0 0	216 2 0	2,439 11 8	9 5 6	5 4 6	2,207 2 0	**3,685 15 5**	1,478 13 5	...
Pilbarra {	M'ble Bar }	5 10 0	...	82 13 0	104 18 0	...	...	...	...	2 19 9	8 9 6	1,164 18 3	**988 2 3**	...	176 16 0
	Nullagine }														
Ashburton ...	... ...	...	...	7 6 0	...	...	...	...	...	0 2 6	0 2 0	35 10 0	**13 7 0**	...	22 3 0
Murchison {	Cue }	34 15 0	34 10 0	543 3 0	491 1 0	347 0 0	324 0 0	13,092 11 6	10,587 9 2	16 12 9	21 18 3	20,474 3 6	**16,429 14 9**	...	4,044 8 9
	Nannine }														
	Day Dawn }														
	Mt. M'gn't }														
Dundas ...	... ...	21 5 0	13 12 6	91 1 0	229 18 6	61 10 0	18 10 0	5,333 18 6	3,151 10 0	3 18 0	4 14 6	7,048 16 5	**4,734 2 0**	...	2,314 14 5
Coolgardie ...	Coolgardie	35 10 0	17 15 0	333 1 0	267 4 0	317 10 0	360 15 0	484 5 11	2,889 10 5	10 18 3	12 0 0	5,743 7 11	**7,406 10 5**	1,663 2 6	...
E. Coolgardie...	Kalgoorlie	49 5 0	62 14 6	329 10 0	266 0 6	819 15 0	797 0 0	...	...	41 6 3	48 1 3	6,857 5 9	**6,727 17 11**	...	129 7 10
Yalgoo ...	... ...	...	...	17 16 0	36 18 0	...	...	...	...	1 7 3	2 5 3	512 8 6	**441 16 9**	...	70 11 9
N. Coolgardie {	Menzies }	34 17 6	20 0 0	337 5 0	657 7 0	20 0 0	3 0 0	22,878 9 6	25,264 10 11	17 6 3	20 8 3	31,148 14 6	**32,129 1 2**	980 6 8	...
	Ularring }														
	Yerilla }														
	Niagara }														
E. Murchison...	... ...	18 7 6	80 17 6	205 8 0	426 16 6	5 10 0	71 15 0	4,755 14 9	8,176 12 11	9 9 3	10 1 0	9,669 15 6	**13,296 18 2**	3,627 2 8	...
W. Pilbarra ...	... ...	...	...	5 4 0	11 18 0	...	...	...	...	5 6 9	1 18 0	294 15 9	**226 15 6**	...	68 0 3
N.E. Coolgardie {	Kanowna }	...	...	256 11 0	157 13 6	30 10 0	5 10 0	...	...	6 14 6	9 12 0	4,354 19 8	**3,095 10 9**	...	1,259 8 11
	Bulong }														
	Kurnalpi }														
Broad Arrow ...	... ...	...	...	57 19 0	208 8 0	53 0 0	...	46 17 9	...	2 16 0	2 16 6	1,794 15 6	**1,585 12 3**	...	209 3 3
Peak Hill ...	... ...	26 0 0	14 15 0	110 19 0	137 4 0	21 10 0	17 15 0	55 19 6	197 18 0	1 13 0	3 8 0	1,346 19 0	**1,351 3 7**	4 4 7	...
Mt. Margaret {	Laverton ...	10 7 6	12 5 0	178 9 0	89 15 0	...	...	3,713 10 4	4,579 9 7	5 9 6	7 16 3	7,218 8 10	**7,331 1 10**	112 13 0	...
	Malcolm ...	23 2 6	15 5 0	172 0 0	92 10 0	441 5 0	492 0 0	2,206 10 10	6,050 13 0	7 14 0	6 6 11	6,033 11 9	**9,853 1 9**	3,819 10 0	...
	Morgans ...	...	...	39 11 0	89 5 0	6 10 0	...	...	...	5 9 0	2 17 0	1,133 15 9	**1,252 17 3**	119 1 6	...
Gascoyne ...	... ...	...	...	...	...	...	...	...	...	...	...	...	**29 12 0**	29 12 0	...
Phillips River	... ...	19 5 0	...	34 16 0	47 1 0	...	...	...	...	3 19 6	4 1 6	1,268 0 3	**800 12 6**	...	467 7 9
Greenbushes ...	... ...	...	...	208 14 0	109 0 6	...	...	686 18 8	792 5 7	4 1 0	2 13 0	1,900 4 5	**1,563 2 10**	...	337 1 7
Collie	... ...	26 15 0	7 15 0	98 18 0	160 16 0	...	...	...	...	8 1 3	0 13 0	3,616 2 8	**3,029 9 1**	...	586 13 7
Northampton...	... ...	...	...	9 7 0	23 8 0	...	...	...	...	1 6 2	0 8 6	426 9 5	**50 10 0**	...	375 19 5
Head Office, Perth	... ...	35 12 6	38 15 0	11 2 6	10 0 0	1,156 11 7	1,183 10 0	75 0 0	...	437 16 9	844 16 11	2,036 15 4	**2,367 8 5**	330 13 1	...
		349 7 6	324 2 0	3,186 1 6	4,039 14 6	3,280 11 7	3,327 15 0	53,545 19 3	64,129 11 3	603 13 2	1,020 16 7	116,315 10 8	**118,428 8 1**	12,174 13 11	10,061 16 6

Flint Mills, Golden Horseshoe Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD.

PART VIII.—EXISTING LEGISLATION.

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

(1.) The Mining Act, 1904.
(2.) The Sluicing and Dredging for Gold Act, 1899.
(3.) The Mines Regulation Act, 1895.
(4.) The Mines Regulation Amendment Act, 1899.
(5.) The Sunday Labour in Mines Act.
(6.) The Mining Development Act, 1902.

In the year 1902 the number of Acts in force was 12, and it is apparent that the passing of the Mining Act, 1904, materially reduced their number. During the year 1905 it is proposed to introduce a Consolidating Mines Regulation Bill which, if passed, will repeal the Acts numbered (3.) (4.) and (5.) above.

The Mining Act, 1904, some of the most important provisions of which were referred to in the last report, has been in operation since March 1st, 1904, and has worked satisfactorily. The provisions regarding exemption as of right have been largely taken advantage of, and appear to have given satisfaction to leaseholders generally.

PART IX.—EXAMINATIONS HELD UNDER THE MINES REGULATION ACT AND THE COAL MINES REGULATION ACT.

ENGINE-DRIVERS' EXAMINATIONS.

TABLE 26.

Number of Examinations for Learners' Permits and Certificates of Competency and Service, held by the several Local Boards on the Goldfields and in Perth, with details of the several Classes of Certificates issued during 1904.

Goldfield.	Place of Examination.	Number of Examinations.	Learners' Permits.	Interim.		Competency.		Service.		Copies.
				Second Class.	First Class.	Second Class.	First Class.	Second Class.	First Class.	
Peak Hill	1. Peak Hill	2	...	...	1	4	3	1	...	...
East Murchison ...	2. Lawlers	1	2	...	2	4	1	...	1	3
Do.	3. Wiluna (Lake Way)	2	...	...	...	5	...	...	...	...
Murchison	4. Cue	2	...	4	4	8	1	...	2	...
Mt. Margaret	5. Mt. Malcolm ...	2	...	...	2	2	2	2	...	2
Do.	6. Laverton	1	3	...	...	...	2	...	...	1
North Coolgardie ...	7. Menzies	2	9	4	3	2	1	...	1	3
East Coolgardie ...	8. Kalgoorlie	2	1	13	2	14	5	3	2	5
Coolgardie	9. Coolgardie	2	4	1	...	4	3	1	1	2
Yilgarn	10. Southern Cross ...	1	3	2	...	1	1	...	...	1
Dundas	11. Norseman	2	4	...	...	5	1	...	...	2
	12. Collie	3	1	...	...	1	...	1	1	...
	13. Perth (Head Office)	4	...	2	...	7	...	1	1	9
	Total	26	27	26	14	57	20	9	9	28

The chairman of the Board of Examiners reports that 26 meetings were held during the year and 331 applications for various classes of certificates were received and dealt with. Full details are given in the report of the chairman.

PART X.—INSPECTION UNDER "STEAM BOILERS ACT."

The report of the Chief Inspector of Boilers, which is given in full elsewhere, shows that the increase in the number of boilers registered in 1904, as compared with 1903, is 150, and that among those registered during the year are 10 of local manufacture.

It is satisfactory to note that no explosions occurred during the year, and only two minor accidents, which were unattended with serious bodily injury.

In four cases proceedings were taken for breaches of the Act and small penalties inflicted. Eighty-seven boilers, or 3·08 per cent. of those inspected were temporarily, and 11, or 369 per cent. of those inspected, permanently condemned.

In all eight inspectors are employed under the Act: four in the South-Western Division of the State, and four on the goldfields. An immense amount of travelling is involved, and the expense of inspection is proportionately high, especially on the goldfields where long journeys have to be taken by road. The revenue collected was £3,327 15s., and the expenditure £5,096 18s. 1d., the cost of inspection to the State thus being £1,769 5s. 1d.

Towards the close of the year the "Inspection of Machinery Act" was passed by Parliament, and on its proclamation will supersede the "Steam Boilers Act." It provides not only for the inspection of boilers, but for regulation and inspection of machinery in factories and on most of the river and harbour steamers. It also provides for the granting of various classes of engine-drivers' certificates.

PART XI.—SCHOOL OF MINES.

The Director's report for the year is a satisfactory one, and though the School was only opened at Kalgoorlie towards the latter end of 1903 the attendance for the year 1904 has been encouraging, the average number of individual students being 133.

Six scholarships have been offered annually—three junior scholarships of the annual value of £40 for three years, with remission of class fees, tenable for a fourth year under certain conditions; two entrance scholarships of the annual value of £60 for three years, with remission of class fees; and one senior scholarship of the annual value of £75, with remission of class fees. With the exception of one entrance and one junior scholarship these scholarships are tenable at either the Perth Technical School or the School of Mines.

The School is well equipped, has an ample staff, and doubtless will, on account of its situation on a goldfield—which from the peculiarities of the occurrence of its gold and the varied treatment plants that have been erected affords so many object lessons of value—attract year by year an increasing number of students.

Brown Hill Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD.

PART XII.—DEPARTMENTAL.

TABLE 27.

Return showing Revenue and Expenditure for the Years 1903 and 1904.

FIELD.	Revenue, 1903.	Percentage of gross Revenue, 1903.	Revenue, 1904.	Percentage of gross Revenue, 1904.	Expenditure, 1903.	Percentage of gross Expenditure, 1903.	Expenditure, 1904.	Percentage of gross Expenditure, 1904.
	£ s. d.		£ s. d.		£ s. d.		£ s. d.	
Ashburton ...	35 10 0	·05	13 7 0	·03	309 14 6	·58	...	...
Broad Arrow ...	1,747 17 9	2·78	1,585 12 3	2·92	533 9 7	·96	578 11 3	1·00
Coolgardie ...	5,259 2 0	8·38	4,517 0 0	8·32	3,577 17 8	6·48	3,942 2 1	6·82
East Coolgardie ...	6,857 5 9	10·9	6,727 17 11	12·39	3,281 11 11	5·94	3,911 16 9	6·76
North Coolgardie	8,270 5 0	13·17	6,864 10 3	12·64	4,931 2 6	8·93	4,111 15 8	7·105
N.E. Coolgardie ...	4,354 19 8	6·9	3,095 10 9	5·70	2,321 6 4	4·2	1,888 19 9	3·26
Dundas	1,714 17 11	2·7	1,582 12 0	2·91	1,268 2 7	2·3	968 4 2	1·68
Gascoyne	...		29 12 0	·05	50 0 0	·09	...	...
Kimberley ...	28 10 0	·04	38 4 6	·07	23 0 0	·04	3 0 0	·005
Mt. Margaret ...	8,465 15 2	13·5	7,806 18 3	14·37	4,747 7 10	8·6	4,185 16 0	7·23
Murchison ...	381 12 0	11·76	5,842 5 7	10·75	4,979 17 0	9·02	4,479 9 0	7·74
East Murchison ...	4,914 0 9	7·9	5,120 5 3	9·42	2,112 7 4	3·82	2,818 13 2	4·87
Peak Hill	1,290 19 6	2·06	1,153 5 7	2·12	942 19 4	1·7	809 16 10	1·39
Pilbarra	1,164 18 3	1·9	988 2 3	1·82	1,743 0 2	3·15	1,894 15 1	3·27
West Pilbarra ...	294 15 9	·47	226 15 6	·41	14 17 6	·03	7 0 0	·01
Yalgoo	512 8 6	·81	441 16 9	·81	445 2 4	·8	664 7 5	1·15
Yilgarn	1,991 0 0	3·17	1,246 3 9	2·29	876 0 6	1·6	764 10 1	1·32
Phillips River ...	1,268 0 3	2·02	800 12 6	1·50	679 10 9	1·23	973 0 11	1·68
Collie	3,616 2 8	5·76	3,029 9 1	5·58	356 13 4	·65	219 14 9	·38
Northampton ...	426 9 5	·68	50 10 0	·09	143 0 0	·26	154 10 8	·27
Greenbushes ...	1,213 5 9	1·93	770 17 3	1·45	546 0 10	·99	498 16 4	·86
Head Office ...	1,961 15 4	3·12	2,367 8 5	4·36	21,334 15 11	38·63	25,001 0 11	43·20
	62,769 11 5	100	54,298 16 10	100·00	55,217 17 11	100·	57,876 0 10	100·00

Revenue and Expenditure under "State Batteries," and Expenditure under "Purchase of Ore" and "Mines Water Supply," not included in above figures.

NOTE.—The above figures include "Revenue and Expenditure" under "Mining Schools" and "Steam Boilers," as per summary hereunder:—

—	Revenue, 1903.	Revenue, 1904.	Expenditure, 1903.	Expenditure, 1904.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
"Mining Schools" ...	390 2 1	813 3 3	2,913 13 1	4,868 12 10
"Steam Boilers"	3,280 11 7	3,327 15 0	4,959 16 11	5,096 18 1

TABLE 28.

Showing the Number of Registrars' Offices, also the Number of Officers on Goldfields and Mining Districts.

FIELD.	No. of Wardens.		No. of Registrars' Offices.		No. of Mining Registrars.		No. of Clerks.		Survey Staff.		No. of Inspectors of Mines.		No. of Clerks to Inspectors of Mines and Boilers.		No. of Inspectors of Boilers.	
	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.	1903.	1904.
Ashburton *a*	1	1	1	...	1	...	...	...	...	...	...	...	...	...	...	...
Broad Arrow *b* ...	...	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Coolgardie	1	1	1	1	1	1	1	1	2	2	1	1	...	...	1	1
East Coolgardie *c* ...	...	...	1	1	1	1	1	1	1	1	2	2	1	1	1	1
North Coolgardie ...	1	1	3	3	3	3	1	...	1	1	1	1	...	...	...	...
North-East Coolgardie *c*	...	...	2	2	2	2	1	1	...	...	1	1	1	...	...	...
Dundas	1	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Gascoyne *a*	1	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Kimberley *d*	1	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Mount Margaret ...	1	1	3	3	3	3	1	1	1	1	1	1	1	1 *l*	1	1 *l*
Murchison	1	1	3	3	3	3	1	1	1	1	1	1	1	...	1	1
East Murchison ...	1	1	1	2	1	2	...	...	...	...	...	...	...	...	...	...
Peak Hill *e*	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...
Pilbarra	1	1	2	2	2	2	...	...	1	1	...	...	...	...	...	...
West Pilbarra *f* ...	1	1	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Yalgoo *g*	...	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Yilgarn *c*	...	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Collie *h*	...	1	1	1	1	...	...	...	...	...	1	1	...	...	...	...
Northampton	...	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...
Greenbushes *h*	...	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...
Donnybrook *i*	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Phillips River *k* ...	1	1	1	1	...	...	...	...	...	...	...	...	...	...	...	...
Totals ...	13	15	28	28	27	24	6	5	7	7	8	8	4	2	4	4

a The Ashburton and Gascoyne Goldfields are controlled by Acting Wardens, who carry out, in addition, the duties of Registrars, their head-quarters being at Onslow and Carnarvon respectively. *b* The Warden of the North Coolgardie Goldfield acts as Warden of the Broad Arrow Goldfield. *c* The Warden of the Coolgardie Goldfields acts as Warden of these fields. *d* The Deputy Mining Registrar also acts as Warden. *e* The Warden also carries out the duties of Registrar. *f* Acting Warden in addition to his duties as Resident Magistrate. *g* Warden of the Murchison Goldfield also acts as Warden of Yalgoo field. *h* The Warden also acts as Registrar. *i* Worked from Greenbushes. *k* Warden also carries out the duties of Registrar. *l* The Inspector of Boilers for Mount Margaret Goldfield also acts for North Coolgardie Goldfield. The duties of Clerk also cover both these Goldfields, the head-quarters being Mount Malcolm.

Officers employed at Head Office.

Table 29.

Return showing Number of Officers employed at Head Office.

Branch.	1903.	1904.
Clerical...	Chief Clerk, 9 Clerks, and 3 Messengers ...	Chief Clerk, 11 Clerks, and 3 Junior Clerks
Accountants	Chief Accountant, 7 Clerks, and a Junior Clerk	Chief Accountant, 9 Clerks, and a Junior Clerk
Drafting	Chief Draftsman, 7 Draftsmen, 1 Junior Draftsman, Plan Mounter, and Typographical Printer	Chief Draftsman, 6 Draftsmen, 1 Junior Draftsman, Plan Mounter, and Typographical Printer
Registration	Inspecting Registrar, Registrar, and 6 Clerks	Inspecting Registrar, Registrar, 6 Clerks, and Junior Clerk
Statist	Statist, and 3 Clerks	Statist, and 4 Clerks
Survey	Inspecting Surveyor, Draftsman, and 2 Junior Draftsmen	Inspecting Surveyor, Draftsman, and 2 Junior Draftsmen
State Batteries ...	Superintendent, and 2 Clerks	Superintendent, and 3 Clerks
Steam Boilers... ...	Chief Inspector, 4 Clerks, and 3 Assistant Inspectors	Chief Inspector, 4 Clerks, and 3 Assistant Inspectors

Correspondence.

Table 30.

Letters, Telegrams, etc., dispatched during 1904.

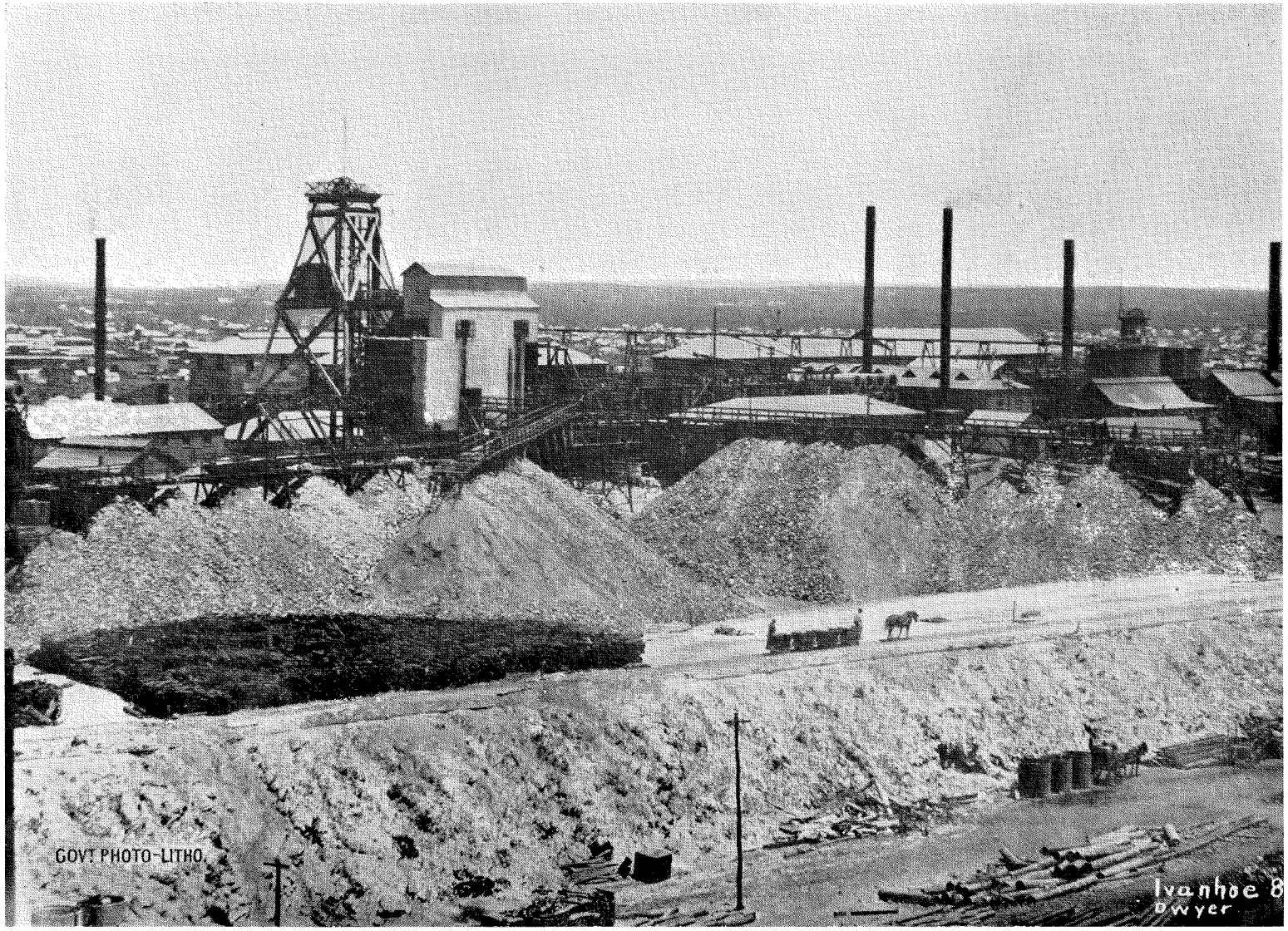
Branch.	Letters.	Telegrams.	Circulars' and Advices.	Statistics and Publications.	Total.
				*	
Analytical and Explosives...	2,018	81	...	...	2,099
Chief Accountant	5,411	160	4,234	...	9,805
Correspondence	8,045	1,012	4,139	11,700	13,196
Drafting	249	10	...	...	259
Geological Survey	981	33	...	2,433	1,014
Inspection of Machinery ...	4,445	248	17	60	4,710
Mines Water Supply ...	3,896	675	8	...	4,579
Registration	6,529	456	...	...	6,985
State Batteries	3,677	211	31	...	3,919
Statistical	432	166	1,190	8,200	1,788
Survey	559	18	...	...	577
				*	
	36,342	3,070	9,619	22,393	49,031

* The figures in this column are not included in the totals column.

Inward Correspondence.

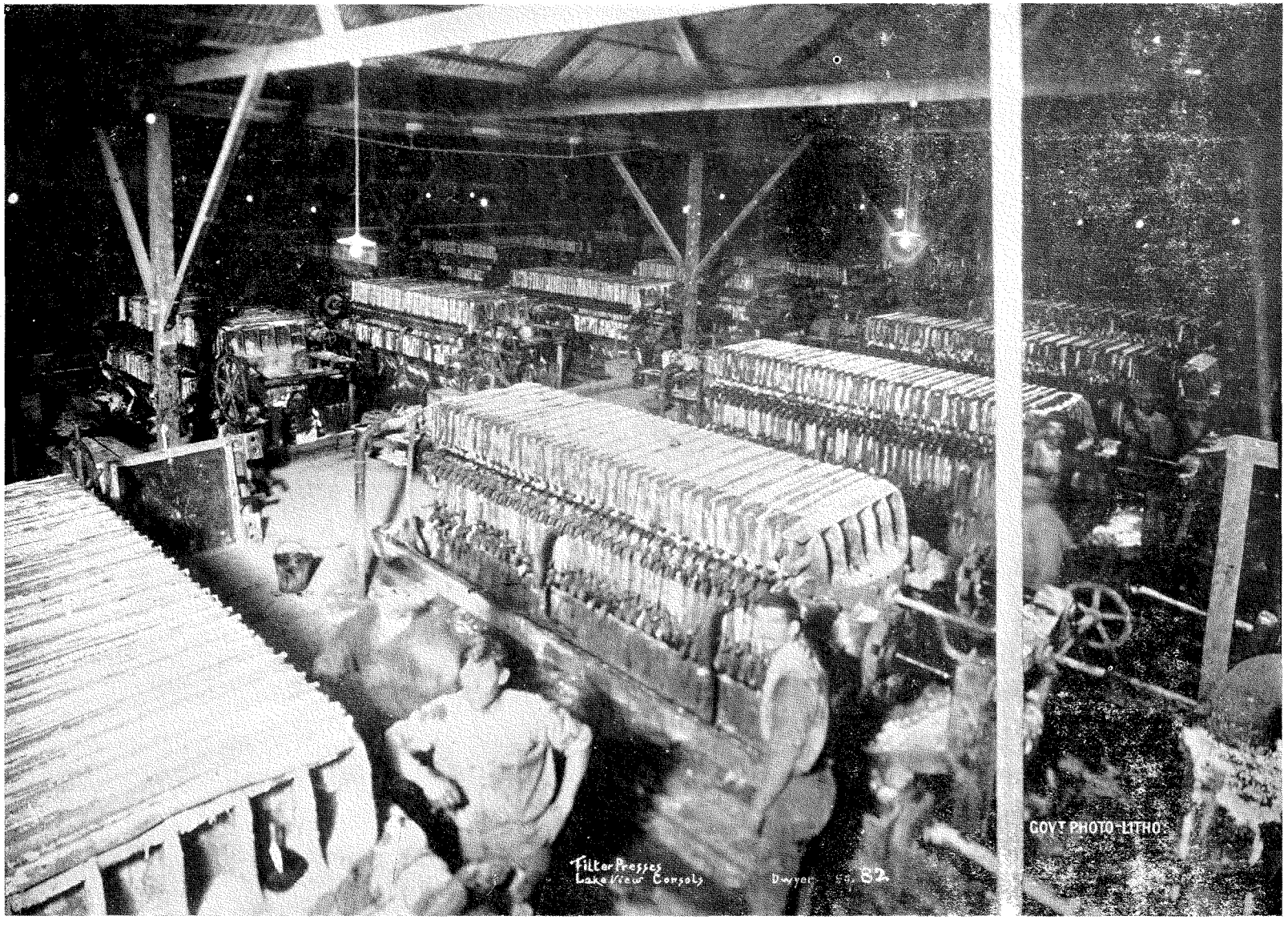
Branch.	1903.	1904.
Correspondence registered.		
Correspondence	7,449	7,600
Analytical and Explosives	1,640	1,904
Geological Survey	...	1,014
Mines Water Supply	...	4,611

By comparison with 1903, as appearing at page 40 of 1903 Departmental Report, it will be seen that with regard to the letters, telegrams, etc., dispatched there is an increase of 13,114, or if the Explosives, Geological, and Water Supply figures are omitted (which were not included in the 1903 Return) there is an increase of 5,422, against the increase for the previous year of 4,739.



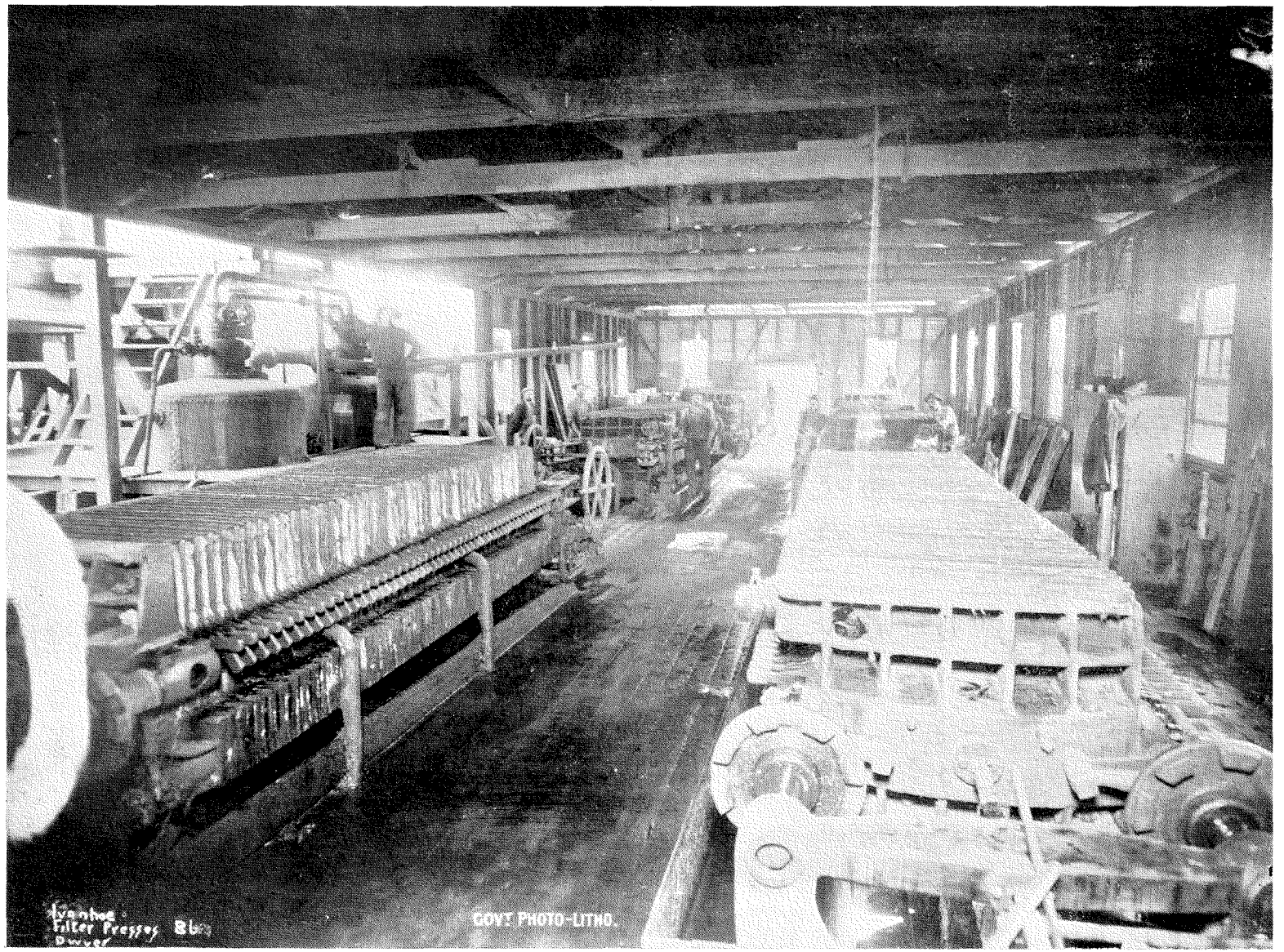
Ivanhoe Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD



Filter Presses, Lake View Consols Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD.

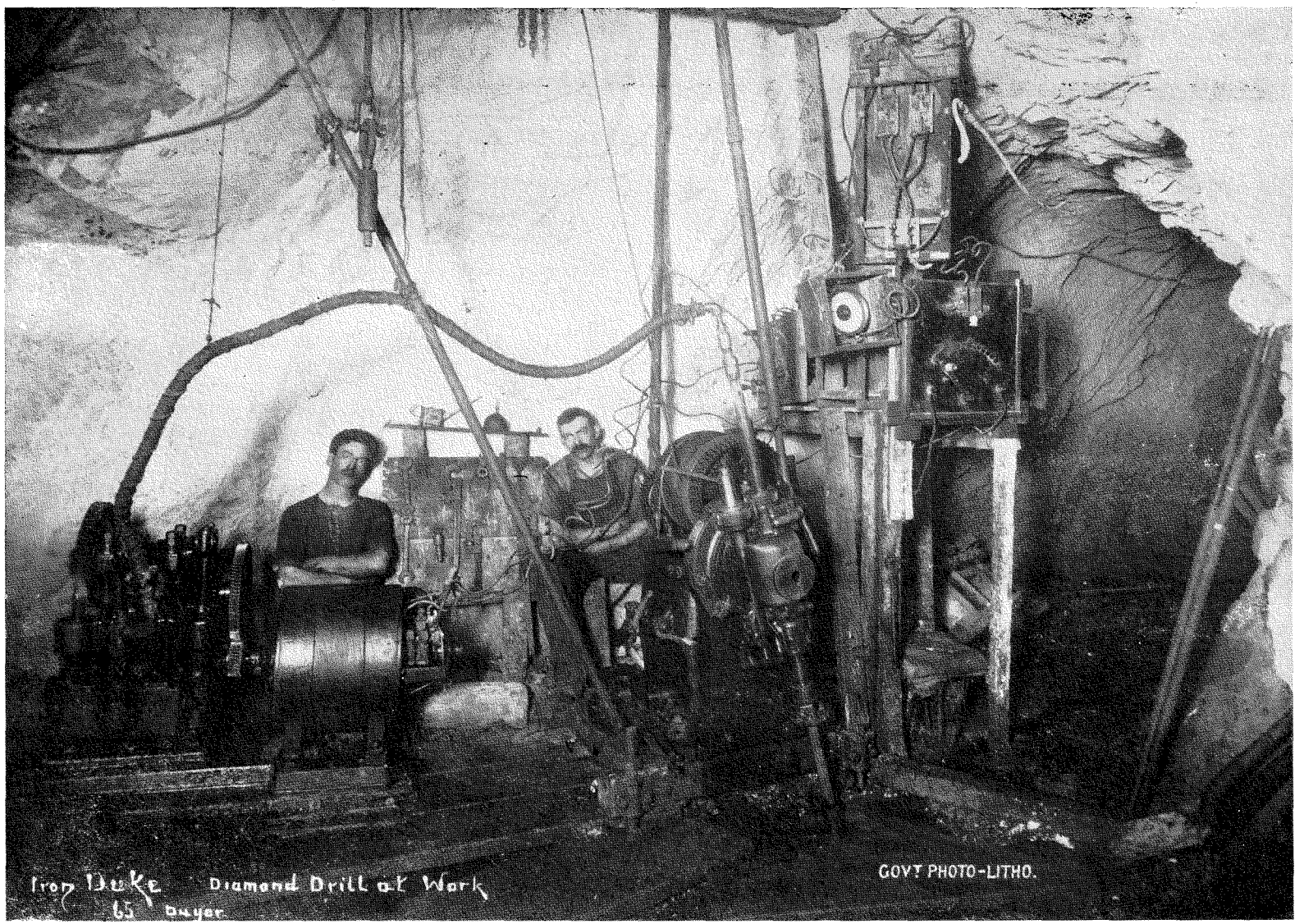


Filter Presses, Ivanhoe Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD.

First Main Shaft, Ivanhoe Gold Mine, 1894.

EAST COOLGARDIE GOLDFIELD.



Diamond Drill, Iron Duke Gold Mine, 1905.

EAST COOLGARDIE GOLDFIELD.

Surveys.

The following tables furnish a statement showing the number of surveys executed for the Mines Department during the year 1904, and compared with the year 1903:—

Table 31.

	1903.		1904.	
	No.	Area.	No.	Area.
Surveys on Eastern Goldfields	878	16,514	638	11,347
Surveys on Central Goldfields	308	3,755	342	4,592
Surveys on all other Fields	86	1,902	100	3,683
Totals	1,272	22,171	1,080	19,632

This does not include groups of Business and Residence Areas.

Table 32.

Traverses and Special Surveys.

	1903.		1904.	
	Traverses.	Cost.	Traverses.	Cost.
	M. C. L.	£ s. d.	M. C.	£ s. d.
Eastern Goldfields	52 47 88	175 6 2	22 20	74 3 8
Central Goldfields	50 52 79	168 16 10	74 77	279 17 5
All other Fields	5 12 22	17 3 7	9 24	31 0 4
	No.		No.	
Business and Residence Areas	269	294 12 0	136	145 12 0

Besides the above, there were special surveys to the amount of £240 executed for the Lands Department during the year 1904.

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

H. S. KING,
Secretary for Mines.

1st August, 1905.

DIVISION II.

Report of State Mining Engineer for the Year 1904.

To the Secretary for Mines, Perth.

Department of Mines, Perth, W. A.,
4th August, 1905.

SIR,

For the information of the Honourable the Minister for Mines, I have the honour to submit the following Report of the work of my office for the year 1904:—

Inspection of Mines under "The Mines Regulation Act, 1895" (with amendments), and "The Coal Mines Regulation Act, 1902."

During the Year the stations and duties of the various Inspectors of Mines have remained the same as at the end of 1903, and there has been no change in the staff. One additional appointment was made, Mr. P. C. Riches taking up the duties of Acting Inspector of Mines in the Pilbarra and West Pilbarra districts in January, 1904 (gazetted November 27th, 1903). Mr. Riches is District Engineer of the Mines Water Supply, and acts as Inspector of Mines until the progress of the field will justify the appointment of a special officer.

PILBARRA AND WEST PILBARRA GOLDFIELDS.

Mr. Riches reports for the year ended 31st December, 1904:—

"Taken as a whole mining matters have been very quiet on the fields under review. This state of things can be attributed to several causes, of which the difficulties of transport and bad seasons lately prevailing probably stand first. In addition, the British Exploration of Australasia have very much restricted their operations during the past year, and as they were the chief employers of labour on the Pilbarra goldfields, the practical cessation of work on some of their properties has been severely felt in the labour market.

"The output of tin has remained about the same as for last year. A matter for congratulation has been the discovery of a new lead at Moolyella, and favourable developments at Wodgina, near the Yule River.

"At Twenty Mile Sandy, in the Nullagine District, the erection of a State battery is being proceeded with, and as soon as this commences crushing the gold yield in this locality should show a considerable increase.

"In West Pilbarra there has been practically only one mine working, namely, the Pilgrim's Rest, at Station Peak, and at the date of writing this report I believe that exemption on this property has been granted for three months.

"During the last week of the year some prospectors have reported the discovery of wolfram, at Wodgina, near the Yule River. If the find proves of any value it should lead to increased activity in this neighbourhood.

"*Inspection of Mines.*—The few mines working have been regularly inspected and have been found to be in a fairly satisfactory condition.

"*Accidents.*—There have been no accidents during the past year. The dryness of the ground and small size of the reefs being worked all tend to safety in mining operations.

"*Explosives.*—There have been no accidents in this branch. The quality of explosives being used on the field is generally good.

"*Safety Cages.*—No cages have been at work during the past year.

"I found it necessary to cause work to be suspended in two mines until the workings were made safe."

CENTRAL GOLDFIELDS.

The Inspector of Mines, Mr. F. J. Lander, reports:—

"I have the honour to submit, for the information of the Hon. the Minister for Mines, my third annual report on the administration of the Mines Regulation Act on the Central Goldfields, for the year ending 31st December, 1904:—

"Mining on the whole has been very dull throughout the Central Goldfields, with the exception of Day Dawn.

"There is, however, one redeeming feature associated with the Central Goldfields which is very encouraging, both to the State and the miner in general, viz., the new finds that have been discovered. They are:—

"(1.) Wilthorpe, 32 miles west of Peak Hill, where a very fine reef has been found during the year, and has been the means of providing work for a number of men. I inspected this find, and judged from the appearance of the reef that the prospects were most encouraging.

"(2.) Eight miles south-west of Meekatharra, a 'find' has been discovered by Robert Bros. and Dunn, where one 'patch' gave a return of over £5,000 worth of gold. This was obtained from a small shaft about 20 feet deep. Several prospectors are on the ground and good work is being done. Some crushings have been taken from adjoining properties, most of which have gone over one ounce to the ton.

"(3.) Gum Creek, where stone has been treated, yielding over 4 ounces to the ton. I visited this field and reported it in the usual way.

"(4.) South-east of the Shadow of Death, on the Yalgoo Goldfield, one known as Woodley's find; several leases have been taken up with satisfactory results. This is a matter for congratulation for this district.

"In connection with the above, I may say that along the line of the rabbit-proof fence, several leases have been applied for, 70 miles east of Cue. All of these finds go to show that, so far as the Central Goldfields are concerned, mining in the different districts at the present time is only in its infancy.

"*Ventilation of Mines.*—The more experience I have in mining, the more persuaded am I that *natural ventilation* is unable to efficiently ventilate big mines; this fact is more in evidence when the tops of the shafts are practically on the same level. The heat from the men's bodies, the burning of lights and explosives, and the movement of the cage in the shafts, are forces not sufficient in themselves to produce good ventilation. Moreover, the slightest atmospheric change sometimes practically stops the current, and when the change is complete the smoke and noxious gases passing through the mine are again brought back over the men. Under such circumstances the air is so vitiated as to be positively poisonous. Therefore, from a health standpoint, and because men working under healthy conditions are able to do the maximum amount of work, it is urgently recommended that a system of artificial ventilation be enforced for all large mines.

"When I consider that in a well-ventilated mine the workmen can perform from one-third to one-half more work per day, I am astounded that engineers of metalliferous mines have not given this subject more serious attention.

"The system of stoping adopted in the Great Fingall G.M., which I described in my last Annual Report, has more than fulfilled all that was claimed for it, so far as ventilation is concerned.

"*Accidents.*—The number of accidents for the year is as follows:—Fatal, 5; serious, 14; total, 19.

"These accidents took place on the following Goldfields:—Fifteen on the Murchison, three of which were fatal; three on the Peak Hill field, one of which proved fatal; and one fatal on the Yalgoo field.

"All these cases of fatal accidents were reported by myself, with one exception, which was reported on by Mr. A. Penberthy. The fatal accidents were due to the carelessness or indifference to danger of the individuals who were killed. The first fatal accident happened at Meekatharra on March 28th, to one John William Davidson, a miner, who was working for himself. He was working a small underhand stope at the 60-foot level, taking out some rich ore to sweeten up a crushing that was going through the mill. While working in this stope he undermined a leg that was supporting a cap piece, and the dirt that had been used for mullocking up the stope when the timber fell, covered him. He was buried for some ten hours.

"The second accident happened at the Countess Extended, a small mine at Cue, on the 10th June. This accident was reported on by Mr. A. Penberthy during my absence at Peak Hill field, and was caused by a stone falling from the roof, and striking Samuel Curnow on the back. He died three weeks later in the Perth Hospital.

"The third accident happened in the Gullewa Gold Mine, Yalgoo, to one John Morton, on the 20th September. The occurrence took place in a small prospecting shaft, 40 feet deep, on the underlay. There was a good footway, and it has never been satisfactorily explained how the accident happened. Morton was found at the bottom of the shaft half an hour after he had been conversing with his fellow workmen. The cause of death was a fractured skull.

"The fourth accident happened at the Commodore Mine, Peak Hill, on the 2nd of September, to one S. Owen. This mine was under exemption at the time, and it is alleged that Owen, hearing that the mine would probably start again on contract work, went below to examine the stone with the view of tendering an offer for the work. He was accompanied by another miner, who stated at the inquest that Owen must have fallen while coming up the shaft on the ladder.

"The fifth accident happened at the State-subsidised battery at Quinns, to one Wilfred Gore, on 15th November. The starting valve of the mill engine was in a bad state, and the wind had blown off the belt that drives the battery; his clothes caught a large cotter that connected the fly-wheel to the main shaft of the engine, and he was whirled round and dashed to the ground with every revolution of the wheel.

"There have been a few minor accidents during the year, but these have been of little consequence. I made enquiries when they occurred, but did not consider them of sufficient importance to report to Head Office.

"*Districts visited during the year.*—Peak Hill, Wiluna, Lake Way, and Yalgoo have been visited twice, and the other portions of my district have been inspected oftener."

Mt. Margaret and East Murchison Goldfields.

Mr. W. M. Deeble, Inspector of Mines, reports:—

"The Mount Margaret and East Murchison Goldfields comprise a large area of country on which, in the the past, something new has from time to time been discovered. In these new discoveries the best

were worked and the lower-grade propositions left, usually to go to the next new discovery. This has served its turn, but for the future attention will have to be turned to the low-grade propositions.

"Mining when carried on on sound business lines should be as sound an investment as any other business. If a large reef is thoroughly and properly sampled its value is easily proved before heavy outlays are incurred and estimates can be made on a metal that is not affected by a fluctuating market. What is required on those fields are men with the necessary knowledge backed up with capital.

"Mining carried out on a small mine with 10 head of stamps just outside Leonora shows what can be done with low grade ore. The ore is stoped and raised through a shaft. The braceman tips the stone into a rock-breaker and the remainder is done by machinery. The total cost is only 12s. 6d. per ton.

"There is a large area between Lawlers and Black Range a distance of about 100 miles, with very promising looking country, and from what I can learn very little prospecting has been done on it. There is a large area between Lawlers and North Erlistoun, a distance of 100 miles east and west by 50 miles north and south, on which very little has been done. At the North Erlistoun a new find was made some months ago and three leases pegged out, but there is not sufficient done on these to prove their value. This place is three miles west of Mulga Queen.

"*Mulga Queen.*—This place is known as the Mulga Queen on account of the Mulga Queen being the first to erect machinery. This machinery was erected at Burtville and when it was decided to remove it to the Mulga Queen the manager dismantled the machinery, carted it 120 miles, and re-erected it within eight weeks, which is about a record for Western Australia. This mine continues to give good payable returns.

"There are a number of mines around this that are considered payable, but as they are waiting for the erection of the Government mill at Duketon, about 15 miles away, their real value will not be known for some time.

"Another mine in this district being opened up is the Famous Blue, where machinery is at present being erected. The power will be supplied by a Robey engine, loco. type compound, about 60-h.p. The winding by compound engine by John Fowler & Co., and the crushing by one Griffin & Huntingdon mill. The certificated boiler-pressure is 130lbs. Unlike most of the mines in this part they are short of water for milling purposes, but are sinking to obtain a supply.

"In this district a number of rich floaters have been picked up, some containing several ounces of gold, but owing to a capping of cement it is difficult to trace them to their source. When the State mill starts work it will no doubt induce a number of prospectors to try the large number of reefs between this place and Duketon.

"*Duketon.*—At this place there are a large number of prospectors, and some appear to be getting good payable stone. On the main line of reef water was struck at 10 feet from surface, and as the leases are small and worked by small parties they are continually in difficulties. The stone broken is rich, otherwise the line would have been abandoned before this. It appears a pity in cases of this kind that they do not amalgate and put down a proper shaft and pump to cope with the inflow of water.

"*Mistake Creek.*—This is about 30 miles south of Duketon. Mining has been very quiet at this place during the year, but a stir was caused lately by a discovery of gold three miles east. I examined the new find, but it is too early to give an opinion as to its value. The prospectors' reef can be traced for nearly two miles and averages about 2 feet 6 inches wide.

"About 10 miles south again are a number of small mines, and some of them are getting very encouraging results, and from one mine rich returns are being obtained.

"*Laverton.*—There appears to be an improvement generally in the prospects of this place. The main mines are keeping up their regular returns, and the management of the Lancefield Gold Mines are showing their confidence in their mine by erecting a new 40-head battery. A new discovery was lately made on the west of Laverton, and I was informed on my last visit that some prospectors are getting some very encouraging results about six miles east.

"*Burtville.*—This place is a working man's district; the leaders are small and usually rich. I am quite satisfied there are a number of rich leaders undiscovered in this place, as rich floaters have been found were leaders have not been discovered. There is a capping of cement in the district which is a great drawback to prospectors trying to pick up the leaders and causes a lot of useless labour. South of Burtville a number of prospectors are working, in most cases just getting a living.

"*Red Flag.*—During the latter part of the year some very rich gold was obtained from ironstone leaders intersected with quartz veins. This place was originally worked for alluvial gold, and the leaders were discovered in sinking below the alluvial, and appear to be the source of the alluvial gold. The same thing occurred on the Christmas Gift alluvial, near Red Castle, where rich gold was obtained from ironstone leaders under the alluvial ground. This shows to the alluvial miner that when he has the bottom clear, all ironstone or other leaders met with are worth sampling, as the gold does not always show in the stone and may contain rich gold without being seen.

"*Mount Morgans.*—The main mine in this place is the Westralia Mount Morgans G.M., on which 60 head of stamps have been running for the greater part of the year. The lode in this mine can be traced four miles to the north, and it is a matter of surprise to me that the business people of Morgans have not tried to take advantage of the Mines Development Act, 1902, and prove this reef at various places by boring.

"To the west of the town a large lode formation was worked with fair returns down to about 20 feet, with the result that all the town was pegged out; but, unfortunately, when the returns dropped in the prospecting lease, all the others were abandoned without being given a trial.

"*Murrin Murrin.*—This place has greatly improved during the year, and the Malcolm Mines and the Princess Alix are now regular producers, besides several smaller shows that are producing small quantities of rich stone. One of the leases at one time held by the Murrin Copper Mines, and from which some rich ore was obtained, is now being worked. On my last visit I saw several tons of ore which I consider will return 20 per cent. copper on surface. The ore runs in pipes and is irregular, but the present holders consider it will pay more than wages.

"*Anaconda.*—The copper mine at this place is at present being worked by tributers, who are said to be on some high-grade ore. On my last visit they were using the reverberatory furnace, and were getting a higher extraction than was obtained by the blast furnace.

"*Australia United.*—A number of rich crushings have been taken out from several small shows in this district during the year by men working for themselves. The same line of country appears to run from this place to Mertondale, a distance of about 20 miles, and where opened up has given good returns.

"The Randwick, Anglo-Saxon, and East Lynne G.M's. are on this line of country, and from time to time get rich patches of gold.

"*Mertondale.*—Merton's Reward Mine did not do much during the year and only employed 30 hands, but on my last visit there was an inprovement, and 120 were employed.

"About six miles north of Mertondale are a number of small prospecting shows, and on one a 10-head battery has been erected.

"*Malcolm.*—The Richmond Gem is the only mine at present working near the town. This is making regular returns, and as a result the ground to the north has been taken up, and it is reported that mining operations will soon be started on it.

"To the north-west of the town is the Midas G.M., and a number of prospecting shows. The Midas has lately erected a small air compressor and winding engine, and is now sinking the main shaft. The last crushing taken out of the bottom level gave good returns, so that there appears to be every chance of the mine being a success.

"At Pig well, 12 miles north of Malcolm, are a number of prospectors working on small leaders. A State Battery has lately been started at this place, so the returns will soon speak for its future.

"*Leonora.*—The Sons of Gwalia is the main mine in this place, the main shaft of which is down 1,800 feet on the underlay, the angle being about 42 degrees. The returns from this mine speak for themselves. From what I can see, no attempt has been made to pick up the continuation of this reef at any distance north of the mine.

"About a mile to the north-west of the Sons of Gwalia Gold Mine is the Tower Hill. The reef on this mine is the largest in the district, and it is rumoured that a 40-head mill will soon be erected on it. Up to the present this mine has been worked in a very spasmodic manner.

"North again are the Harbour Lights and the Boston, on which there is a large formation. These properties are under offer to Messrs. Bewick, Moreing and Co., and are being thoroughly tested.

"From $2\frac{1}{2}$ to 4 miles north-west of Leonora are three mines, known as the Leonora Main Reefs, Trump, and Leonora Gold Blocks. The Leonora Main Reef is the only one at present on which there is any energy being shown. A 10-head battery and winding engine has been erected, and I understand satisfactory results are being obtained. From this, 40 miles north-west, there are a number of prospectors working, and in some cases getting good returns, but in each case the leaders are small.

"*Mount Clifford.*—This is about 40 miles from Leonora, and at present two small shows are being worked, They are owned by Shank and party, and are known as the Victory and Emancipator. In the Victory the leader will average about three feet, and varies in value from three to 25 ounces per ton. Very little has been done on the Emancipator, but sufficient to prove the leader is small and rich.

"*Lorna's Luck.*—This is about 14 miles east of Mount Clifford, on the Darlôt-road from Leonora. At present a five-head battery is being erected, and all underground work stopped.

"Four miles north of this is the Great Western Gold Mine, owned by a syndicate. A 10-head battery and winding engine is erected on this, but the battery has only been running two shifts, on account of shortage of water. The reef is large on this mine, and low-grade stuff is being made to pay.

"*Darlôt.*—This is chiefly a working man's field, but there is one mine in it that would benefit the district more if it were in the hands of a company. The Saint George has returned some rich pockets during the year, but has been very irregular. The Filbanduit was very rich near the surface, and a shaft has been sunk vertically 120 feet to cut the reef; but water was met with in such quantities that they had to put in pumps, and practically nothing has been done on the reef. The same may be said of the adjoining mine, the Zangbar. North, and adjoining again, is the Monte Christo G.M. In this there is a large reef, crushings from which show it to be worth 12dwts. per ton. The Amazon G.M. has not been worked much on the reef this year, as the holder has been sinking a new vertical shaft 120 feet. The Waikato has been giving regular returns during the year, and is now equipped with a winch and boiler. They are opening up the mine with a view to future workings. Other small mines in this district are getting out small crushings, and in most cases fossicking around old workings is being carried on.

"*Lawlers.*—Mining has been very quite in and around Lawlers during the latter part of the year, with the exception of the Vivien mine. On the expectation of this mine's development, quite a small town has sprung up near it. Judging from prospects, I consider Lawlers will revive again during the coming year.

"*Sir Samuel.*—The principal mine in this district is the Bellevue G.M., on which has been erected a new battery with an air-compressor and winding machinery of an up-to-date pattern. The ore from the time it is put into the skip until it leaves the battery is handled by machinery, and economy has been

studied at every point. The treatment of the ore in this mine has been a problem difficult to solve, as it contains sufficient copper to effect the treatment of the tailings by cyanide, and yet not sufficient copper to pay for treatment of that metal alone. Another mine in this district is the Vanguard, which is being worked by a syndicate. A five-head battery and cyanide plant has been erected on this mine, and a large formation is being worked with payable results.

"*Kathleen Valley.*—Mining is very quiet, and great difficulty has been experienced to get water to work the two batteries there. The mines have been worked with varying results.

"*Black Range.*—Situated about 100 miles west of Lawlers. There are several groups of mines within a radius of ten miles. The main group is around what is known as the Black Range G. M. On this a 10-head mill has been working, and up to the time of my last visit crushed 2,399 tons for 5,724ozs. over the plates. I learn a 20-head battery will be erected on this mine at an early date. At present this is the only mine in Black Range that has its own battery. The Wanderie is another promising mine in this group, and in fact there are several giving good prospects and worth developing. About six miles north-east of Black Range are a group of mines which may be considered working miners' shows. The leaders are in most cases small and rich. About one mile south of the town are a number of mines including the Wirraminna, Bright Beauty, Eureka, and Lady Jackson. In these the formation is large, and from crushings put through, the results are lower than from any other part of the field, although rich patches have been obtained.

"*General.*—During the year I have given special attention to the following:—

"*Signalling.*—I notice that in a number of the larger mines electric signalling is used, but on visiting the mines often find them out of order and requiring the attention of a trained mechanic.

"*Winding Ropes.*—In most cases of the mines in these districts the ropes do not last very long, especially in underlay shafts, as when they are well-greased to protect them from the water they pick up gravel, and thereby cause deterioration.

"*Engine-drivers.*—During the year I have only received one complaint against a first-class certificated engine-driver, and this was for not allowing sufficient time for a man to get on the cage."

Inspector Deeble goes on to remark on the necessity for uniformity in engine-driver's examinations, and recommends publication of the examination papers for the information of intending candidates. With regard to sanitation of mines, he reports the provision of necessary pans and receptacles well attended to in all the larger mines; but finds great difficulty in getting the men themselves to co-operate in making proper use of them. During the year 1904, two fatal and five non-fatal accidents occurred in the East Murchison Goldfield, and two fatal and 19 non-fatal in the Mt. Margaret Goldfield.

North Coolgardie Goldfield.

The Inspector of Mines, Mr. W. F. Greenard, reports, 28th April, 1905, that a systematic inspection of the mines on the North Coolgardie Goldfield has been carried out during the year 1904, and where defects have been noticed compliance with the Mines Regulation Act has been insisted upon. Action was taken against the manager of the Waihi Mine, at Davyhurst, for allowing work to be resumed at a place where an accident had happened before it had been inspected by the Inspector of Mines, and he was fined. Another information against the same manager for failing to provide adequate ventilation in winze, in which the accident happened, was dismissed. The Inspector goes on to say:—

"*Accidents.*—Five fatal, nine serious, and seven minor. Searching inquiries were held into all these cases immediately after their occurrence, and evidence taken from all that could give any information about the accident. Not in any case could it be shown that there had been any deliberate negligence.

"*Filling Stopes* has received considerable attention during the year, I have insisted on them being filled to within 10 feet or 15 feet of the back, of course, this is not possible in every case, and some latitude has been extended where the ground was hard and the stopes on the underlie; in that case, I have insisted upon solid pillars being left at regular intervals. With the 'Cosmopolitan' stopes at Kookynie we are confronted with serious difficulties, as the large flow of water (370,000 gallons per day) prevents the use of tailings for filling. Since the amended Act came into force, the powers conferred were used on this mine with good effect, although I did not get all I wished done; measures were taken for greater safety, the Act thereby being vindicated.

"*Safety Cages, Hooks, and Ropes* have been carefully examined during the year, cages dropped and springs tested every six weeks;—Hooks, the copper rivet renewed every six months, and mine managers advised to oil their ropes with warm castor oil every week, if this is done the core of the rope becomes impregnated with oil, and one has no fear of corrosion.

"*Engine-drivers* have continued to be a source of trouble during the year; a repetition of dangerous practices have again occurred on two mines, viz.:—The Golden Pole, Davyhurst, and Cosmopolitan Proprietary, Kookynie. In the Golden Pole case the underground manager (Peacock) gave the signal to be lowered, instead of the engine-driver obeying it he hoisted the cage to the head-gear, where the safety hook saved Peacock from being killed. It may be remembered I had to prosecute a previous mine manager to get this hook attached to the rope. This case clearly proves the driver did not know which way the engine ran. The certificate I am informed was of a recent issue. This case was not reported to me and did not come under my notice until some time had elapsed. In the Cosmopolitan case the man obtained the certificate one week, and smashed the head gear, etc., the next. This case was also not reported to me.

"*Mining Developments.*—The developments at the 'Menzies Consolidated,' Woolgar, No. 9 Level, are of a very reassuring nature. Should they continue north in this level, it will warrant the manager in recommending a re-arrangement of machinery, and the equipping of the mine with a modern reduction plant.

"*At Goongarrie* tributers have continued to work the 'Boddington,' with payable results. There are also a few miners working some of the abandoned mines and getting fair returns.

"*At Comet Vale.*—Moss Bros. have erected a good ten stamp mill on the 'Coonega,' which will give the prospectors a chance to test their properties; the Margaret Paley, Sandstone, and Gladstone leases are developing some large quartz reefs carrying nice values.

"*Mulline and Mulwarrie.*—During the year developments have been anything but reassuring.

"*Davyhurst* has gone ahead during the year considerably, due in a measure to the water supply obtained by the Department.

"*The Golden Pole* has continued to develop splendidly. The winze now being sunk from the 300 feet to 400 feet is down 50 feet, and the reef maintains its width and values.

"*The Waihi* is doing good work, and if the developments between the 200 feet and 300 feet prove equal to those above the 100 feet the life of the mine is assured.

"*The Homeward,* owned by Hewitt and party, is doing good work at 150 feet where they have a reef two feet six inches wide carrying two-ounce values. This mine has consistently produced two-ounce values.

"*The Homeward Bound, Melrose,* and *Waihi South* are extremely promising propositions, and should developments continue to disclose values at present in view these claims will considerably augment the gold output of Davyhurst.

"*The Great Ophir* has continued to develop satisfactorily, disclosing considerable reserves. The mill should start crushing on the 27th April, and good results may be expected from the 1,000 tons of ore at grass.

"*The Eileen Mine* has erected a good ten-head battery during the year and the mine is being worked with a considerable amount of energy. The battery on the ground permits the owners to make large profits from 9dwt. ore, of which they have disclosed a large tonnage.

"*The Oasis Reward and Eagle Leases* are now being formed into a small syndicate for further development, which they fully warrant. The Oasis contains a large ore body of diorite schist, interlaced with quartz veins, carrying fair values; several shafts have been sunk, proving the line of lode through the leases. The deepest is 180 feet. Nine hundred and twelve tons of ore have been crushed from various shafts and drives on the leases, and a return obtained of 421ozs. 18dwt. 2grs. This is highly payable as the lode can be easily worked and proves the mine to be worth energetic development. The Eagle developments proved the continuity of the Oasis lode through the lease carrying fair values—283½ tons from this lease gave 149ozs. 8dwts. This is undoubtedly a sound mining venture, which may develop into a large mine.

"Messrs. Hamely and Driffield have recently struck some rich stone in Walhalla and Federation G.M's. which is of a very promising nature.

"*The Golden Lode* and one or two other leases are doing good development work in the Davyhurst district.

"*Kookynie and Niagara.*—The closing down of the Cumberland and Champion Mines has been a very serious blow to all concerned. Tributing parties are at present working these properties and some are making good wages, but the difficulty of the future is ever present, as no development is taking place to renew the ore being mined.

"*The Cosmopolitan* has almost exhausted its 'pay ore values,' until recently better values were met with in No. 9 level driving south. The development is of a promising nature, and I trust it will give the mine renewed life.

"*The Altona Line of Reef* has found work for several parties of tributers with good results, but here again, development has been neglected and the natural sequence is gradual exhaustion of pay ore values.

"*Niagara.*—'The Hannan's Main Reef Company' have sunk their main shaft to 400 feet and crosscut the reef which maintain its values, but, unfortunately, no water was obtained by sinking, thereby stopping the working of the mine which is equipped with a modern ten stamp mill, etc. 'The Eagle Hawk Company' is equipped with a modern battery and appliances, and is doing good for itself and the public at 8s. per ton; the underground work is also of a reassuring nature.

"*The Challenge Mine* has one of the best defined large quartz reefs on the field, and considering the values obtained above water it is strange that the late company did not do some development work below water. However, a Kalgoorlie syndicate are now equipping the mine with machinery with that end in view.

"*The W.E.G. Mine,* which the Department assisted from the Mining Development Vote, has been taken over under a working option, and if energetically worked there are sound reasons for believing that the Department will recover its advance, as the mine is a sound mining proposition.

"*Tampa.*—Good work is being done on several leases with the assistance of Gull's battery; but the price of crushing is too high to permit the prospector to test low-grade ore, work by which high-grade ore might be discovered.

"*Yerilla.*—The mines here have been noted for their richness and patchy nature from the time of their discovery.

"*The Melba Consols* has not been a success. The cause of non-success is undoubtedly the battery.

"*Yerilla* requires constant and arduous prospecting, and the prospectors' only aid is cheap crushing.

"*Yarrie.*—The Wallaby line of reef has continued to develop satisfactorily; the Wallaby Central has 12,000 to 14,000 tons of stone at grass ready for crushing, and large reserves ready for stoping. When the State battery starts I think its erection will be justified.

"*Edjudina.*—The Neta and Senate Companies have continued to do good work; the development in the Neta at the 200-foot is of a very promising nature, demonstrating beyond doubt that the reef in width and values continues in depth. The Senate Mine is now sinking its new shaft, present depth 170 feet; the management propose sinking to 300 feet before opening out on the reef. The owners of this property have now equipped it with a good 6in. lift and plunger pump, 5-head battery, and small winding engine, which has been well erected.

"*At Pingin* several claims are continuing to open out well, and when the promised State battery is erected it will give the prospectors a chance to develop their properties in this outlying portion of the Goldfield.

"*Yundamindera.*—The Potosi Consolidated Mines continue to do good work on their properties, and development has disclosed large reserves of fair value; they continue to employ nearly 100 men.

"No development in this district of an encouraging nature has taken place in the prospectors' leases, the rich chutes of ore have continued to be depleted, and the high price of crushing prevents any systematic exploration of low-grade material.

"*Mount Ida.*—The Mount Ida Consols and Copperfield Leases have been worked by tributing parties, wages have been made by those working the soft ground, but those working under water on the hard diorite have suffered considerable loss.

"The Federation, owned by Ridd, Gaffney, and Bremner, has continued to turn out good values, the crushings going from two ounces to five ounces per ton for large parcels. This lease will continue to be a good producer. The Forest Belle, Rio Tinto, Unexpected, and several other leases are being worked with varying success. I am of opinion cheaper crushing will give this place a chance to develop and find work for a large number of miners. The Mount Ida Lease is owned by the Department, and being assisted by the Mining Development Vote. It is being tributed by Messrs. Dolan & Millington, and a shaft is now being sunk to the 200ft. level, the shaft is down 160 feet. The assistance given by the Department will, I think, return good results, and prove in a measure this line of country."

Inspector Greenard also reported on the Pingin district on 1st September, 1904, as follows:—

"I recently visited Pingin situated 29 miles south-east of Edjudina, where about 25 prospectors are working some very promising surface prospects.

"Pingin is an abandoned field and had six or seven years ago a five-head battery which was not a success, and was removed.

"At the early part of the year, Messrs. O'Brien and party took up a position on portion of the abandoned ground, and after considerable work, located four small reefs running north and south and parallel, dipping to the east at 60 degrees. The deepest shaft is about 60 feet, and has a very nice 18-inch reef at the bottom carrying good values.

"Williamson and party have located O'Brien's reef to the south, carrying good gold in two places over 100 feet apart.

"Christenson and party are sinking a shaft through the cement to cut the northern extension of O'Brien's reefs. Several prospecting areas have been taken up in close proximity to O'Brien's, and good surface prospects have been disclosed in most of them. Hack and party, Potts and party, and Craig and party have also located reefs carrying gold.

"The reefs at Pingin are extremely difficult to locate, as they are covered with a cement five feet and six feet or even 10 feet thick; floaters carrying gold can be specked in a number of places, but the difficulty is to locate the reef from where the floater came; beneath the cement the country rock is a decomposed diorite and micaceous schist, very soft, being easily worked.

"In a northerly direction from O'Brien's, three shafts have been sunk to a depth of 30 feet, where nice wash was disclosed; it is said colours of gold were got in the wash. I think if the wash was driven on till the gutter was reached there might be a probability of striking something payable as small patches of surface alluvial have been worked in the vicinity.

"The prospects at present being worked are of an extremely promising nature for small parties of working men, but they require further development for their possibilities to be accurately gauged."

North-East Coolgardie and Broad Arrow Goldfields.

Mr. George Jenkyn, Inspector of Mines, reports:—

"During the year under review, viz., 1904, I have endeavoured to make an inspection of all mines about every two months, and where sinking has been in progress my visits have been more often. Although prospects on the whole are not as promising as could be wished there have been some rather good developments in mining. The Lily mine of the North White Feather Company, Kanowna, and the South Gippsland property of the Queen Margaret Company, at Gindalbie, have opened up well and continue to promise satisfactorily.

"I anticipate good results from Randell's, in the Bulong district, where a Government battery is in course of erection.

"The Broad Arrow Goldfield has been somewhat under a cloud, but the Bardoc centre of the same has held its own with mines such as the Excelsior, Eureka, Slug Hill, and Wycheproof.

"The Red Hill, at Kanowna, has turned out some good parcels and some of the mines there, amongst which are the Kanowna, Gentle Polly, and Madame Melba, are still working on good ore.

"Towards the close of the year an alluvial rush broke out about six miles in a north-easterly direction from Bulong. Some large slugs have been obtained there but no defined run of gold has as yet been traced.

"In deep sinking, the White Feather Main Reefs mine at Kanowna is to the fore, with the main shaft down to close on 900 feet. Developments at the lower levels of late are said to be encouraging. The Queen Margaret shaft at Bulong is about 700 feet in depth, and the property there has for the greater portion of the year been worked by tributers, with fair results.

"On the Oversight lead at Bulong, a local syndicate, assisted by the Department, has sunk a shaft to nearly 300 feet, but so far there is nothing of note to record as regards prospects.

"*Accidents.*—There were only seven accidents in all on the two goldfields. They have been reported upon after due inquiry.

"*Ventilation.*—With the exception of three mines on the north-east Coolgardie Goldfield, there has been natural ventilation in the mines, and the same has proved satisfactory throughout.

"*Explosives.*—As in previous years I have paid special attention to the storing and handling of explosives, and I am pleased to say that no accident has occurred from any cause in connection with these.

"The sanitation of the mines has been satisfactory, and I have had no cause of complaint either upon personal inspections or from outside reports.

"Only three permits were granted under the Sunday labour in Mines Act.

"*Generally.*—The working of the fields has been done without friction between the mine owners and their men or the Department. The mines on the whole have been worked in a thorough and systematic manner, and due precautions have been taken for the safety of the miners. Timber sufficient for all requirements has been available and furnished for use, and I am pleased to be able to report favourably on my district as a whole."

East Coolgardie Goldfield.

Mr. George Lightly, Inspector of Mines, reports as to work performed in discharge of his duties during the year:—

"Eighty-six underground inspections were made, mainly in connection with investigations relative to the occurrence of accidents, and 95 surface inspections were also made. The latter was chiefly in compliance with requests from the Warden's Department for information in respect of applications for Mining Leases, Homestead Leases, and other similar matters. Twelve inquests were attended and 106 inquiries were made concerning the causes of accidents. Several days were occupied in attendance at Engine-driver's Examinations, and a special visit of some days' duration was made to Randells in connection with an application that had been made for a Government battery at that place.

"During the 12 months there were 16 fatal accidents, which together involved the deaths of 20 men. Two of them happened at the surface and resulted from entanglement in machinery. The others occurred underground.

"Amongst matters of general interest connected with the field, reference may be made to the active development of the northern portion that was undertaken by working parties and small local syndicates. By their means it was shown, in at least three or four cases, that ground that had either been abandoned by companies or that had lain untouched till then, could be profitably mined. This led to other leases being taken up, and to a considerable amount of additional prospecting work being done in the locality.

"Diamond-drilling was much in requisition during the year as a prospecting medium, the result in some cases having gone to show that lodes exist at considerably greater depths than had then been reached in the mines, and that they were more or less productive at those greater depths.

"It may also be noted that for the first time in the history of this goldfield a conveyor-belt, actuated by an electric motor, was made use of underground for the transport, from pass to pass, of filling stuff for stopes."

Mr. J. O. Hudson, Inspector of Mines, reports as follows:—

"*New Development.*—There has been a revival in the north end of the field, and several satisfactory discoveries have been made; all the available country has been taken up and prospecting has been carried on vigorously.

"*The Hidden Secret Lease.*—A lode was discovered on this lease at 150 feet, carrying very high values in telluride ore, several crushings forwarded to Fremantle Smelters have given very high results. A vertical shaft has been started, it will be taken to 200 feet and connected with the old workings for ventilation and development purposes.

"*Fairplay Lease.*—This lease is east of the Hidden Secret Lease. A shaft has been carried down on the underlay to a depth of 85 feet; the lode is well defined and crushings have given returns of two to three ounces per ton.

"*Devon Consols South Extended.*—This lease is the most northerly one in which telluride ore has been discovered in payable quantities. A five-head battery is in course of erection. The returns from batteries have been highly payable. A large amount of driving has been carried out at the 80-foot level.

"*Hannan's Reward North.*—This lease has been giving good returns and the holders are negotiating for a five-head battery. The property has a lode trending north and south, with a number of leaders of various sizes running into the east and west walls. The holders are of opinion that it is payable to work the whole body, about 50 feet wide, at a good profit.

"*A.W.A. Consols.*—This lease is working out a large deposit by quarrying. The values are low but give the holders very handsome profits. It is the intention of the owners to erect a ten-head battery.

"*Brownhill Extended.*—A new lode was discovered in an east crosscut at the 700-foot level, 1,100 feet east of the main shaft. A large amount of development has been carried out, the results of which have been so satisfactory that it is the intention of the management to sink a new main shaft to work this lode.

"*Lake View Consols.*—A new lode was discovered east of the main shaft, at the 1,800-foot level. Crosscutting is being carried on in the higher levels to locate this lode. This discovery is a very important one for this Company, as it can be opened up in the higher levels at a lower cost.

"*Main Shafts* (Hamilton's shaft).—This shaft on the Great Boulder Proprietary Mine has reached a depth of 1,000 feet, at which level a plat will be formed and prospecting work carried on. Sinking will be discontinued for the present, pending the installation of larger winding gear.

"*Great Boulder Main Shaft.*—This shaft has attained the greatest depth yet reached on this field, viz., 1,976 feet.

"*Ivanhoe South Extended.*—This shaft has reached a depth of 1,300 feet. Sinking has been discontinued until a larger winding engine has been installed.

"*Boulder Deep Levels.*—This shaft is being carried down to 1,100 feet. Should the values prove as satisfactory as those at 900 feet, it will give impetus to this portion of the field.

"*Inspection of Mines.*—The mines have been regularly inspected during the year. This work was interfered with somewhat owing to my time having been a good deal occupied in obtaining returns of the aliens employed on the mines, and also on account of the visit of the Royal Commission on Ventilation and Sanitation of Mines, whose report, which is issued on this matter, renders it unnecessary for any comment on my part.

"During the year 222 mines were inspected, and 11 inquests attended by me.

"*Winding Ropes.*—The condition of winding ropes on this field is not all that can be desired, and the wide difference of opinion on the subject and the condition of the ropes render it imperative that a definite method should be adopted for the examination of same. Cases have come under my notice where the condition of the rope at the shoe has been good, and the other portions of the rope in anything but a satisfactory state. The deterioration is chiefly due to internal corrosion. The factors of safety used by makers vary considerably from 5 to 10, and I am of the opinion that it would be more satisfactory to adopt a standard for the State.

"The practice of splicing winding ropes is carried out on this field, and is one that should be discontinued.

"During the year four winding ropes broke, in only one instance with serious injury to any person.

"A record of all particulars of winding ropes is now being obtained by this Office, and filed for reference. In some cases I find that the makers do not supply certificates with ropes; I am of the opinion that this should be insisted on in all cases. I have also found where ropes have been considered unsafe on one mine, and removed, and afterwards sold and used again for winding purposes on another mine, which I am also of the opinion should be discontinued.

"*Signalling.*—The mines on this field do not use any uniform method of signalling. A conference was held during the year, and suggested alterations were forwarded to Perth, to Head Office. It is very necessary that only one construction should be placed on the Code, and the present practice of using different signals for raising men to surface should be discontinued.

"*Prosecutions.*—During the year I proceeded against five persons for breaches of the Mines Regulation Act, and in all cases convictions were recorded.

"*Explosives.*—The main storage magazines have been regularly inspected, and found to be well attended, and the regulations complied with. The carriage of explosives to working places has received attention, and it was found necessary to take action against workmen for carelessness. This seems to have had the desired effect, and canisters are now used in all mines."

Coolgardie, Yilgarn, and Dundas Goldfields.

The Inspector of Mines, Mr. J. Crabb, reports:—

"The mines on the various goldfields from a safe point of view have been worked in a fairly satisfactory manner. Defects which I have observed and brought under the notice of the management have been almost invariably remedied. In the cases when unwillingness was shown to comply with the provisions of the Act proceedings were instituted, and fines ranging from a few shillings up to £18 were inflicted.

"Three fatal and 13 serious accidents occurred. This is a decrease of one in the number of fatalities compared with 1903, whilst in the number of serious accidents there has been an increase of three.

"Four engine-drivers' examinations were held; two at Coolgardie, and two at Norseman.

"There were 276 mines inspected, or an average of 23 per month. This necessitated my travelling 4,620 miles, or an average of 385 miles per month.

"Several applications have been made for Sunday Labour Permits, but only two were granted."

Mr. Crabb makes the suggestion that section 18 of "The Mines Regulation Act, 1895," would be improved by leaving out the words "if demanded by any three miners engaged on the mine."

Phillips River Goldfield.

The manager of the State Smelting Works, Mr. John Provis, has acted throughout the year 1904 as Inspector of Mines, and made repeated visits to all the mines at work. His monthly reports show that the work, so far as regards the Mines Regulation Act, has been carried out satisfactorily.

Collie Coalfield, Donnybrook Goldfield, and Greenbushes Mineral District.

The Inspector of Mines, Mr. T. D. Briggs, says:—

"I have the honour to submit my annual report for the year 1904.

Collie Coalfield.

"The output of coal during the year was 138,549 tons, being a slight increase on the previous year. Three serious accidents occurred, resulting in injury to three persons, none of which, however, were attended with fatal results.

"It was not found necessary to initiate any prosecutions for offences against the provisions of 'The Coal Mines Regulation Act, 1902.'

"There are now four collieries at work, and the total number of men employed at the end of the year was 401.

"In November, the leases, estates, and interests in the Collie-Boulder Coal Mine Company were purchased by the Scottish Collieries Company of W.A., Ltd.

"Coal-cutting machines of the 'Jeffrey' type were introduced at the Proprietary Colliery in June, and are still at work. These machines are an undoubted success, enabling an increased quantity of coal to be won per day from the same length of working face, and also reducing the cost of production considerably.

"The ventilation, sanitation, and general condition of the mines throughout the year has been fairly satisfactory.

Greenbushes Tinfield.

"It was not until the latter part of September that the Mines Regulation Act was applied to this field.

"Most of the work in this field is shallow alluvial, and the claims are in nearly every case worked by small parties of men.

"No serious accidents have occurred since the Act was applied, and no prosecutions have been taken for infringement of the Act.

"The workings generally are in good condition.

"One bad feature of the field is the numerous small shafts abandoned and left open. They are nearly all shallow, but sufficiently deep to be dangerous. In most cases they are on abandoned claims, making it difficult to fix the responsibility."

Mining Accidents.

The mining accidents for the year ended 31st December, 1904, are tabulated in Tables 21, 22, and 23, attached to the Annual Report of the Department by the Secretary for Mines, in comparison with the figures for the preceding year. Table 21 shows 42 persons killed in 1904, as against 43 in 1903, also the distribution of the accident cases in the various Goldfields or Mining Districts. The fatal accidents are one less than in 1903, but three more than in 1902, and are in all three of these years less than in the preceding three years, 1899, 1900, and 1901. The non-fatal accidents recorded for 1904 have been 152, as compared with 179 in 1903, and 132 for 1902; but in comparing years before 1903 it has to be borne in mind that during the last two years the recording of accidents of comparatively trivial nature, which nevertheless disabled the injured man for more than fourteen days from following his occupation, has greatly swelled the figures as compared with previous years, when such were frequently neither reported to the Inspector of Mines nor inquired into by them. From Table 22 it is seen that the death-rate from accidents was 2·38 per 1,000 in 1904, and 2·36 in 1903.

The deaths from explosives were fewer in 1904 than in any year since 1896, only two lives being lost in this way. One was due to the premature explosion of a charge in a winze in the South Kalgurli Mine on 16th November, 1904. The coroner's jury considered that the accident was probably due to faulty fuse, though the remainder of the coil was in perfectly good order. The other, at the Vivien Mine, Lawlers, on 23rd March, 1904, was also due to the explosion of a charge before the man who lighted it got away; but in this instance he appears to have remained too long at the face trying to re-light another fuse which had failed to ignite. ... ...

The fatal accidents from falls of ground were fewer than in the previous year, 10 being recorded for 1904 and 13 for 1903. Accidents of this nature are inseparable from the miner's occupation, and cannot always be prevented by any foresight and caution, but the inquiries into some of the cases emphasised the necessity for careful inspection of all overhanging ground and removal of any loose material. The practice of working out high stopes, the back of which cannot be easily examined for loose ground, is constantly being fought against by the Inspectors of Mines.

Fatal accidents in shafts during 1904 were unfortunately more numerous than in any previous year, no less than 20 being recorded, as compared with nine in 1903. The worst case took place in Edwards shaft of the Great Boulder Proprietary mine on 25th May, 1904, when two gigs containing men engaged in skidding the shaft fell to the bottom, owing to the driver losing control of the winding-engine. To enable the skidding parties to work opposite one another in adjoining compartments of the shaft, both winding-drums were made to run the same way, giving the engines equal to nearly double their usual load in single gear. The reversing lever jumped out of its notch and flew forward, and before the engine-driver could regain control the gigs had run to the bottom of the shaft, and five men were killed. Another fatal accident occurred on 31st July, 1904, at the Hamilton shaft of the same mine. There was a bucket in the pump compartment used for winding up the air-hoses of the drills used for sinking, and not supposed to be used by men, who travelled in another compartment. One of the men, however, went to the surface in this bucket as it was more convenient at the time than the cage, and returned in it also, but in coming down the bucket caught for a short time on a projecting pump-bearer or yoke and then fell away suddenly. The man was not thrown down the shaft, but sustained a fracture of the skull, from which he died on 2nd August. He was well aware of the existence of the projecting bearers, and must have known of the liability of the bucket to catch on them if swinging.

A very serious accident happened in the Great Boulder Deep Levels main shaft on 8th December, 1904, one of the men engaged in sinking the shaft being killed by the fall upon him of the sinking bucket owing to the rope breaking. On examination the rope was found to be in a very bad condition owing to internal corrosion.

Another man was killed in the Paringa Mine on 1st March, 1904, by falling from the cage, it being supposed that he either fainted or became giddy, or in some way got caught by the shaft timbers and pulled out of the cage.

Two other fatal accidents in main shafts were also occasioned by the machinery used for hoisting. In one the injured man was engaged in filling the skip in an underlay shaft from an ore bin, and must have unthinkingly put his head into the skip compartment to look at something after ringing the signal to hoist, whereby he was caught between the skip and the shaft timbers. In the other the braceman must have taken the chairs from under the cage at the top brace and got into the cage without signalling to the engine driver, just as the latter released the loose drum to which this cage was attached, to put the engine in single gear. The cage ran to the bottom of the shaft, and the man in it was found dead in the bottom of the sump, apparently drowned, as otherwise his injuries were slight.

Another fatal accident in a main shaft was due, as far as can be ascertained, to the deceased man falling from a higher level to the bottom of the shaft owing to his having neglected to put up the cross-bar across the shaft after sending away a cage and truck.

Another man was killed in the bottom of the Princess Royal Central Company's main shaft by the fall of a chain sling from surface, owing to its escaping from the hands of the braceman as he was detaching it from the bucket.

A fatal accident in a main winze worked by machinery is also included among the accidents in shafts, the winze being to all intents and purposes a main shaft. A man fell down this winze while trying to pass round or step across it.

In smaller shafts there were several fatal accidents; two from men falling from windlass ropes on which they were being raised, in one case owing to the man losing his footing as he was getting off the rope at surface, in the other through being overcome by gunpowder fumes; two from falls from ladders, and one from the bucket getting off the hook and falling down the shaft. Two men also came to their deaths by walking into open shafts; one an aboriginal, who by some means must have walked over the dump and into a shaft on the Horseshoe lease at Menzies, the other a prospector returning in the dark to his camp near Burtville, who must have wandered from the track and fallen down an old abandoned shaft.

The accidents classed as "Miscellaneous Underground" caused six deaths in 1904, as against nine in 1903. Two were from falling down winzes left open in the course of work, two from poisonous fumes of explosives, and two from falling into mullock passes and being smothered by sands used for filling.

On surface four fatal accidents were recorded, as against five in 1903, all being due to machinery in motion, the men getting caught in moving belts or by revolving shaftings.

A fatal accident to an aboriginal at the Darlôt State Battery through his drinking cyanide solution from a pipe running into one of the sumps has not been recorded as a mining accident, though technically it might come within this category.

The accidents attended with serious injury to persons during 1904 were 152 in number, classified thus:—

(*a.*) Due to explosives	8	men	injured
(*b.*) Due to falls of rock	36	„	„
(*c.*) Occurring in shafts	40	„	„
(*d.*) From miscellaneous causes underground	20	„	„
(*e.*) Occurring on surface	48	„	„
Total	152	„	„

All these accidents were inquired into by the Inspectors of Mines, and where it has seemed possible to prevent a repetition of accidents from the same cause, steps have been taken to secure greater safety. It has been necessary in only a few cases to prosecute any person for breach of the Mines Regulation

Act, the accidents being usually either from causes which could not be guarded against by any ordinary care and foresight, or from forgetfulness, clumsiness, or want of judgment on the part of the men hurt, not amounting to negligence.

Safety Catches for Skips in Underlay Shafts.

During the year there have been two or three proposals of methods of fitting safety catches to the skips and man trollies used in underlay shafts, but none of them have as yet appeared entirely satisfactory, and none have been brought into actual use. The necessity for attention to this matter is still, therefore, as pressing as ever.

Signalling in Mines.

The Inspector of Mines at Kalgoorlie, in his annual Report, has again drawn attention to the want of uniformity in the signals used in the mines of the State. The law requires that there shall be a uniform code of signals used, and regulations have been issued prescribing these, but cases have arisen in practice where the prescribed code is very cumbrous and liable to be misunderstood through the multiplicity of knocks. The requirements of a large deep mine in respect of signalling and its conditions of working are often so different from those of smaller mines that the signals used in the latter cannot well be applied to the former. It is the custom in the large mines at Kalgoorlie to put a platman in charge of each cage or skip and to make him responsible for all signalling, and the engine-driver's knowledge of where the platman is working enables the code of signals to be much abbreviated. An amended code brought forward by the Chamber of Mines, agreed to after public discussion by delegates from the Chamber of Mines, Mine Managers' Association, and Miners' Associations, and recommended by the Inspectors of Mines, has been in use in several of the mines, but has not yet been legalised by regulations. Pending the consideration by Parliament of the new Mines Regulation Bill to be introduced this year, which deals with signalling somewhat differently from the existing Act, it has been thought best not to bring forward new regulations.

In some mines electric bell signals are in use, but in several instances much trouble has been experienced with these, especially in wet mines. One accident was recorded during 1904 from the use of electric signals at the Cosmopolitan mine, Kookynie. The electrician of the mine and a helper were repairing a bell that was out of order, and the assistant got into the skip to go to a higher level. As he was getting in, the skip was raised, the engine-driver having received the signal to hoist (one bell), and the man was jambed against the shaft timbers. No signal appears to have been knowingly given by anybody, but in some way a contact had been made and the bell rang in the engine-house. The cause of the ringing has not been ascertained. The ease with which an electric "push" signal can be operated suggests that it is possible for a signal to be unwittingly transmitted, and this consideration renders it necessary that all signals should be repeated audibly or visibly in the plats, so that the signaller may know that the circuit has been properly completed and bystanders be able to check the signals given. Such repeating devices also enable "return" signals to be given from the engine-room to the plats.

The question of "return" signals has been a good deal discussed during 1904, some managers holding that they are unnecessary and impracticable, while others are strong advocates of them. The system installed by Mr. E. D. Clelland in Bayley's mine, Coolgardie, is very highly spoken of by the Inspector of Mines, and worked admirably, proving a great convenience to the mine as well as affording greater safety. Mr. McCullough's somewhat similar installation in the Great Boulder mine at Kalgoorlie * is stated to have proved troublesome to keep in order, and was abandoned after a time. In several mines at Kalgoorlie electric bell return signals are reported to be working very satisfactorily.

An electrical system of signalling by means of lamps has been proposed by Mr. E. Neville and Messrs. Ritchie and Jackman, of Kalgoorlie, but has not, so far as I know, been yet used in actual practice. At each station underground there is a switch-board and signal-box corresponding to similar ones in the engine-room. By inserting a plug into various holes in the switch-board, lamps are lighted in compartments in the signal box so as to illuminate instructions printed on different portions of its glass front. The signal is seen in the plat and simultaneously in the engine-room, and remains visible until the engine-driver replies by switching it off from his end. This affords a very rapid and effective method of giving a large range of signals, the whole signal appearing instantaneously and doing away with the counting of knocks or bells that takes up so much time in ordinary signalling with knocker lines. The connections are fixed so that the signals at surface and underground must be identical, and as both lamps in action are on one circuit the extinction of one owing to occasional breaking of the filament puts out the other also, and is at once seen that the system is out of order. This system seems an excellent one in principle, and deserves to be tried on a working scale. A system of signals by means of lights will probably be found less liable to get out of order than bell signals, judging by the experience of ordinary electric lamps and electric bells underground.

The necessity for return signals is shown by the above-mentioned accident in the Cosmopolitan mine, and also by another which took place in the Associated Northern mine, at Kalgoorlie, on 4th August, 1904. Ore was being sent to surface, the engine-driver hoisting quickly as soon as he received the signal (one knock) to do so. Two men wishing to go to a higher level got on to the cage and started to ring the signal, and at the first knock the cage was taken away and the man ringing was caught against the cap of the chamber and thrown out upon the plat. The signal he was giving was 1 pause 2, and the engine-driver, having no means of knowing that it was not the ordinary hoisting signal started to hoist before the pause was over. The warning signal 4, "men on," ought to have been given first. A return signal from the engine-room would have given the men below time to send the remainder of their signal, or to draw themselves into the cage out of danger.

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* Described in the Chamber of Mines of W. A. Monthly Report, November, 1903, page 355.

Some of the difficulty of operating knocker lines in deep shafts arises from the large number of levels that are all connected with one shaft line, the knocker lines at each level all requiring to be kept in thorough adjustment. It is suggested that part of this difficulty may be overcome by using two or more knocker lines, dividing the shaft into sections of five or more levels and giving one line to each section.

Protection of Men in Shaft-sinking.

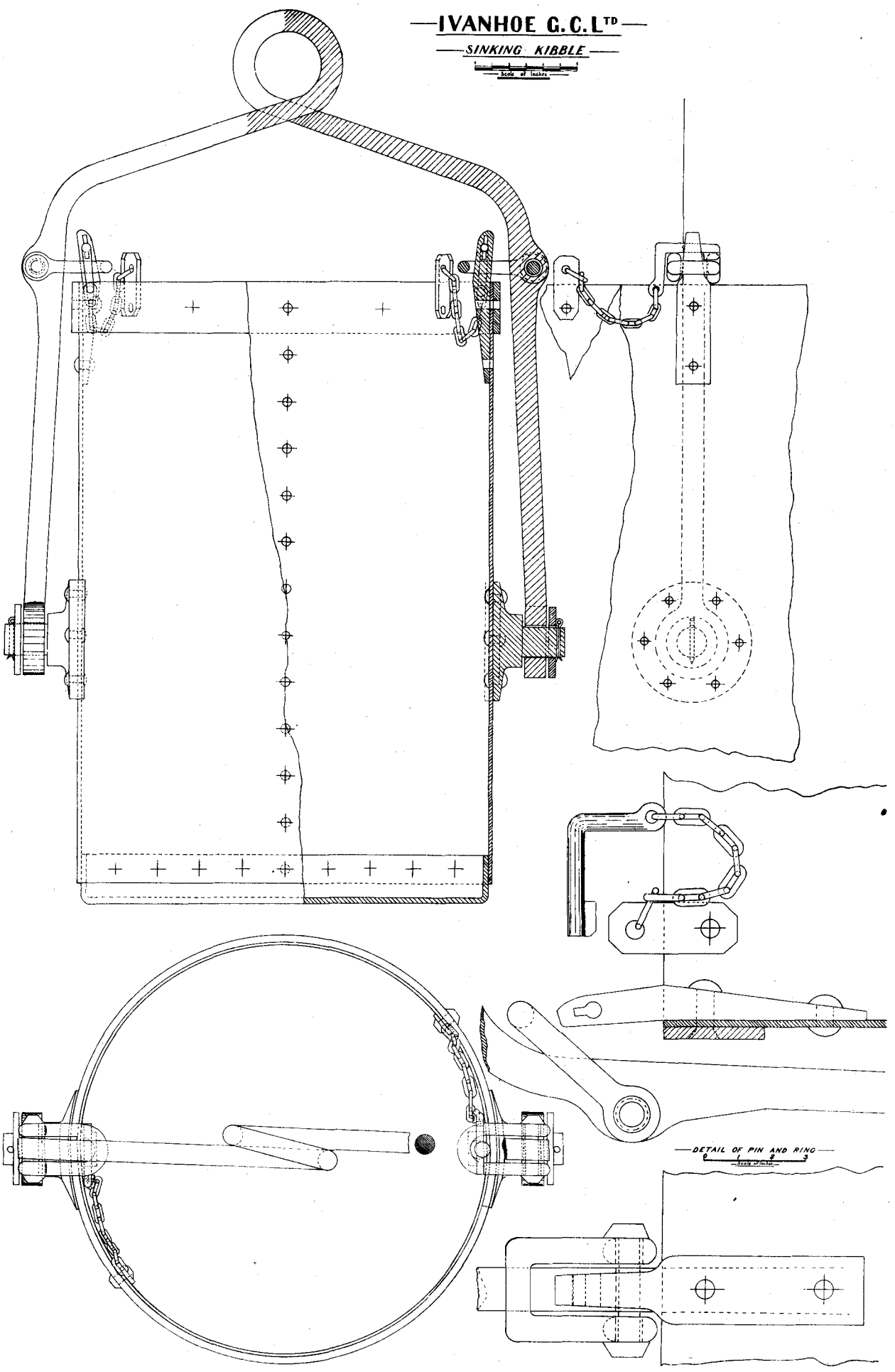
During the year under review there have been several instances of deep shafts being sunk without any driving being done from them until a very considerable depth has been attained. For example, the Princess Royal Central Company's main shaft did not cut the reef till a depth of 950 feet was reached, and there was no reason to open out from it at any shallower level. Hamilton's shaft on the Great Boulder mine, the Boulder Deep Levels Company's main shaft, and the Ivanhoe South Extended main shaft are very similar cases, in all of which deep sinking has been carried on for long distances without opening out. As the fields become older, the sinking of deep shafts to cut reefs on their underlay must become more and more common. These deep shafts are very expensive and take a long time to sink. The methods by which such work should be carried out therefore deserve great attention, the aim being to combine the maximum of rapid progress with the greatest amount of safety to the men engaged in the sinking. In mines which have upper levels at work, requiring the constant use of the shaft for hoisting ore and men, and where the sinking is done from level to level by "sinks" of from 100 feet to 200 feet at a time, it is impossible as a rule to give up a compartment of the shaft entirely to the sinkers, and the usual practice is therefore to put in a pent-house below the lowest level and sink the shaft with an air winch winding to that level. The dirt brought up by the sinking bucket is then filled into trucks and sent to surface in the cage. This method involves double handling of the dirt, and it would obviously be preferable to hoist it at once to the surface, but it is forced upon the mines by the exigencies of their other work. The reason of winding in two stages, therefore, is not usually the safety of the men sinking, but the necessity for using the shaft for the ordinary work of the mine. There has recently been based upon it, however, a demand on the part of some of the workmen and their friends to have all shafts sunk in the same way, and it has been advocated that direct winding from bottom of the shaft to surface should not be permitted, say over 300 feet in depth, and that thereafter the bottom "sink" of say 200 feet must be taken out with a separate small engine, such as an air winch. This would involve the cutting of a number of chambers which would be of no use afterwards, and would evidently add considerably to the cost of sinking, and it is quite doubtful if any additional safety would be gained by it. If the compartments of the shaft in which no kibble is working are covered at surface to prevent falling of material from there, and the men below take care not to work under the uncovered compartment except when the kibble is on the bottom or resting on the doors at surface, there is probably as safe a condition as when there is a pent-house 100 to 200 feet above the men. Owing to the bad light and cramped space in which the men landing the dirt at the pent-house have to work there is greater danger of material being dropped down the shaft than when landing it at surface, and the falling of timbers or stones from a height of even 100 feet is likely to do as much damage to any person struck by them as if they had come from a much greater height. If, as is often the case, the winding is done from the bottom direct to surface, but a pent-house is also used in the winding compartment, then the kibble has to be carefully raised until it has passed through the pent-house and been signalled clear before rapid winding can be begun. This involves a man being kept to open and close the doors of the pent-house, pilot the kibble safely through them, and give the necessary signals, and it becomes a question whether the liability to falls of material from his station is not even greater than if the shaft were quite clear. So far as falls of material are concerned, the objection to working in deep shafts without pent-houses immediately overhead appears, on looking into it, to be mainly sentimental, the risk being little different from that in a shallow shaft.

There is, however, an undoubtedly serious risk of accident in sinking deep shafts if the men have to do all their travelling up and down from surface on the kibbles, especially when fast winding is done. There is always a certain amount of swaying of the kibble, and liability for it to catch on projecting timbers and jerk off the men; or, even if the shaft is lined with planks, for a started end or nail to catch a man's clothes and pull him off. There have been very many fatal accidents through men falling from kibbles. One took place early this year in the Princess Royal Central shaft at Norseman. No reason could be ascertained for his falling, unless possibly he fainted or became giddy, there being no projections in the shaft and the winding having proceeded steadily. Another accident in Edwards shaft of the Great Boulder mine at Kalgoorlie last year has already been referred to, in which case the bucket caught on a projecting bearer and then dropped suddenly. Again, when to prevent swaying of the kibble a guiding cross-head or "monkey" is used, the safety appliance itself has been known to become a source of danger by catching on the guides and hanging up for a time and then falling suddenly. Yet another possibility is that the kibble may become detached from the rope itself, as was the case last year in the Great Boulder Deep Levels shaft. Being unprovided with any safety catches, the kibble must fall to the bottom of the shaft. To remedy the difficulty is not altogether easy. One method which is fairly satisfactory in suitable ground is to keep the lining of the shaft well down towards the bottom and use the safety cage all the way, fitting it with long guides at the sides, or a "skeleton" frame, so as to allow it to reach the bottom without loosing touch of the skids. This is, however, not nearly so convenient for working in the bottom of the shaft as the kibble, and also requires considerable head room in the brace at surface to enable the cage to be raised enough to allow of landing the dirt at the height required for dumping. In the hard country usual in deep shafts in this State, and with the consequent very heavy blasting that is necessary, this method is troublesome on account of having continually to refix temporary skids below the permanently timbered portion of the shaft. A variation of the method, which however is only possible when the dirt is discharged at a higher level in the shaft or there are very high poppet-heads at surface, is to use a kibble suspended below the cage. The men can then ride up and down in the cage as far as the timbering extends, going the remainder of the distance on ladders. This method is more suitable for mines with workings at higher levels at which the broken rock may be stowed

—IVANHOE G.C.L TD—

—SINKING KIBBLE—

Scale of Inches



DETAIL OF PIN AND RING

Scale of Inches

h. J. Pether. Government Photolithographer, Perth, W.A.

than for deep shafts sunk from surface without intermediate openings. If the permanent high head gear is erected over the shaft from the first it is possible to work this method to surface, but it may often happen that the sinking is done for prospecting purposes, and that only small poppet-heads are at first used, only high enough to allow of handling the kibble alone, thus making it impossible to use the cage and tail rope. In this instance the best way which I can suggest to remove the necessity for the men riding all the time on the kibble is to put in a double pent-house in the two compartments next to the kibble compartment, as near as practicable to the bottom of the shaft, and use a safety cage in the second winding compartment down to the pent-house. The men would then descend in the cage, step out into a small recess cut in the side of the shaft and pass round on to the upper floor of the pent-house in the third compartment, go down by a ladder to the lower floor, pass on it under the cage compartment, and go down in the kibble the rest of the distance or else descend by the ladder way. The recesses required to allow the men to leave the cage and pass round to the adjoining compartment need only be very small, and in wide shafts would often be unnecessary. When the distance to be ridden on the kibble to the bottom came to exceed 250 feet the pent-house should be removed and another put in, say 50 feet above the bottom of the shaft. The winding of men on the kibble would then be only for a comparatively short distance, and could be done at a slow speed; while the winding of dirt from the bottom through to surface could be done rapidly and without interruption.

Use of cross-heads in shafts.—The fatal accident in Edwards shaft of the Great Boulder mine at Kalgoorlie, due to a descending bucket catching on a projecting bearer and then falling away, has been previously referred to, but is again quoted to show the necessity for some method of guiding kibbles to prevent like accidents. The Inspector of Mines at Coolgardie, Mr. J. Crabb, has sent me particulars of two similar accidents, one causing the death of five the other of three men. The first was in the Birthday shaft of the Sydney Harbour collieries, and was due to the bucket swaying and striking a bunton at about 1,424 feet, or some 400 feet from the bottom of the shaft, and tipping over enough to throw the men off. The other was in East Scotland, in a large coal pit being sunk to a depth of about 1,200 feet. Four men were being lifted from the bottom after lighting the fuses of a number of shots, and the bucket began to oscillate and strike the sides of the shaft, throwing off three of the men, who were, as usual, standing on the rim of the bucket. The Inspector, reporting on the occurrence, says:—

"The immediate cause of the accident was the swinging of the kettle; had there been nothing for it to catch this might have led to no fatal result. One or two precautions might have been taken; first, cleading the buntons with sliding deals, or second, fitting the kettle with a rider sliding in guides . . . Since the accident a rider has been added. This rider is of somewhat different construction from that figured in my report of last year in connection with two fatal accidents at Newbattle colliery, one of which was caused by the rider sticking on the guides and then falling away."

While cross-heads are without question of the greatest service in steadying the bucket, the reference just quoted to an accident from the fall of one points out that the use of these devices also introduces a new source of danger. A good many similar accidents have been recorded, for example:—

Dr. Le Neve Foster, in his report as Inspector of Mines for the Isle of Man District, for 1894, mentions one from the fall of a rider, which jammed and became hung up on its guide ropes and then suddenly fell away. In this State there was an accident at the Euro mine a few years ago in much the same way by the fall of a cross-head. Many miners stand so much in dread of this accident that they refuse to work with cross-heads, regarding the danger occasioned by them as greater than that which they prevent. This objection, which must be admitted to have reasonable grounds, based on bitter experience, stands in the way of rendering the use of these appliances compulsory under the mining regulations, although the balance of evidence appears to be that, when properly constructed and used on carefully made and well looked after guides, there is very little chance of their hanging up and that they are a very great safeguard. A good buffer and stop on the rope, above the heads of the men when standing on the bucket should always be provided, to catch the cross-head if it should fall. The difficulty of getting a completely satisfactory device for steadying and guiding the kibble strengthens the contention that this method of raising men should only be employed for short distances of winding, and where no other better means are practically available. Wherever it is possible to use a safety cage or skip for raising or lowering the men, riding on the kibble should be prohibited.

Tipping Buckets.—Several accidents have been recorded during the last few years from the use of tilting or tipping buckets in sinking, these having the body suspended in the bow at a point below the centre of gravity but held upright by a pin and link. On releasing the pin from the link, the bucket turns upside down and shoots out its contents. These buckets are very convenient in sinking from underground chambers where there is little head-room, and have consequently been much used. The accidents have resulted from the link becoming unfastened from one cause or another, permitting the bucket to upset and discharge its contents down the shaft while being hauled up. Two men were seriously injured on 20th July, 1904, while working in the bottom of Patterson's shaft, on the Ivanhoe mine, Kalgoorlie. They were preparing to open out at the 1,200-feet level, and were sending the dirt in the bucket to the 1,000-feet level by means of a winch at the 800-feet level. The bucket had two spears or pins projecting two and a-half to three inches above the rim and each with a link thrown over it. They had sent away a bucket full of dirt and it had been raised about 100 feet when it was heard to knock against the shaft timber and immediately afterwards the contents fell and injured two of the men. When the bucket reached the 1,000-feet level it was upside down and empty. The Inspector of Mines, after making inquiry, came to the conclusion that either the bucket must have struck against the timber with sufficient force to jerk the links off the spears or the bucket must have caught by its rim against one of the frame sets and been turned enough to cause the links to fall off. It is to be noted that the use of a cross-head would in all probability have prevented this accident.

A somewhat similar accident occurred at the Oroya Brownhill Mine, Kalgoorlie, on 6th September, 1904, by which one man was somewhat seriously injured. A side-tipping bucket was being sent away

from the bottom of the Pomeroy shaft, and had ascended some 70 feet, when by some means it tipped up and emptied its load down the shaft. The supposition is that some jerk caused the link to release itself from the pin or possibly some stone may have shifted in the bucket and pressed the link up. There was no visible defect in the appliance. Yet another accident of the same sort occurred during 1904 in the Lake View Consols Mine.

These and other accidents of the same nature have led to attempts to improve the fastenings so as to render the unintentional overturning of the bucket impossible. The improved arrangements now used in the Ivanhoe, Oroya, Brownhill, and Lake View Consols Mines are shown on the accompanying lithographs from drawings kindly supplied by the managers. In the Ivanhoe pattern "there is a keyway in the pin or lug through which the key is passed after the link has been dropped over the lug. After the key has been passed through the keyway it is reversed by means of a twist given to the handle. The weight of the chain attachment is supposed to keep it in that reversed position while the bucket is in transit." The fastenings are in duplicate, one at each side of the bucket. The Lake View Consols "device consists of a hammer-headed pin of just sufficient clearance to allow of the usual hinged link being dropped over it. In other words the straight pins that have hitherto been in general use have been replaced at this mine by ones that have two flat lugs at the top—one at each side. The slight sway that must necessarily take place when the bucket is on its upward course would bring one side or the other of the retaining link beneath either the one or the other of the lugs." The Oroya-Brownhill device is very clear from the drawing without farther description.

Dean's Safety Device.

A safety device has been recently patented by Mr. Alfred Dean which merits attention, though as yet it has not been tried on a working scale. Trials in Perth, with a large working model were, however, very satisfactory, and the principle appears to be good. The device may be called an "emergency stop," as it would not be used except in cases of failure of the ordinary appliances. It is intended to be brought into action in case of a cage getting out of control of the engine-driver. There were two fatal accidents from this cause in the State during 1904, involving the deaths of six men. One was the terrible accident in Edwards' shaft of the Great Boulder Mine, Kalgoorlie, which has been previously referred to, when two gigs with five men in them engaged skidding the shaft, fell to the bottom, and the other at the Golden Pole Mine, Davyhurst, where a braceman incautiously withdrew the chairs and got on to the cage just as the engine-driver had released the clutch holding the loose drum on which it was suspended. In such cases the ordinary safety catches on cages are of no use as the strong tension on the rope keeps them from closing on the guides. Mr. Dean's idea in such an event is to seize the rope itself by an appliance which will bring into action a rapidly increasing resistance and gradually bring the cage to rest without shock. The accompanying lithograph is from Mr. Dean's patent drawing, and the following description is quoted from his specification:—

"The object of this invention is to provide an apparatus for the arresting of a cage when anything goes wrong in the engine room as, say, when the engines lose control of the winding drums.

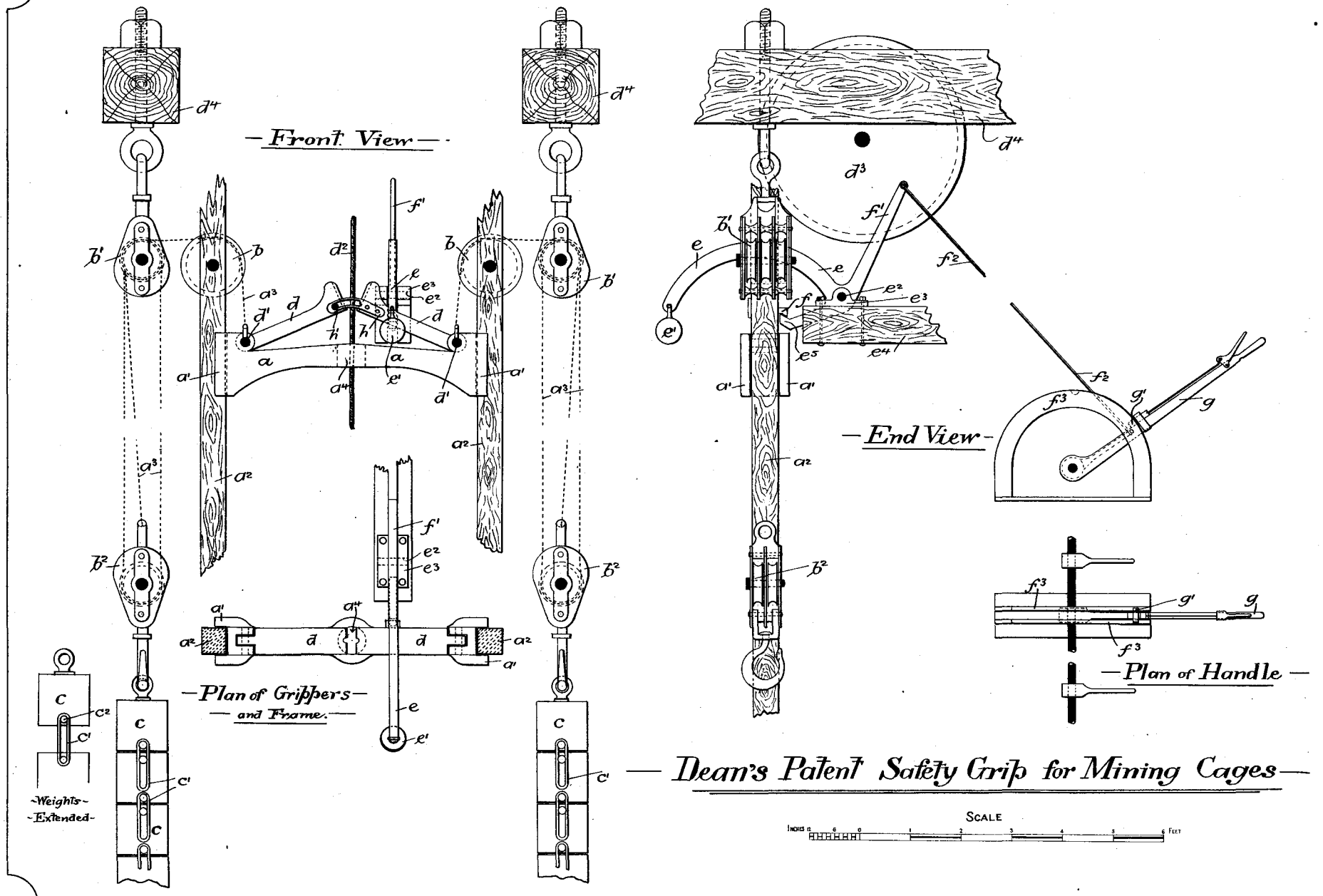
"The safety grip appliance is arranged and placed at or near the poppet heads and close to the overhead wheel, and the appliance is applicable for either single, double, or multiple shafts.

"For the arresting agents I employ a number of weights, and which come into operation on a system of mathematical increase of progression.

"The appliance will now be explained in conjunction with the accompanying drawing, and in such drawing A is the bridge piece or sliding frame, having recessed ends forming guides A1, which run on the skids A2. This bridge piece is formed with a central enlargement as A4, through which the hook may pass when it becomes disengaged from the cage. This frame is suspended by the block and tackle ropes A3, which rope passes over the pulley block B and treble sheaf block B1, and passing round the bottom double sheaf B2, and finally secured as at B3 to the block B2 as shown, or in other ordinary manner. The treble block B1 is suspended to the framing D4. To the sheave B2 are attached any number of weights as C, and which weights are connected to each other by the side links C1 and pins C2, and so arranged that they allow the weights to fold up or become opened out to about 12 inches, as shown in the drawings. To the sliding frame or bridge A are secured the jaws D hinged at D1, and which jaws are made to grip the winding rope D2 which passes over the head pulley D3 mounted on the poppet head framing D4. To enable this to be done by the engine-driver from the engine room I employ a quadrant-shaped lever as E, which is provided with a counterbalance as E1, and pivoted as at E2 to the bearings E3, and secured to a beam piece E4. This lever is formed with a snug piece E5, which latter engages with a lug as E, formed on one of the grippers, and also is formed with the arm F1, which is connected with the rod F2 to the pivoted handle G in the engine room. This handle works on the quadrant guides F3 and held in position by the tooth and notch G1 as shown. In order to cause the grippers to fall together, they are connected by means of the slotted and curved link as H, and the pin H1 works in such slot. When the winding drum bolts, or the rope runs away, or the driver loses control of his engine, he thereupon throws the lever G over, and so causes the snug piece E5 to release the grippers D which, by closing on the rope D2, cause the cage E and the sliding frame A and related tackle and weights to become as in one united whole, with the result that upon the descent of the cage and frame or pay-out of the rope the weights C are lifted one at a time, so that no jerk is given to the cage, as the weight gradually increases by way of progression until equilibrium is obtained, and the consequent arrest of the rope or cage.

"The total weights would be arranged so as to act as a counter-balance to the cage when loaded to the degree found necessary for local requirements."

The danger with an appliance such as this which clutches hold of the rope when in rapid motion is that a sudden jerk will be occasioned which might snap the rope. Care must therefore be taken not to pick up the counter-balance weights too rapidly. If they are taken up evenly and progressively the effect on the rope will, after the first small jerk caused by overcoming the inertia of the comparatively light



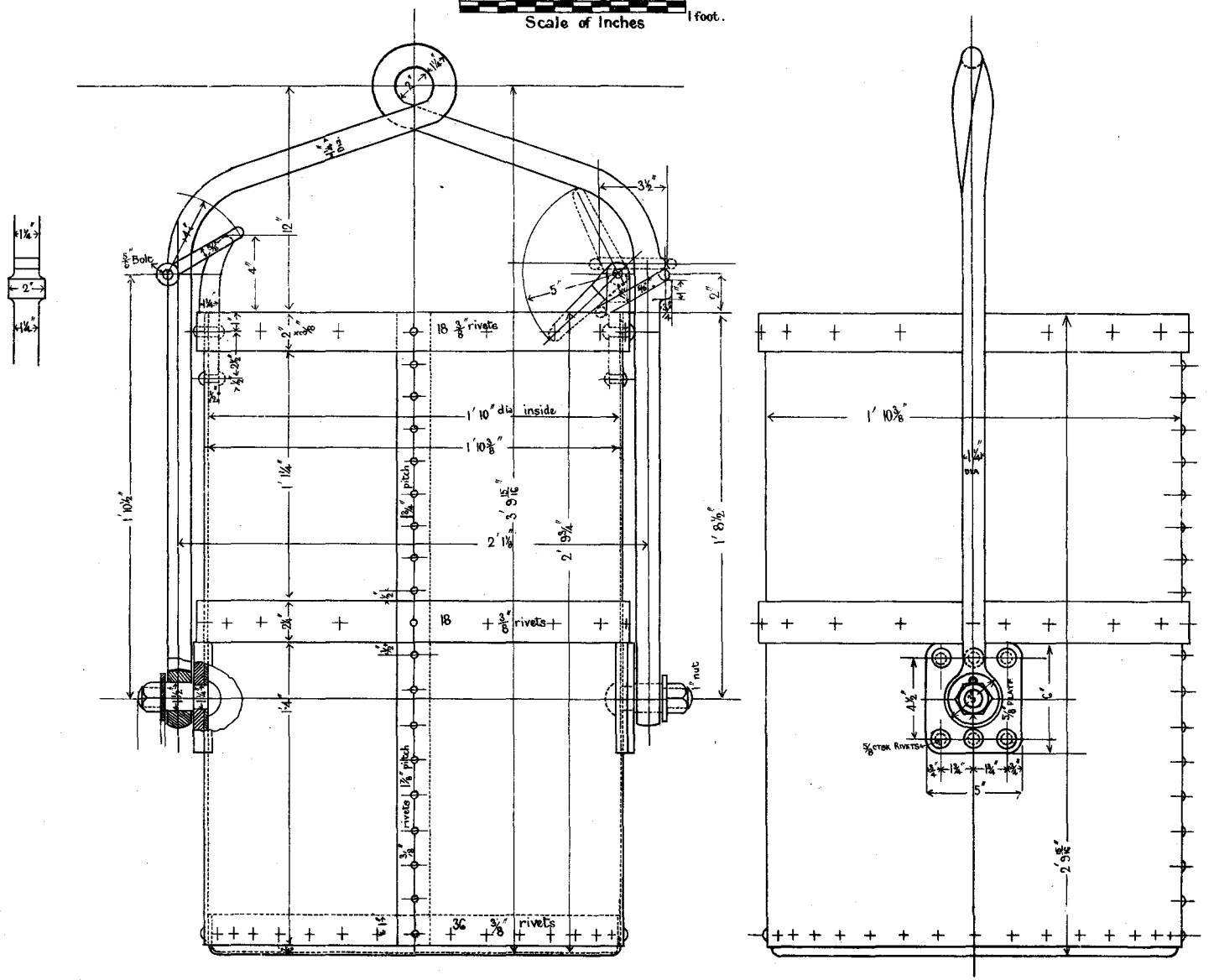
H.J. Pether, Government Photolithographer, Perth, W.A.

ORE BUCKET

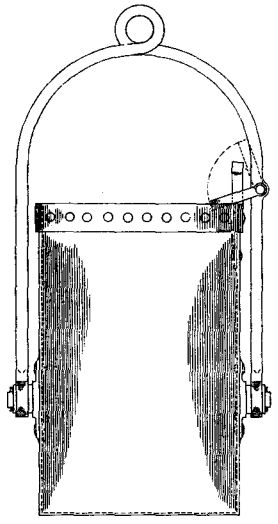
Oroya Brown Hill Co Ld

Capacity 7·3 Cub Ft

Scale of Inches — 1 foot.



H.J. Pether, Government Photolithographer, Perth, W.A.

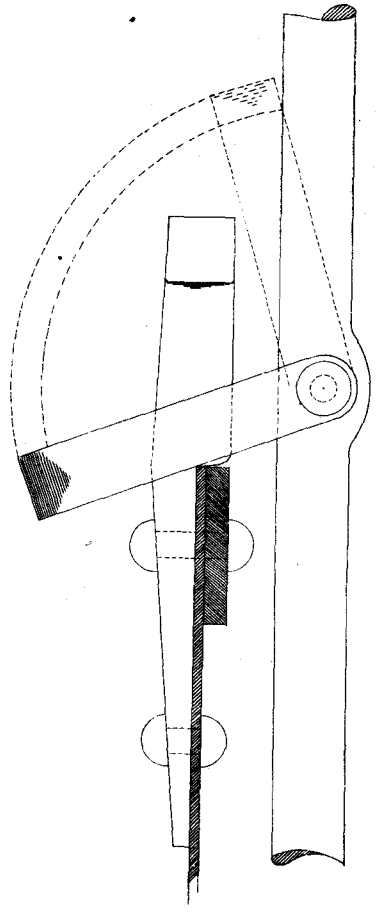


Side View

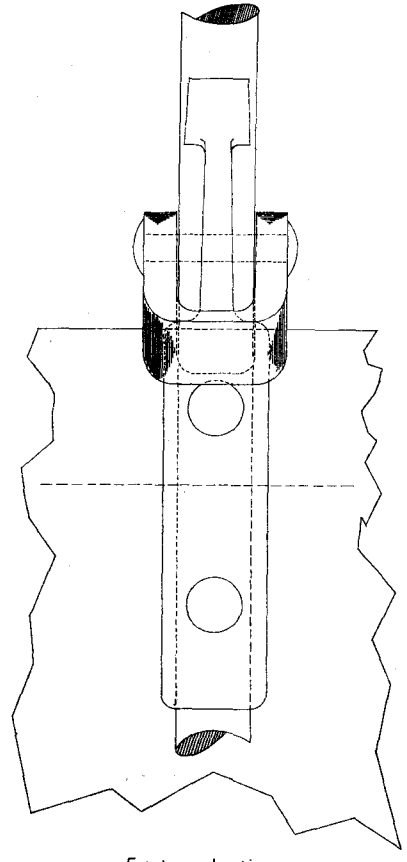
SINKING BUCKET

Showing position of side catch

0 2 4 6 8 10 12 1 foot.
Scale of Inches



Side elevation



Front elevation

SIDE CATCH

Shewing construction and method of working

Scale of Inches

LAKE VIEW CONSOLS LTD

bridge piece and its immediate attachments, be very similar to that of a brake applied on the winding drum, bringing the cage to rest in the same distance. It should be borne in mind that the stress in the rope caused by suddenly neutralising the momentum of the falling cage is much in excess of that due to the static load.

In order to provide for cases of overwinding with Dean's Appliance the usual safety detaching hook is used, but the thimble is attached to the bridge piece, and this is prevented from moving upwards by stops. The result is that the cage hangs up on the bridge piece, and falls downwards again until held by the counter-balance.

There are obviously other methods of creating a suitable resistance or counter-balance besides that of weights proposed by Mr. Dean, but his is probably the most simple, easily understood, and least likely to get out of order.

Testing and Examination of Wire Ropes.

The fatal accident in the Boulder Deep Levels shaft, from breakage of the winding rope and fall of the bucket on to a man working at the bottom, has again drawn attention very strongly to the necessity for the greatest care in examining the ropes on which men's lives depend. The rope which broke seems to have had very little wrong with it so far as outside appearances showed, but was very much corroded internally.

There is much need for systematic examination of winding ropes throughout the State, and for the establishment of regulations prescribing the methods by which they should be tested. The existing Mines Regulation Acts make no special reference to this matter beyond requiring (Sec. 23, Gen. Rule 20) that all machinery, which by definition includes ropes, shall be kept in good order and condition. No factor of safety is prescribed, and no indication given of what is to be considered "good order and condition." In the event of legal proceedings arising in consequence of an accident from breakage of a rope, it would devolve upon the court or the jury to decide as to the fact of whether the given rope was or was not in good order and condition, and there would be endless opportunities for conflicting expert evidence.

This question has received much attention in the Transvaal, and it has been found expedient to establish a laboratory in which thorough tests may be made. From the Annual Report of the Government Mining Engineer for the year ending 30th June, 1904, Part II, page 54, it appears that a small machine was first obtained capable of making tensile, torsion, and bending tests on single wires, then a large 50-ton vertical machine, by Messrs. Joshua Buckton & Co., capable of making torsion, tensile, bending, and shearing tests on wire ropes up to 50 tons breaking load; and lately, a yet more powerful machine has been ordered, namely, one of Messrs. Buckton & Co.'s 200-ton horizontal machines.

In response to my inquiries the Government Mining Engineer at Johannesburg has very kindly sent me the following interesting letter:—

"With reference to your letter No. 6157/01 of the 13th April, 1905, I have the honour to inform you that the following publications are being sent to you under separate cover:—

"(*a.*) Annual Report of Government Mining Engineer, Transvaal, 1904.

"(*b.*) Wire ropes used for winding: their strength, and some causes of its reduction."

Respecting (*a.*), on pages 54 and 55 of Part II., you will find a short account of the work performed in the Mines Department Mechanical Laboratory. In Appendix "B," of Part II., dealing with the winding accident at the Robinson Deep Gold Mine, the detailed results of tests of portions of the defective rope are set forth.

With respect to (*b.*), this paper—written by Chief Inspector of Machinery (J. A. Vaughan) and Inspector of Machinery (W. M. Epton)—deals fairly fully with the methods employed in the testing of winding ropes in the Mechanical Laboratory. From the tabulated results of tests of both new and old ropes you will see that no simple or regular relation has been discovered between the breaking strength of the rope as a whole and the aggregate breaking strengths of its component parts.

Our 50-ton Vertical Buckton machine has proved in every way satisfactory, except that its limitations in the matters of length of test specimen and maximum-breaking load have been found to be inconvenient. We have now on order at Messrs. Buckton & Co. a 200-ton horizontal machine.

Your requirements in the way of a whole rope tester would probably be best met by a 100-ton horizontal machine.

With respect to wire-testing machines, our 1,500 kilos Tarnogrocki machine has been found very useful, but its accuracy cannot be relied on in the higher and lower parts of its total range (0 to 1,500 kilos.) To remedy this, and to increase our plant, we have recently ordered through Messrs. George Craddock & Co., Wakefield, England, the following:—

One testing machine, to test wire in tension up to 2,000 kilos, as illustrated on page 40 of "Dusseldorfer Machinenbau" Catalogue. Approximate cost, including extensometer and special dies, £84 10s.

One testing machine, to test wire in tension up to 300 kilos, as illustrated on page 3 of "Tarnogrocki's Catalogue." Approximate cost, including extensometer and controlling balance, £45.

One testing machine, to test wires for torsion, as illustrated on page 8 of "Tarnogrocki's Catalogue" (Figure 1). Cost, with spares, £27 3s.

One testing machine, to test wire by bending, as illustrated on page 9 of "Tarnogrocki's Catalogue" (Figure 2), with changeable rollers. Cost £10 17s.

Regarding the cost of the large testing machines, these are approximately:—Fifty-ton machine, £600, f.o.b., London; carriage and insurance, £150; cost of erection, £100. With this machine we use a Wicksteed Hydrographic Extensometer. The cost of this instrument was £150. The 5-h.p. Tangye oil engine, with pulleys, shafting, and small lathe, cost £175.

The estimate of costs of 200-ton testing machine is:—

Machine, with pump and accumulator	£2,950
Mechanical Autographic Recorder	75
Freight, £150; railage, £350; insurance, £25	525
Erection and shafting	350
	£3,900

The Consulting Engineer to the Crown agents recently advised us that the Mechanical Autographic Recorder was more satisfactory and also cheaper than the Wicksteed apparatus, and we are therefore giving the former a trial with the 200-ton testing machine."

The fact brought out in the Transvaal experiments, that there is no simple or regular relation between the breaking strength of a rope as a whole and the aggregate breaking strengths of its component wires, shows that it is quite necessary for satisfactory testing of ropes to use a machine capable of taking a test piece cut from the whole rope.

Messrs. Vaughan and Epton's paper was read before the Transvaal Institute of Mechanical Engineers, 11th March, 1905, and is entitled "Wire Ropes used for Winding: their Strength and some causes of its Reduction," and should be consulted by managers interested in the question of preservation and testing of ropes. They recommend that in opening ropes for internal examination the following method should be used, which seems much preferable to the use of spikes, as often practised in this State:—

"At a position in the rope where it is desired to examine internally, this part should be brought to a point a little above the collar of the shaft and the weight of the conveyance and dependent rope should be taken up by means of wooden-faced clamps, resting on beams across the shaft. It is then possible, by means of two "Spanish Windlasses," to turn the rope in opposite directions, this leading to untwisting of the rope in a length of, say three or four feet, and allowing the internal examination to be carried out. The lever bars used for the windlass should be secured to the rope by hemp lashings, which also provide a protected fulcrum, and the wires of the rope will not be injured. The loosening of the strands is entirely "taken up" when the statical load is returned to the rope."

From the Transvaal Government Mining Engineer's Report for 1904, Part I., Page 10, it will be seen that the articles of the Mines and Works Regulations of that State have recently been amended to read as follows:—

"Article 40, subsection (*c.*):—Winding ropes shall be made of steel, of the best quality and manufacture, free from any defect, and the wires used in the construction of the ropes shall be of sizes suitable for use with the sheaves and drums fitted. Winding ropes shall not be used for raising or lowering persons when, owing to deterioration, the breaking strain has become reduced to below six times the maximum working load. In case a winding rope is used for other purposes besides the transport of persons, the maximum working load, when raising or lowering persons, shall not be allowed to exceed ·85 of the maximum working load when the rope is in use for other purposes.

"N.B.—The maximum working load includes weight of rope in the shaft at the lowest working point, as well as the weight of the skip, cage, or other conveyance and its contained load.

"Article 42, subsection (*a*), subdivision 4:—At least once a month the structure of the rope shall be examined for the purpose of discovering the amount of deterioration of same. For the purpose of this examination, which shall be be made by the Resident Mechanical Engineer in charge of the machinery on the mine, the rope must be thoroughly cleaned at selected places, and the Resident Mechanical Engineer shall assess the strength remaining in the rope, and shall record each assessment in the machinery record book.

"At least once in six months in the case of a round rope, and once in three months in the case of a flat rope, the rope shall be re-capped, and a portion, of length not less than half the circumference of the pit-head sheave, cut off the lower end. The portion of rope removed shall be tested in the Mechanical Laboratory of the Mines Department, at the expense of the user, to whom a certificate shall be furnished. At each occasion of re-capping, the connections between the rope, skip, cage, or other conveyance shall be annealed."

The Chamber of Mines at Kalgoorlie has forwarded to this Department letters from some leading wire rope manufacturers bearing on opening wire ropes for examination internally. Messrs. John Shaw, Limited, of Sheffield, say that opening a rope for 20 feet or so for the purpose of examination "would certainly be very detrimental to the good working of a rope, as it disturbs the strands, and it is by no means certain they will fall exactly into their own places again, and unless there is very strong evidence of failure or reasons for doing so, we should not recommend this form of examination," and go on to say that the rope being opened would have a prejudicial effect on its life. Messrs. D. H. and G. Haggie, of Sunderland, say: "It is quite possible for an expert to raise the strands of any particular rope and get them back again into position, but we do not think this is an advisable step, nor will it be an advantage to the life of the rope unless done by a practical rope maker. We see no necessity for opening out any rope every 20 feet, and think it would be a very dangerous practice." On the question of re-capping ropes, Messrs. Shaw remark: "It is a very wise and useful thing to re-cappel the rope at certain periods, especially if working in a wet pit, as the jar and shaking of the rope and stopping and starting has a

very detrimental effect, and a tendency to make the rope brittle; and this should be looked to frequently, and as occasion occurs, re-cappel. In all our large mines at home and in Africa these ropes are regularly re-cappeled at intervals, which vary accordingly to the circumstances under which they are working." Messrs. Haggie concur in this, saying: "The bulk of the collieries, mines, etc., in Great Britain test the condition of their ropes every three months, by cutting off the hose or cappel next the cage, and re-socketting it, at the same time examining the condition of the internal wires at that particular place." Messrs. George Cradock and Co., of Wakefield, also recommend frequent re-capping, saying: "It is exceeding important that all winding ropes should be re-capped every four to six months, and when the cap is removed a length of rope equal to about the diameter of the head gear pulley should be cut off, and this piece of rope should be opened out and carefully examined both for corrosion and broken wires. If this piece is corroded it is advisable to remove a further length of rope. The cap end of the rope is always subject to a large amount of vibration and fatigue, and for this reason alone it is prudent to re-cap a rope and remove a length of it; also, the water naturally runs to the low end of a rope, and lodges near the cap. Thus in ordinary practice it is found that this portion of the rope is more liable to corrosion than any other."

There can be no doubt that the unskilful opening of ropes for examination may often be detrimental to them and lead to internal corrosion, but it is difficult to see how internal examination can be dispensed with. The internal condition depends greatly on the care with which the rope has been made and the completeness with which its component wires are lubricated throughout its structure, and cannot be ascertained without opening for inspection. It is quite unsafe to rely on the outside appearances only. The remedy against inducing internal corrosion must therefore be sought in the employment of skilled men to open the ropes and in the application of suitable protective dressings to the portions opened before closing them up again. The accident at the Boulder Deep Levels mine showed that the examination of the pieces of rope cut off when re-capping was not sufficient to tell the state of the rest of the rope, as it was proved that the rope was good for about 20 feet at the lower end next the kibble, but very much corroded internally higher up. The break was 165 feet from the shoe.

Medical Examination of Engine-drivers.

It has been represented more than once to the Department that there exists a necessity for periodical medical examination of engine-drivers in charge of winding engines, especially fast running first motion engines, to ensure that they are not affected by any complaint which might render them suddenly incapable of controlling the engines. For example, an engine-driver suffering from heart disease might collapse suddenly while winding a cage load of men. Defective vision, making a driver doubtful of signals from the braceman or of the position of marks on his indicator; defective hearing, making him unable to receive knocker-line signals correctly, or epilepsy might also cause a bad accident, and the fact that the man had passed a satisfactory medical examination when getting his certificate is no guarantee that he will in after years remain physically fit for his duties.

The practical difficulties in the way of requiring by law that drivers should periodically obtain certificates of physical fitness are obviously great, but there seems no less reason for insisting on a mine owner seeing that his driver is fit to control his engine than for requiring him to have the engine itself in good order and condition. Both man and engine are necessary for raising and lowering the men working underground, and the lives of these men while on the cage depend on the physical fitness of the driver equally with the good condition of the inanimate appliances.

This question was discussed in the Legislative Assembly in committee on the Inspection of Machinery Bill, during the season of 1904, but a proposed section requiring periodical medical examination of winding engine-drivers was thrown out. For their own protection, nevertheless, it is advisable for mine-owners to satisfy themselves that the men whom they employ as engine-drivers are physically fit and proper persons to carry out the duties entrusted to them.

Plans of Mines.

This is a matter which is in a very unsatisfactory state under the existing Mines Regulation Acts. Section 31 of the Act of 1895 requires plans to be kept *at the mines* and to be posted up at intervals of not more than three months, and permits the Inspector of Mines to take a copy or tracing thereof. The scale prescribed is two chains to an inch, which is inconveniently small for the working plans of mines. It would be better to adopt one of the scales commonly used for mine plans, say 20, 30, or 40 feet to the inch, so that copies of the working plans could be given to the Inspector with the least amount of trouble possible. The worst point about the section as it stands is, however, that unless the inspector takes copies of the plans no record of the extent and position of the workings comes into the possession of the Government until the abandonment of the mine, when, under Section 32 of the Act, the owner is obliged to furnish complete plans to the Minister within three months. It is quite impossible for the Inspectors of Mines to keep tracings of all the mine plans in their districts, a work which would necessitate the continuous employment of a staff of draughtsmen, and consequently there is no regular system of obtaining plans of the mines of the State for record. The provision requiring plans to be sent in on abandonment of a mine is practically a dead letter, as mines are rarely definitely abandoned until long after they are shut down. Very commonly the owner is in hopes of soon starting work again, and does not abandon the mine until his lease becomes forfeited. By that time the enforcement of Section 32 is often impossible, or, if possible, the completion of the plans may involve more cost than paying the penalty for a breach of the Act. The object of requiring plans of mines to be regularly supplied to the Mines Department is to insure that they are systematically kept, and to provide a record for public information in later years. The mines are the property of the State and liable to revert into its possession, and it is reasonable that the State should require, as a condition of its leases for mining purposes, that the lessee should supply plans that will show what has been done during his tenancy. It is also very necessary that there should be

records of old workings for the sake of safety, especially when the old workings become filled with water. There have been numerous disastrous accidents in mines from breaking into old workings full of water, and accurate plans kept for public record are the best means of preventing such. It is not sufficient that the plans should be kept at the mines themselves, for it constantly happens that when a mine shuts down it becomes nobody's business to see to the preservation of plans and books, and these become lost and destroyed. Legislation on this question should therefore provide for the regular forwarding to the Minister for Mines of copies of the plans of all important mines at work throughout the State.

Abandoned Shafts.

In my report for 1903 I referred to the necessity for defining whose business it is to attend to the filling up of old abandoned shafts which are dangerous. It has lately been decided that this will no longer be done by the Mines Department, but left to Local Bodies, who must apply, if necessary, for assistance in doing so to the Public Works Department. To prevent recurrence of this trouble, the new Mines Regulation Bill now before Parliament proposes more stringent provisions than hitherto for the covering of old shafts by the owners of leases and claims.

Stripping Old Shafts.

The practice of removing the timber coverings of old shafts and of unlawfully taking the timber lining out of them continues to give much trouble to Inspectors of Mines and to the Police. It is usually difficult to get convictions in such cases, but every effort should be made to secure them and prevent the practice, as this renders nugatory all efforts to keep such shafts from becoming a menace to the safety of the public. The covering of shafts, where possible, by brick arches 10 to 20 feet below the surface and filling above these with earth is strongly recommended instead of wooden covers.

The Mines Regulation Act Amendment Act, 1904.

In November, 1904, "The Mines Regulation Act Amendment Act, 1904," was passed by Parliament and became law, giving Inspectors of Mines more defined powers in regard to unsafe practices not specifically mentioned in the principal Act of 1895. At the same time it allowed the mine manager the right of an appeal to arbitration if he thought the decision of the Inspector an unfair one to him or his work. Previously it had not been anywhere clearly laid down that the requirements of the Inspector must be complied with, though this was involved in the general power given to Inspectors under section 9 (7) of the Act of 1895: "to exercise such other powers as are necessary for carrying this Act into effect." The Amendment Act of 1904 has strengthened the hands of the Inspectors very much, enabling them to enforce their demands unless the manager is prepared to submit the question in dispute to arbitration.

Height of Stopes.

One of the questions which the Amendment Act of 1904 has enabled the Inspectors to deal with more decisively than heretofore is that of the height to which stopes may be carried without filling. There have been a great many complaints from time to time that the stopes in many mines are carried so high that there are large overhanging masses of unsupported rock, and that the "back" cannot be properly examined and freed from loosened material. Several accidents from falls of rock have occurred in such places, which might presumably have been prevented if the "back" had been more accessible. It has therefore been claimed on behalf of the workmen that it should be laid down by law that no stope should be carried higher than 10 feet above the filling, which would involve that each stope should be filled with mullock immediately after removing the broken ore before another could be commenced. The exigencies of mining work often do not permit of keeping the filling so close up to the working faces, and strict insistence on any such rule would undoubtedly hamper the mine-owners very much indeed in keeping up supplies of ore for the mills, and would largely increase the working costs. This is against the interests of all concerned in the industry, whether workmen or mine-owners, and the utmost latitude, compatible with safety, should be allowed to the latter in their methods of working to enable them to reduce cost of production to the minimum. So long as the work is carried on so that the workmen's safety is thoroughly secured the methods of working should not be prescribed by law, but should be left to the mine manager. It is his prerogative to fix the method which he considers most applicable to the conditions of his mine. To require by regulations that filling must be used in all mines, involves the proposition that the workings cannot be maintained in a safe condition by any other method, which is quite untenable. It has in very many mines been found impossible to fill all stopes, and other methods of supporting them have had to be used, for example, the square-set system of timbering, and it would be absurd to deny the mine-owner the use of well approved and safe methods suitable for his particular case. There is so much variety in the conditions of different mines—the nature of the ground varying not only in adjacent mines but even in the same mine—that it is not reasonable to prescribe hard-and-fast rules. A practice which is safe in one place may not be permissible in an adjoining one, and the precautions to be taken for safety must always be mainly a matter for individual judgment on the spot. Skilled workmen under the direction of experienced foremen and capable managers are the best guarantee of safety in mining operations.

It is the practice of the Department, therefore, to leave to the discretion of the Inspectors of Mines, who are able to look into each case on its individual merits, the decision as to whether the methods of working adopted in any mine are or are not sufficient for safety of the workmen; and I would urge that this is much more reasonable than laying down absolute rules. If an Inspector considers that safety is not sufficiently provided for, he has now ample power to get his reasonable requirements attended to; but he should not dictate to the management of a mine the method by which the required result is to be brought about unless he is convinced that no other proposal to arrive at the same end can safely be entertained. So long as safety of the workmen is secured the mine manager should be given all possible freedom in carrying out his work to what he considers the best advantage. The only exception to this

principle which in my opinion should be recognised, would be the case of a method safe enough for the present moment, but which would develop dangerous features later on. Looking to the future of the mine as well as the present, the Inspector would be justified in objecting to any mode of working which would ruin the mine eventually. Such a case would be the stoping out of ground on light temporary timbers under a river or lake, where the collapse of the workings would irretrievably flood the mine.

The main point to be kept in view in dealing with the safety of stopes is not so much their height as their accessibility for examination and removal of loose rock, and the possibility of securing them with timbers. If they are so high that they cannot be conveniently examined and sounded, it is plainly unsafe for men to work without putting in timber to protect themselves from falls of rock. The alternative to close filling, therefore, is increased timbering, and the choice must usually be decided by the exigencies of the moment. The rule should be that all ground whose safety cannot be guaranteed by frequent inspection and working down of loose stuff must be secured by timber.

Ventilation and Sanitation of Mines.

The report of the Royal Commission appointed to inquire into these subjects has been published, and is therefore available for public information, and it is hoped that its recommendations will be taken to heart by both managers and miners, and more attention be given to these important matters.

Employment of Aliens in Mines.

The report of the Royal Commission on the Immigration of Non-British Labour has also been published, and contains recommendations to obviate the difficulties and dangers arising from men being employed in the same mine who are unable to understand one another's language. This inability to communicate one man with another has been the cause of lives being endangered on several occasions.

Mining Centres visited.

During the year 1904 my duties as Chairman of the Royal Commissions on the Ventilation and Sanitation of Mines, and the Immigration of Non-British Labour took up so much time that it was not possible to visit many of the mining fields with a view to reporting upon the circumstances under which mining is being carried on in them, their prospects of progress, and their requirements of improved facilities for working. While these commissions were visiting different parts of the country I saw many of the principal mines and was able to obtain a good deal of information as to the fields in their vicinity, but my time was taken up almost entirely in the inquiries on the special matters dealt with by the Commissions. It was not possible therefore for me to make any general report on the state of the mining industry in the districts visited by the Commissions, the inspection being much too limited and incomplete.

Erlistoun and Duketon.

In January, 1904, I accompanied the late Minister for Mines, Mr. Gregory, on a flying visit to the Erlistoun and Duketon district, travelling from Laverton northwards to Duketon. The country between these two places appears to be favourable throughout for occurrence of gold, a large number of auriferous reefs having been found at intervals throughout it. It is mostly the usual greenstone of our goldfields, often schistose, and the surface is plentifully strewn with concretionary ironstone and often with white quartz. Bars of black jasperoid quartz and outcrops of white quartz occur pretty frequently. The dark banded jasperoid reefs often stand in close connection with chutes of auriferous quartz in the Murchison and East Murchison districts, as instanced in the Westralia Mount Morgans, Craiggiemore, Lancefield, and Mount Magnet mines, and many of the smaller mines at Boogardie. The "King of Creation," mine, about 38 miles north of Laverton, is on one of these jasperoid lodes with ironstained cellular quartz portions in it, and other bands that are soft and micaceous. In many respects it closely resembles the "Lady Miller" lode now being so successfully worked at Norseman by the Lady Mary G.M. Co. There was a shaft on the "King of Creation" at the time of my visit down 108 feet, to water-level, in which the lode was proved for 27 feet in width without, in all probability, its entire thickness having been cut through. Crushings of 50 tons for 19 dwts. to the ton, 30 tons for 18 dwts. per ton, and 31 tons for 14 dwts. per ton were reported by the owners. Testing the lode is however expensive, cartage to the Laverton battery costing 30s. a ton. The "Little Doris" 5-head battery is only $2\frac{1}{2}$ miles distant, but the charges there, without cyaniding, were 30s. a ton. The oxidised ferruginous material from the "King of Creation" reef could not be expected to yield a good extraction of gold by amalgamation only. This large auriferous body is probably, on the average, of very low grade, but it seemed to me to be deserving of systematic opening and sampling in view of the possibility of its being able to be worked with profit by an open-cut system on a large scale. The water in the shaft is fresh, and in a well 70 feet deep, to the south of the hill on which the lode outcrops, there is said to be a large supply of good water.

"The Little Doris" was not working at the time of our visit. The reef has been worked along the outcrop for about 600 feet from five shafts, the principal one of which is 125 feet deep. Water-level is at 60 feet in this, and the supply is sufficient for the five-head battery. The water is brackish. The reef is said to have averaged 32 dwts. per ton by amalgamation only, from some hundreds of tons crushed, and to have been about four feet in thickness. It is composed of good-looking quartz, often carrying a little galena. The outfit of machinery on this mine seemed very inadequate for economical work. There are several other prospecting shows in this vicinity which I had no time to visit. The country seems fairly soft schistose greenstone in the oxidised zone.

Some 44 or 45 miles from Laverton, on the road to Duketon, we come to Mr. Kirkpatrick's "Little Battery" of three stamps on the "Caledonia" mine. This has a reef about four feet wide, which has given fair returns. The water supply is rather insufficient.

Five or six miles farther north is the "Mistake" mine, which has a strong reef outcropping for a long distance on surface, and said to carry gold along the whole length exposed. It is equipped with a 10-head battery, and was putting up a cyanide plant at the time of our visit. The main shaft was down

100 feet, and there was not much water at that depth. The owners said the reef had averaged about 10 dwts. to the ton in their crushings, but some parts had gone to 30 dwts. If the values are as stated by them there seems much reason to expect that the mine will be a good property. My visit to it was quite too short to allow me to make any tests to verify the values.

Between Erlistoun and Duketon the road passes the "Baneygo" mine and battery, at which a good deal of work has been done. There was no one on the ground at the time of our visit and no appearance of work having been done for some time, so no information was obtainable.

The township of Duketon is on the "Golden Spinifex" line of lode, which runs a long distance through several leases. There appear to be three or more parallel reefs, forming a "run" of lodes very similar to that at Edjudina. Work was going on at the time of my visit upon the "Ballantyne," "Combine," "Rose of Persia No. 1," "Rose of Persia," "Marmont," "Long Reach," "Golden Spinifex," "Lauriston," "Wallaroo," "Water Melon," "Morialta," and two or three other leases upon this line. Most of the workings were from prospecting shafts, 60 to 80 feet deep, down to the water-level. The water-level comes nearer to the surface going northward, owing to fall in the ground, being at about 80 feet at the south end and at 10 feet in the "Morialta" at the north end. The country is schist very similar to that at Edjudina and Yarri, and is often very white and soft. The quartz in places appears to be a metasomatic replacement of the schist, retaining its lamellar structure. The reefs are from two to six feet wide, and have the smoothed walls characteristic of fissure veins. Very fair crushings have been obtained from several of the leases, and the line of reef appears to be gold-bearing throughout its length. "The Rose of Persia," "Golden Spinifex," "Lauriston," and "Water Melon" had the most extensive workings at the time of our visit. The "Golden Spinifex" has a five-head battery and small winding plant, but has been very unfortunate in losing two shafts through swelling of the soft white ground. The "Water Melon" had a steam pump at work, variously stated to be raising from 24,000 to 40,000 gallons of water a day. The water is quite fresh, and has been made use of in irrigating a vegetable garden with excellent results. This good water supply will be of much advantage to the district in time, but at present is a great drawback to the prospectors. The whole of the district around Duketon appears to have good fresh water fairly plentiful at comparatively shallow depths.

"The Golden Spinifex" line of reef seems a very promising one, and the establishment of a State Battery, which was decided upon by the late Minister during his visit, and has since been erected, will enable it to be properly tested. The State Battery is located about two and a-half miles north-west from Duketon, in order to be as central as possible to not only the "Spinifex" line of reef but also the others lying to the westward of Duketon. There are a large number of gold-bearing reefs between Duketon and the "Mulga Queen" mine, which is about 19 miles further west. "The Mount Maiden Reward," five miles from Duketon, has a reef of two to three feet wide, trenched along the outcrop for 400 feet and with two shafts 107 and 60 feet deep. This is a well-defined fissure lode. The "Lady Bella," 14 miles from Duketon, has a smaller reef, from which 40 tons were crushed for 34 ounces of gold, but which had very little work done on it when I saw it. "O'Connor's Reward," about 12 miles from Duketon, had some rich leaders, and crushed 19½ tons for 46 ounces of gold. The "Famous" had from 2½ to 3½ feet of stone, and had a shaft sunk 110 feet. Gold has been traced on the outcrop for nearly 200 feet. Some very nice gold-bearing stone was seen on this reef, which seems likely to be a good one. It is about 17 miles out from Duketon. The "Famous Blue," some 15 miles from Duketon, had very little done on it but trenching at the time of our visit, but showed large outcrops of white quartz. From surface appearances it seems likely that there were several reefs close together. One that was being trenched upon was about 12 feet wide where cut, and showed a good deal of gold. The "Mulga Queen" reef has been traced through three leases, the outcrop showing in surface trenches about three feet of quartz. A main shaft had been sunk 105 feet, getting water at 56 feet, and a battery of five stamps was being put up when I saw it. The water supply was said to be 4,000 gallons a day of soft fresh water. This appeared a very promising mine, and has since had several good crushings.

The Erlistoun and Duketon Districts are yet in quite the first stage of development, and require a great deal more prospecting and opening before their importance can be justly estimated. Even a flying visit is, however, sufficient to show that the reefs are numerous and have prospects of gold sufficient to justify high hopes of their future. The impression gained by me was that there was a very valuable district to be exploited. Prospectors gave also good accounts of the country westward from the "Mulga Queen" right through to Lake Darlot.

Phillips River Goldfield.

In February of 1904 I accompanied the late Minister for Mines, Mr. Gregory, to Ravensthorpe and spent a week in examining the mines of the Phillips River Goldfield. As this field has been again visited during the present year and a later report has been made public (appended hereto in Appendix No. 3) it is unnecessary to make special mention of the mines visited beyond saying that the Minister decided to proceed with the purchase and erection of Smelting Plant.

Black Range District.

A short visit was made to this field by the late Minister and myself in April, 1904, when most of the workings were visited. Quartz reefs are scattered over a wide area of country. The prevailing rock is greenstone, often schistose, but there are dykes of quartz-porphyry which traverse the greenstone, and are likely to be of importance in any theory to be formed as to the origin of the auriferous reefs. The general structure of the district was described by the assistant Government Geologist, Mr. Gibson, in a report which was printed in the Annual Progress Report of the Geological survey for the year 1903 in last Annual Report of the Department of Mines. The "patches" of alluvial gold therein described had been pretty well worked out at the time of our visit, and the district was beginning to depend on its auriferous reefs. Close to the west of the township of Nunngarra work was in progress on the "Warriminna," "Bright

Beauty," "Star," and "Eureka" leases, on which shafts have been sunk from 50 to 75 feet in depth. The workings in these are on a somewhat undefined "formation," which appears to be a decomposed quartz-porphyry dyke with veins of quartz through it. A crushing of 50 tons from the "Warriminna" is stated to have given a return of 10 dwts. per ton by amalgamation. There has been some fairly rich stone found in veins in these mines, but on the whole they seem to be of low grade. Very careful sampling is required to ascertain if there is any prospect of them being able to be made pay if worked on a large scale; there seems to be some hope that this might be possible.

About five miles east of Nunngarra, on the road to Lawlers, is the "Butchers" lease, on which there was a shaft 66 feet deep. The reef was about four feet wide and showed a good deal of visible gold. The outcrop is traceable to the north-east about 400 feet, and the reef seems to be a strong, well-defined fissure lode. Water was struck at 64 feet in the main shaft and proved too much for windlass work. This reef seems to be well worth opening up and testing by crushings.

The principal reefing workings are in two groups of leases, one lying about seven miles somewhat east and north from Nunngarra, the other about six miles north-east, and which are separated from one another by a distance of about two and a-half miles.

In the north-eastern group, on the "Chicago" lease (13B) a large quartz outcrop was seen, the reef being about four feet thick in some shallow workings, but there had been no crushings to test the values. On the "Worker" and "Welcome" leases and in Jobson's mine the reefs were very small and flat-lying, and were in a quartz-porphyry dyke running more or less north and south. These small veins have been pretty rich at times. The "Floater" lease had a shaft down 80 feet at the time of our visit, with a smallish reef, about a foot wide, of fairly good quartz showing gold pretty frequently. In the "Fingall" lease there was seen a large outcrop of quartz, said to carry gold. The reef seems to lie pretty flat, and little work had been done on it. This is close to one of the large "jasperoid" formations above mentioned, which has itself been found to contain some gold in parts. In the "Lord William" close by, a reef of quartz runs against the jasper bar and appears to be cut off by it. The "Koinoor" is another lease in this group, and has a small reef on which two shafts had been sunk, and from which a good crushing was obtained. The stone in this reef is often coated with yellow metallic-looking limonite very closely resembling gold to the untrained eye. In the "Abundance" lease there was a shaft 110 feet down, with a small reef of fairly rich quartz. South of this shaft about four chains there is another huge outcrop of the jasperoid formation.

The northern group of leases comprises the most important mines as yet discovered on the field, and it seems rather likely that the principal centre of population in the district will be in this vicinity.

The "Horseshoe" (45B) and "Dulgite" (24B) workings were on the same lode, and both had whip shafts down 60 feet to 80 feet on the underlay, which is rather steeper than one in one. The reef is small, the stone only averaging eight to 12 inches in width, but crushings have shown it to carry fair gold, payable in the soft weathered rock. When the rock becomes hard it is doubtful if these small veins can be worked successfully. They appear to be of the fissure-vein type, and are likely to be persistent in depth.

The "Wanderie" line of lode is a strong reef about five or six feet in thickness, running N. 75° E. through 8B and adjoining leases, and traceable on surface for over 10 chains in length. A shaft has been sunk 120 feet, but had not reached the lode at the time of our visit, and another was down on the reef 75 feet. The first crushing of 65 tons returned 37 dwts. of gold per ton by amalgamation without cyaniding. This seemed a strong, good-looking lode, and likely to open up well.

On the "Sandstone" lease (6B) two shafts have been sunk on a strong, well-defined lode three to six feet in thickness, with well smoothed walls. The quartz appears to have been subjected to strong crushing stress, being in these workings so shattered that it is difficult to get a solid piece the size of a walnut, while most of it is coarse angular sand. Very fair prospects of gold were obtained in this material, and the reef seemed likely to be a valuable one. South of the "Sandstone" is the "Kingoonya" lease (16B) into which the "Sandstone" lode passes, being cut near the boundary between the two leases. A shallow shaft sunk further south had cut a small lode on about the same course as the "Sandstone" reef, but unlike it in appearance, being bluish hard quartz. In lease 10B ("Undaunted") and 74B ("Undaunted East") prospecting was in progress, and near the north-west angle of the former a shaft about 37 feet deep had cut a lode three to six feet wide running a little west and north and corresponding fairly well in position with the expected continuation in this direction of the "Sandstone" reef. The quartz is blue and hard, but somewhat fractured. Fair gold was got at this point. In the "Undaunted East" a parallel lode about 2 feet 6 inches wide of blue hard quartz had been cut in two shafts about 10 chains apart, and yet another parallel lode has been found to the west of the "Sandstone" line.

The "Black Range" group of leases (5B and others) lie between the "Sandstone" and "Wanderie" groups and the most extensive workings on the field were on them. A strong lode outcrop has been traced on a more or less north and south line for over 15 chains in length. A main shaft has been sunk 160 feet, which cut water at 112 feet, about 300 gallons per hour. There were also another shaft 60 feet deep and a north shaft 32 feet deep on the reef. A 10-stamp battery had been erected and excellent results were being obtained at the time of our visit. The reef seemed a very promising one.

About 15 miles on the road from Nunngarra to Lawlers we passed the "Maninga Marley" lease, on which there was a vertical shaft 60 feet deep. This reef runs a little north and east with slight underlay to the north, and at the bottom of shaft was six feet wide and not then completely cut through. In a shaft sunk 40 feet on the underlay there was a thickness of seven feet of quartz, with four feet of soft schistose lode material on its footwall, all carrying gold. Fair prospects of gold were obtainable from the stone and the reef seemed likely to be a payable one.

From this point eastward to the Lawlers Field the country passed over on the road is mostly granite and several reefs are visible but do not appear to have been found worth working.

LAWLERS.

At Lawlers the greenstone country is again encountered and an auriferous district once more entered. The mines are somewhat sparsely scattered over a belt of country extending from about two miles south of the Lawlers townsite to eight miles north of it and about six miles in width. The most extensive workings are those of the East Murchison United Company and the Vivien Company. The former have a large battery close to the townsite of Lawlers, from which a tramway extends south-west about four miles to the "Donegal" group of leases and north-north-westerly about six miles to the "Waroonga" group. A branch from the "Waroonga" tramway, a little over three miles in length, runs out north-easterly to the Empire leases, and another branch from this to the north about a mile long communicates with the "Lone Star" leases. The quartz from these mines is brought in by the tramway to be crushed by the central battery at Lawlers. This is a system which has many advantages and which might be followed with benefit in many of our fields. It enables the milling to be concentrated at one central point where work can be carried on in the most elaborate way at the cheapest rate, and ensures constant supplies of ore for the battery. The cost of carriage is small and is largely offset by the better saving in gold and cheapness of working possible in a large and completely equipped mill than in the smaller mills that would otherwise be required at each mine.

At the time of our visit no mining work was going on in the E.M.U. Company leases at the Lawlers centre, the stone being brought in from the Waroonga, Donegal, or Empire mines. The general value of the ore was low. The principal purpose of the visit being to see the smaller mines of the district and consider the question of a State battery for their benefit, we were unable to look through the workings of the large mine except for a hurried visit to the Waroonga. In this the main shaft has been sunk to No. 4 level or 365 feet, and the lode was six or seven feet wide, underlying westerly. The lode material is a good deal like that in the Sons of Gwalia mine and in some of the Kalgoorlie mines, greenish dark coloured silicious material with much actinolite and strings of quartz. At surface there is a large open cut excavation from which a large amount of low-grade ore has been crushed. In depth the lode has been somewhat poor, the returns being given to us from 5 to 7dwts. per ton.

The *Vivien* mine is about 7½ miles north-north-east from Lawlers. The lode runs about north 25 degrees east, and underlays about 45 degrees to the south-east. It is worked from a main underlay shaft, which was down to the 220 feet level. The lode had been opened for about 1,500 feet in length, and is seen to be a fine strong body of quartz up to 15 feet wide, with well defined walls, and carrying fair values in gold. It had every appearance of turning out a fine mining property. A 10-head mill and cyanide plant had been erected, and active work was in progress both on surface and underground. The mine was stated to give about 120,000 gallons of water per day.

Of the smaller mines the following were visited :—

Caroline (627).—This lease lies about a mile and a half east of Lawlers. A shaft has been sunk about 57 feet deep in a large lode of quartz probably up to 20 feet wide, but not cut through so as to expose both walls. About five feet in width were being worked, with returns of from 10 to 18dwts. to the ton by amalgamation.

Bounty (19).—This lease lies two miles west of Lawlers. It had a shaft down 95 feet worked with a steam winch. At the bottom of the shaft a lode had been driven on for 85 feet showing a broken jumbled formation five to eight feet wide, apparently shattered diorite with strings of quartz. The values were good. There was a good deal of water in this shaft, and as it was fresh it was being used with splendid effects in irrigating a vegetable garden.

Surprise.—This mine had a shaft 60 feet deep on a lode about four feet wide. The last crushing of about 400 tons was said to have averaged 8dwts. gold per ton by amalgamation. The country is hard foliated amphibolite, and several other reefs are seen in this vicinity. The reefs run more or less north and south corresponding with the foliation of the country.

Smith and Langford's Battery.—This is situated at the Government well, which contains a good supply of fresh water. It consists of 10 stamps and a 4-vat cyanide plant. Most of the public crushing of the southern part of the district is done at this battery.

Empress of the East.—This was an abandoned mine on which a fairly large lode up to six feet in width has been traced for about five chains by surface cuttings. Crushings are stated to have returned from six to 17dwts. per ton. As the Waroonga tramway runs very close to this reef its stone could very readily be sent to the E.M.U. mill if, on further prospecting, it were found to be worth working.

In the *New Woman South* lease, towards the south end of the Waroonga line of reef, a small reef has been worked to about 50 feet in depth with good results, but was not worked deeper on account of a heavy influx of water, said to be about 1,500 gallons per hour. The outcrop has been worked for over 300 feet in length.

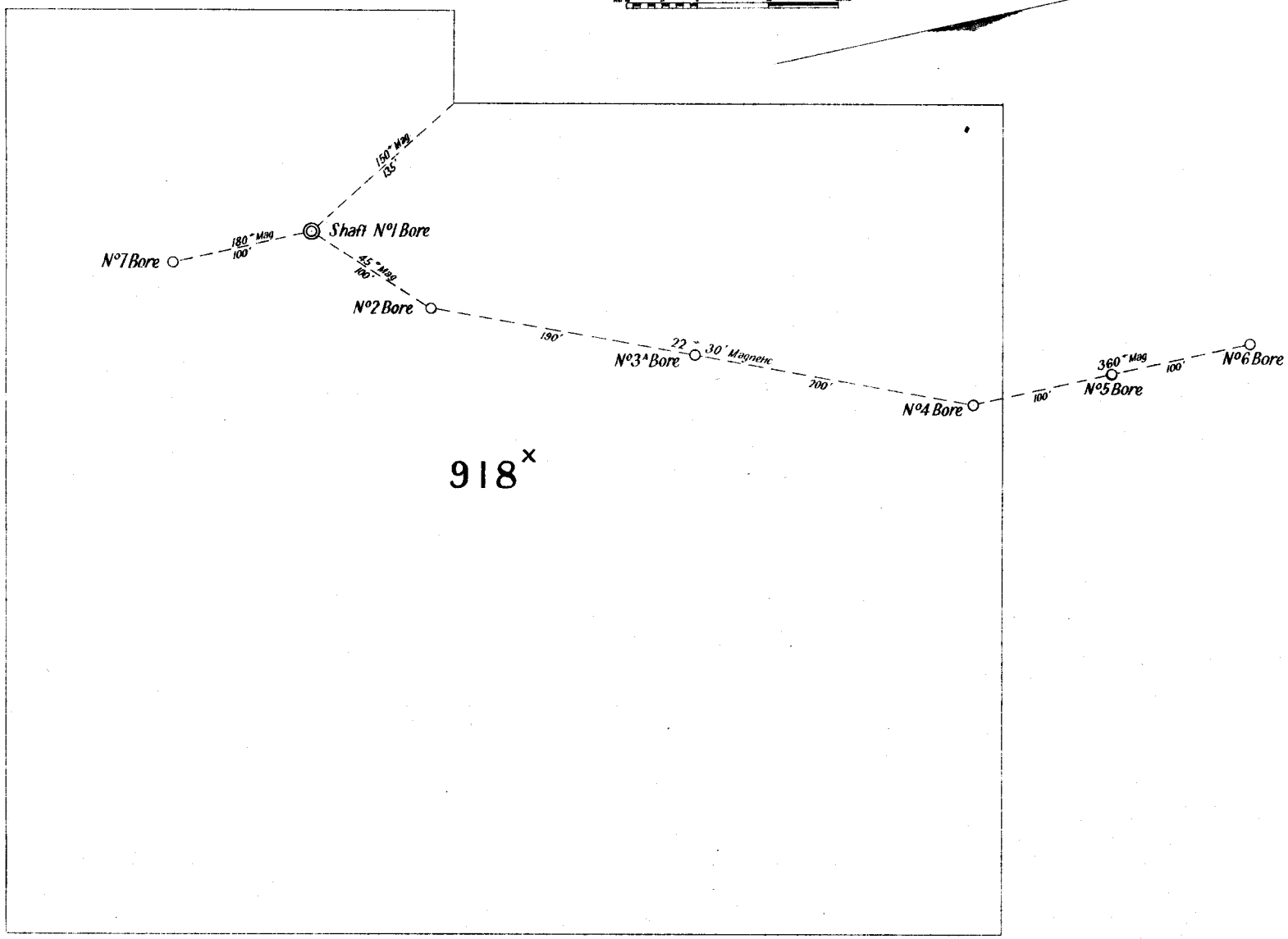
The same lode continues into the "New Woman" lease (858) and has been worked along the outcrop for over 600 feet. It was about two feet wide and is stated to have yielded fairly good stone. There was an engine shaft on this lode said to be 150 feet deep, but the machinery has been removed. The flow of water is said to have been about 2,500 gallons an hour.

About a chain east of the shaft there is seen a wide formation of ironstone, shattered country, and quartz said to carry a little gold, and about four chains to the east there is a huge quartz outcrop running north and south on which it has not apparently been found worth while to do any crosscutting. Immediately east of this, however, a good deal of work has been done on a shattered schistose formation, said to give prospects equal to 4 to 6dwts. of gold to the ton. One test crushing is said to have resulted in a return of 4dwts. to the ton from a parcel taken across a width of 30 feet of the lode material. The tailings from this ore were not tested, but those from a similar test of 60 tons which returned 16 ounces of gold by amalgamation are said to have given 3 to 3¼dwts. of gold by assay. Very little work has been

PLAN OF BORES

KANOWNA DEEP LEAD

SCALE



done on this large low-grade body, but it seems to deserve very careful sampling and testing. The Waroonga tramway runs through the lease. The New Woman reefs are on the line of the "Waroonga" reef and are probably part of the same lode.

In the *Waroonga North* (No. 603) lease a party of prospectors were working on the Waroonga lode, getting ore said to be worth 7 to 8dwts. to the ton from an ore body five feet thick. Two shafts have been sunk, 50 feet and 112 feet deep. There was also another lode a short distance to the west, from which poor prospects were obtainable.

Kiora.—On this ground there were two shafts sunk, 50 to 60 feet, in a white soft rock that looked like weathered felsite. The prospectors were following some small rich veins of quartz, which seemed to be rather irregular in their occurrence.

Glasgow Lass (No. 115).—Here there is a very flat-lying reef, 18 inches to two feet wide, which seems to be of irregular shape. It is also in the weathered felsite country. Some good gold has been got, but the reef is difficult to follow.

Cinderella (No. 645).—In this lease the main shaft is down 125 feet, and had just cut the reef and a lot of water at the time of our visit. There is a five-stamp battery on this lease, which does a good deal of public crushing.

New Holland (No. 573).—On this lease there are three shafts down to the water level (86 feet), and a wide schistose formation, about 15 feet in thickness, has been worked from them. The owners said the values would average from 12 to 15dwts. to the ton.

Left Bower.—Some fair returns are said to have been obtained from a large outcrop of quartz on this lease. From the appearance of the workings, I should say that the owners have been following the richer veins only, but to make a mine of this proposition it would have to be worked systematically on a large scale, and very careful and extended preliminary trials are necessary to show whether the stone is good enough when handled in bulk.

The *Right Bower* is an adjoining lease on the same line of reef, and has had several very fair crushings, and would best be worked as one concern with the "Left Bower."

We had not time to visit the "Empire" workings, which are said to be about 120 feet deep, and have steam machinery on them. The reef is said to be from 25 to 40 feet in width, of white quartz, returning from 5 to 6dwts. of gold to the ton.

The *Mt. Weight* is another large low-grade body of quartz close to the "Empire," said to have given returns to from 2 to 7dwts. of gold to the ton.

The impression received by me of the Lawlers field was that it was on the whole a rather low-grade field, but there were numerous large bodies of ore that will eventually be worked. Some of these seem good enough to be worth the attention of mining companies prepared to spend a good deal of money in development work and equipment, but as a rule they are rather too poor to be of much use to the working owner who depends on opening up a mine by his own unaided efforts. There is a good deal of water to be pumped out of most of the mines when they get down over 100 feet in depth, and while this is of little consequence in the case of a large mine, it is usually fatal to the working prospector. The tramway system of the East Murchison United Company with short extensions could be made to command nearly the whole field and would enable the whole of the milling to be done at one centre if suitable arrangements could be come to between its owners and the owners of the various mines.

Boring at Kanowna.

In continuation of last year's report on the boring done to locate the northward continuation of the Kanowna North Lead, I attach hereto a plan and section of the bores put down during 1904, which clearly show the sort of ground passed through. The northern depression in the cross-section probably indicates the old valley of the Q.E.D. Lead, the southern one that of the North Lead. No gold beyond occasional small colours was found in the bores, and no "wash" that would give promise that more extensive working would find any. The gold got in Rollo's shaft was evidently on a "false bottom." As pointed out in last year's report, there is a great difference in level between the one worked on by Messrs. Blake and party, to the east of Rollo's shaft, and the bottom shown by the bores. The wash obtained in Blake's claim was more or less waterworn quartz gravel, and appears to be part of the North Lead, as worked in the claims further south, It seems very probable that this "wash" runs out on to a false bottom in the deep ground, and is to be looked for at about 100 to 110 feet below the surface, instead of on the bed-rock.

To make the pumping plant erected by the Government on Rollo's shaft effective for the benefit of the district, it is now necessary to crosscut from the shaft to tap the water, which has put an end to all working at the north end of the Lead. The 120-feet level will probably prove deep enough for this, enabling the bottom on which the gold is known to exist to be drained. When the shaft was pumped out for sinking, there was no appreciable effect on the water in the claims on the North Lead, though it is said to have gone down in some of those on the Q.E.D. Lead, thus showing that the water in the North Lead was in some way (probably on account of one of the thick layers of clay) prevented from getting down to the bottom of the old valley. By crosscutting below the bottom on which the water appears to be lying, and putting up bores and rises, it should be possible to tap it, and unwater a considerable area of ground for working. The amount of work necessary to obtain this result cannot, with present information, be foreseen with any approach to exactitude; probably several hundred feet of driving would be required. There being no demand for mining areas lately in this vicinity, the matter has been left in abeyance until those who are locally interested make some move to show that they are prepared to go on with the mining operations if the ground is unwatered. The Government has provided a pumping plant, and it is now fair to expect the people interested in the further development of the North Lead to do something towards making use of it.

Another boring project was brought forward in the Kanowna District during 1904 by Messrs. McIver, Stuart, and Rollo, viz., to do further boring in the vicinity of the bores xxii. and xxiii., made by the Government in 1901, and shown on map accompanying the Annual Progress Report of the Geological Survey for 1900. Assistance was sought under the Mining Development Act, 1902, and granted to the extent of £250 on the £ for £ principle. Work was begun in September, 1904, and was still in progress at the end of the year.

Advances under the Mining Development Act, 1902.

A large number of applications for advances under the above Act were received during 1904, further particulars of which are given in Appendix No. 1 attached hereto. In dealing with these applications it has been very strongly impressed upon me that in the majority of cases the applicants have undertaken heavier tasks than they have much hope of carrying out successfully. Very often it appears that they have exhausted their means before applying for assistance, and have little or nothing but their own labour to represent their share in the work proposed to be carried out. The assistance given under the Act being on the £ for £ principle, it often happens that the applicants have difficulty in providing their half of the cost, and one of the great troubles in making advances is to obtain some reasonable assurance that the applicants will be able to carry the work to completion successfully. It is evidently quite futile to begin a scheme of development unless there is a reasonable prospect of being able to complete it. The estimates of probable cost submitted by applicants are frequently a long way under the actual figure required, and it has often become necessary in consequence to make advances at a fixed rate per foot of work done so as to spread out the agreed amount over the work proposed, instead of paying £ for £ on the actual expenditure. If the latter were always done, there have been several cases where the amount of the advances, based on the applicant's estimates of what he would require for the whole work, would not have sufficed to carry out one half of it.

Applications continue to be very frequent from prospectors anxious to get advances to assist them in opening their mines, and the difficulty mentioned in my last year's report still remains as serious as ever of deciding which of them ought to be assisted. The propositions are generally very fair ventures, on which the applicant has spent much time and labour, and is willing to continue to do so to the full extent of his ability, thus giving the best possible guarantee of his own faith in them. Assistance in such cases was evidently contemplated by Parliament when Part III. of the Mining Development Act was passed, and to refuse it in deserving cases lays the Department very open to the reproach that a stone is given when bread is asked for. It is clearly impracticable to assist all deserving prospectors, but no fixed principle has been arrived at on which it can be decided which ones are to be favoured. Consideration is given to the state of mining in the district and the probability of a revival in it if a good find is made by the aid of the subsidised work, to the amount of money already spent in the same district in assisting similar ventures, to the immediate prospects of the mine, and to the circumstances in general of each case, and assistance is given to those which seem most likely to give good results from a public point of view. It is evident nevertheless that a well presented and supported case might easily secure preference over an intrinsically better proposition which was not well put forward, and that comparison of the merits of various applications is very far from satisfactory.

Comparison is often made between these advances to miners under the Mining Development Act and the advances to agriculturists through an Agricultural Bank, but the cases are not really comparable. There is a fundamental difference in the fact that labour expended in improvements on farming land has a tangible result in the increased value of the property, but on a mining venture there is no increase in value unless valuable mineral discoveries are made. Money and labour may be expended in proving that a promising and apparently valuable prospect is of no value as a mine, and its value as an asset disappears. It is only, therefore, in those cases where the mines turn out successfully that the loan moneys expended on them create their own security in the same way as in improving agricultural land.

State Batteries.

Under Part IV. of the Act the extension of the State battery system has continued during 1904 on much the same lines as in the preceding year. It is unnecessary for me to repeat particulars of new batteries erected and subsidies to private mills to induce them to crush for the public given elsewhere in the Department's Annual Report for this year, but it may be useful to make a few remarks on one aspect of the State battery question which has on several cases lately been brought into prominence. This is a demand that the State batteries should from the first be furnished with plant for the most complete and economical treatment of the tailings, both sands and slimes, in order that the owners of small mines may realise the greatest possible percentage of the value of their ore, and raises important questions as to the proper functions and objects of a State battery, and how far it should be managed on strictly commercial lines. The primary object of State batteries, I take it, is to enable the prospectors and small mine owners of a district to prove their mines by working trials, and put them in a position to have them opened up on a more extensive scale, so that they may eventually get batteries of their own. No mine of any magnitude can be content for long to cart its ore, perhaps several miles, to a small State battery, and in a healthy and progressive field the natural growth of the mines ought from time to time to result in the erection of their own batteries, leaving the State one free to crush for prospectors and little developed mines, or even rendering it unnecessary altogether. The State battery under such circumstances might show a heavy loss if considered purely as a commercial concern, and yet have been a great national benefit in bringing about the establishment of a flourishing field. Its first object is served when the mines become strong enough to do without it, and from this point of view it is seen to be an essentially temporary means of encouraging the early stages of the development of a district.

Its primary function being of a temporary nature it is hardly reasonable to demand that the equipment should be of the costly character of a permanent mill, and the question of the class of plant to be provided narrows itself down to that which will reasonably serve the object of bringing the mines to the

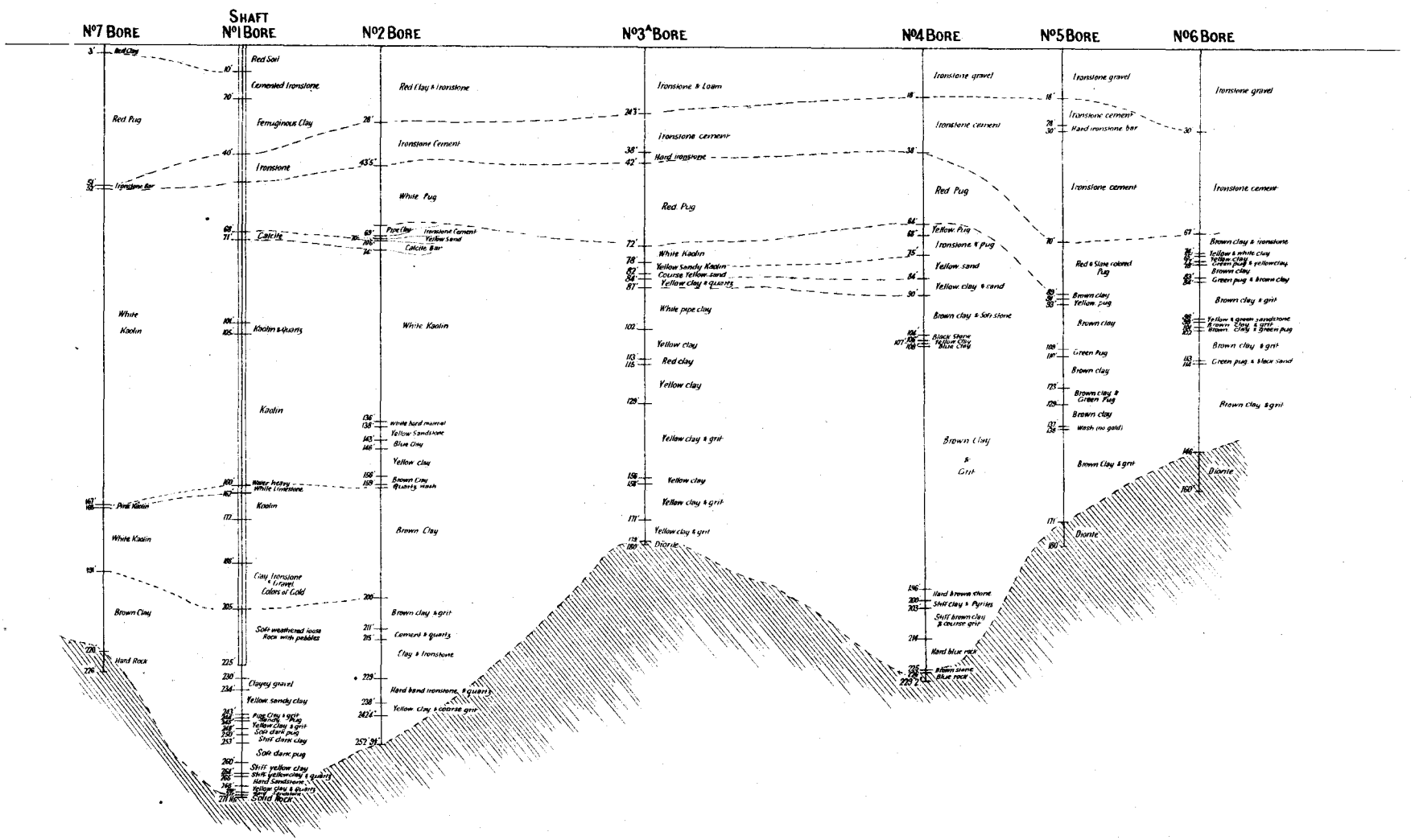
CROSS SECTION

KANOWNA DEEP LEAD AT PUMPING SHAFT

AS SHEWN BY BORING

HORIZONTAL SCALE

VERTICAL SCALE



self-supporting stage. There are two ways by which this stage may be reached, either by the introduction of sufficient capital to open the mine and furnish it with a battery, or by raising enough gold from the mine itself to permit progressive expansion of the mining operations and purchase of machinery. For the introduction of outside capital the first necessity is proof of the value of the mine, and this is furnished most conclusively by crushings at the State battery. If the only end to be attained were the proving of the mines there would be little need for the battery to have any appliances for treatment of the tailings from the amalgamation process, as the assays of these would show their values quite satisfactorily, and tests could readily be made on parcels sent away to well-equipped mills, which would show how far they were amenable to treatment and what percentage of the values could be extracted. But as the prospector has to make his living from the proceeds of the crushings, it is always almost necessary that the treatment should go further and include the cyaniding of the sands, as otherwise the returns are insufficient to enable him to cover expenses. Where there is a possibility of cheaply treating the slimes, by drying them and leaching them with sands, it may often be reasonable to do this also, so as to give the most complete treatment possible at small cost of plant; but there are few cases where the heavy expense of a filter-press plant for slimes treatment would be justifiable. The few shillings per ton of extra return so obtained, though often of vital importance in extensive and continuous working, are of little consequence on small parcels, and so far as testing the value of the stone is concerned, the assay value of the slimes gives quite sufficient information to show if the mine is worth the introduction of capital without actual treatment. For the purpose of proving mines sufficiently to justify capital being put into them, I would contend, therefore, that it is unreasonable to expect the State batteries to be provided with expensive slimes treatment appliances.

The case where the mine owner is trying to develop his mine as he goes along stands on a somewhat different footing, as he wants every penny he can make from the ore to enable him to extend his operations. If there were many mines in this position in a district a good argument might be made for equipping the State battery very completely, even at some risk of loss, as the additional revenue due to the success of even one good mine would compensate the State for considerable loss on the battery. Such instances are unfortunately not nearly so common as they ought to be, many owners of small mines being apparently quite content to work on from day to day on a small scale, so long as they can make a living, without bestirring themselves to try to extend their operations. There are many instances on the fields of mines which have given highly profitable returns, from which they might have been equipped with machinery and made self-supporting, but which are still only worked in a small way, and by primitive methods, on account of the money obtained from them having been squandered. In actual practice, the need for completing the slimes equipment of the State batteries in order to enable small mine owners to extend their operations is so seldom visible as to be quite neglible in most cases.

So far as testing and proving prospecting mines is concerned, therefore, there is rarely any good reason why the State mills should carry the treatment further than amalgamation, followed by cyaniding of the sands. But we come now to the second function of these batteries, which is to provide treatment facilities for small mines which have no plant of their own. This has become of more importance in many districts than the original object of testing and proving the reefs. Small parties of working miners take up reefs and work them to make a living out of the gold raised, without any special intention of doing anything towards more extensive development. In such instances the State battery is simply in the position of a "Customs Mill," and when the claims of these mine owners to State assistance are looked into, there seems really very little reason why the general body of taxpayers should contribute to their support at all. They are not improving the public estate to any appreciable extent, rather the contrary, as they are working out the most accessible portions of the reef and rendering them more difficult to re-open later on. The only benefit from these workings, other than the maintenance given for the time being to a certain portion of the population of the State, is that the records of the mill returns afford incontestable evidence later on of what has actually been got from them, and so give encouragement to people trying to re-open them in depth. Being simply worked for the purpose of making a present living, they ought to be entirely self-supporting, and a State battery erected to afford them crushing facilities should make charges on ordinary commercial principles, to recoup not only working expenses, but also interest on the cost of erection and profit sufficient to cover redemption of capital cost. The amount of plant erected should therefore be determined by the prospects of its being commercially profitable. When a large quantity of slimes has been accumulated, and the state of the district affords some guarantee that ample supplies of ore will be maintained, it might be good business to add filter press treatment of slimes to the mill equipment, but the question, in my opinion, ought to be looked at mainly from a commercial point of view.

It seems to me that a sharp distinction must be drawn between batteries erected in new fields for the purpose of proving them and hastening their development, and those which are put up, especially in settled districts where there are batteries already, simply to afford crushing facilities for a number of small mine owners. In the former case there is reason for the State to run considerable risk of loss in the endeavour to open new fields, but in the latter the same considerations do not altogether apply. The extreme cases of each type are easily distinguishable, but most of the difficulty of the question results from the fact that very many cases are a blending of both types, purely prospecting ventures of the first gradually becoming small working mines of the second, and possibly, in the hands of energetic owners, passing on into the desirable stage of becoming independent concerns with their own machinery equipment for mining and milling. It is useful, however, to keep distinctly in mind the idea of the two types of mines and to remember that State aid may be permissible in so far as they are being worked for the end of national advantage by the development of the district, but is not so in regard to them as merely worked for the support and profit of their immediate owners. The plant provided should accordingly be in the first instance just so much as is sufficient to enable the mines to be opened up and developed, and might legitimately be worked at some loss; but when complete equipment is required in order to act as a "Customs Mill," the question should be decided on ordinary commercial principles. One of the best of

the principles, be it remembered, is that the provision of facilities increases business, and therefore, when the prospects of a district justify the erection of a better plant than is required for immediate necessities, it may be good policy to anticipate developments.

The most feasible method of confining encouragement to parties developing and extending their mines with establishment of crushing facilities for those who are simply working for a day to day living, appears to me to fix the ordinary rates for treatment at a figure which will pay for working expenses and interest on and redemption of the first cost of the plant, and give substantial reductions in the rates to such owners as are carrying out *bona fide* development work.

Reliance Furnace.

In Appendix No. 2 to this report a description is given of the trial made during 1904 of Mr. R. W. Heads' Patented "Reliance" Smelting Furnace in Perth. This furnace was afterwards erected by Mr. Heads near Ravensthorpe, on the Phillips River Goldfield, and worked for a short time with a certain amount of success from a technical point of view, but soon had to be shut down for business reasons.

Coolgardie Oil Shale.

Some notes gathered together on this subject have been collected in Appendix No. 4 for public information, though the immediate prospects of making any use of the mineral do not appear very hopeful.

I have, etc.,

A. MONTGOMERY, M.A., F.G.S.,

State Mining Engineer.

Appendix No. I.

Advances granted during 1904 under "The Mining Development Act, 1902."

1. *W.E.G. G.M.L.* 505G, *Niagara.*—The owners of this mine obtained an advance of £500, to be spent half in sinking the main shaft from the 240 feet to the 340 feet level and half in purchase of necessary machinery, they to spend at least a like amount. Up to the end of the year £246 16s. 1d. were advanced towards purchase of machinery and £50 towards sinking of the shaft. The mine was favourably reported on by the Inspector of Mines, and appears to be generally considered a good property requiring more development to put it in a paying condition.

2. *Carbine G.M.L.* 33s., *Kintore.*—Messrs. Crawford and Pimley, owners of this lease, applied for an advance to enable them to sink their shaft a further depth of 100 feet and crosscut to their lode in order to test this and also obtain a supply of water for their battery. The estimated cost of the work was £1,000. The report of the Inspector of Mines being favourable, an advance of £500 was granted on security of a lien over the lease, the borrowers being bound to crush for the public, if required, for at least ten days in each month at prescribed rates. The ground in the shaft proved very hard and expensive, and when 86 feet had been sunk the advance was all expended, together with some £700 of the lease-owners' own money. An application for a further advance of £400 was then made, and after a second report from the Inspector of Mines another advance of £300 was agreed to by the Hon. the Minister for Mines. Work was still in progress at the end of 1904.

3. *Lady Mary G.M.L.* 3993, *Coolgardie: Tierney, Baker, and party's application.*—Particulars of the early stages of this application were given in last year's report, but though an advance of £150 had been authorised work had not started at the end of 1903. After many delays in making satisfactory arrangements for water supply work was commenced, using sluice-boxes for washing the dirt. From four to six men were employed for two and a-half months and used 1,333,340 gallons of water for a return of 36ozs. 2dwts. 8grs. of gold, valued at £133 15s. 4d. The cost of water was 4s. 6d. per 1,000 gallons, of which one half, or £150, was paid by the Department. The cost of labour was £91 10s. The returns being quite unpayable the party did not go on with the venture.

4. *G. Marshall's application.*—After Messrs. Baker and Tierney had failed to work the alluvial deposit on the Lady Mary Lease by box-sluicing, a further application was made by Mr. G. Marshall to try it with his rotary puddling machine, described in annual report for 1903. An advance of £200 on the £ for £ principle was granted to assist the applicant in removing and re-erecting his machine and working it. The machine was worked for 18½ days, the actual running time being 13 days and six hours, and treated 1,180 tons of dirt for a return of 9ozs. 17dwts. of gold, at a cost of £182. This was an average output, including stoppages, of 64 tons per day, or, on actual running time, 86 tons per day; an average return of only 4 grains per ton, worth about 8d., and an average cost of 3s. 1d. per ton. The output of the machine was greatly less than estimated, the costs greater, and the ground poorer. Work was stopped immediately the Government subsidy ceased. The machinery has since been sold under the bill of sale held by the Minister as security for the advance.

5. *R. Foran and Party: Prospecting alluvial lead at Kalgoorlie.*—After completing the work described in my last year's report, Messrs. Foran and party continued driving on the deep lead, getting encouraging prospects from time to time, but nothing payable. They made application for further assistance, and early in 1904 were granted another advance of £50 to assist them in sinking a second shaft and do some more driving, but this work also was unsuccessful in finding payable gold. The operations proved the fact of the existence of a distinct "lead" at a depth of 109 feet.

6. *Waite and party: Prospecting alluvial lead at Trafalgar.*—This application also was referred to in last year's report, which showed that very encouraging results had been obtained. Early in 1904 the party applied for further assistance on account of the wetness of the ground and the need for machinery for raising and treating the dirt, but it was considered that the prospects were good enough to permit them to obtain all necessary assistance locally. Nothing more was done after the balance of the subsidy had been paid. There appears to be a valuable "lead" in this claim, but it is too deep and wet to be worked successfully without steam machinery.

7. *Jameson and party: Prospecting alluvial lead at Smithfield.*—An advance of £1 for £1 up to £50 was granted towards the end of 1903 to this party to sink a shaft on a deep "lead" at Smithfield, near Paddington. A shaft was sunk 86 feet and about 30 feet of driving done, but though cemented wash carrying a little gold was got, there was no payable ground laid open, and work was abandoned when the subsidy ceased.

8. *Mr. J. T. Walker: Prospecting at Coolgardie by boring.*—To assist Mr. J. T. Walker in his search for deep alluvial ground in the vicinity of Coolgardie he was granted the use of a boring plant, he paying all wages and expenses except the wages of the foreman, which were contributed by the Government. No less than 118 bores were put down, aggregating 1,247 feet bored. Most were very shallow, the two deepest being 94 feet and 115 feet, on the outskirts of the patch of deep ground described in the annual report of the Geological Survey for 1900. The applicant was allowed to bore where he chose, and ran lines of bores in some very shallow ground. He found a little gold almost everywhere, but nothing payable. The amount authorised for this work was £100, of which £80 2s. were expended.

9. *Blake and party: North Lead, Kanowna.*—An advance of £50 was granted to this party to assist them in prospecting for the northward continuation of the "North lead" at Kanowna, to be expended at the rate of 10s. a foot on sinking, crosscutting, and driving done below the depth of 95 feet in their shaft. The work done showed the existence of wash at a depth of about 95 feet below the surface similar to that worked in the claims higher up the lode, but it was not payable. The Minister

was willing to increase the advance to £100 to enable work to be extended, but the party broke up and left the claim. They had a good deal of water to contend with, requiring a pump driven by an oil engine.

10. *White Flag Consols G.M.L.* 682, *Wilson's Patch, East Murchison.*—The owners of this lease obtained an advance at the rate of 15s. per foot sunk below a depth of 65 feet, but not to exceed £100, to enable them to deepen their shaft and thereby prospect their reef and obtain a water supply. Up to the end of 1904 a sum of £45 had been paid on account of this work.

11. *President Loubet G.M.L.* 611U, *Callion.*—In last annual report it was stated that up to the end of 1903 an advance of £50 had been expended in subsidising the lessee in carting his quartz to the Callion battery. The water supply at this mill having given out, 25 tons were sent to the Mulwarrie battery and crushed for a yield of 12ozs. 2dwts. of gold, or at the rate of 9dwts. 16grs. per ton. The tailings assayed 4dwts. 4grs. per ton. Unfortunately, instead of taking a representative sample from the 100 tons at the Callion mill, the lessee sent 11 loads from this and seven loads from another heap at the mine, thus making the test useless so far as the bulk parcel was concerned. After a further report from the Inspector of Mines an advance of £300 was granted, at the rate of £2 10s. a foot, on work done in sinking shaft from the 100 to the 200-feet level and in crosscutting at the latter depth. Up to the end of 1904 the advances made amounted to £92 10s.

12. *Oversight G.M.L.* 957Y, *Bulong.*—An advance of £300, at the rate of £1 per foot, was granted to Messrs. Jones and party to assist them in sinking a shaft to a depth of 300 feet to prove the "Oversight" lode at a depth well below all the surface workings. The ground proved hard below the weathered country, but good progress has been made. Up to the end of 1904 the sum paid in advances was £200.

13. *Water supply for public battery, Mosquito Creek, Nullagine.*—Particulars of this proposition were given in last year's annual report, but the work of sinking had only started. The shaft during 1904 was sunk to a depth of 190 feet, and yielded about 1,000 gallons of water a day. With the aid of his other water shaft the owner can run the battery for ten days continuously. He states that during the drought he crushed 744 tons of stone for the public for a yield of 1,342ozs. of gold, which could not have been otherwise crushed. His expenditure on the shaft was £1,054 17s. 8d. The advance of £500 has accordingly been paid.

14. *Assistance to erect battery on Melba Consols G.M.L.* 682R, *Yerilla.*—The Melba Consols Gold Mining Company (No Liability), having approached the Minister for an advance to enable them to complete the purchase and erection of a 5-head battery on their mine at Yerilla, a loan of £501 17s. 6d. was made to them on the security of the company's property, repayable in two years with interest at 5 per cent., on condition that the Company would crush for the public for ten days in each month at a rate not exceeding 15s. a ton. The dealings with this company proved exceedingly unsatisfactory from the first, there being delays and difficulties in getting the plant running, financial troubles with creditors, and disputes with prospectors regarding the conditions of public crushing. Since the end of 1904 the company has gone into liquidation and the plant been taken over by the Government as a State battery.

15. *Assistance to E. Hodder in erecting a battery at Randalls.*—In order to induce Mr. E. Hodder to permit the public to have the use of his Griffin mill at Randalls for crushing purposes, an advance was made to him of £150 to enable him to purchase a Gates' rock-breaker, which was duly obtained. As security the borrower gave a bill of sale over his machinery. He undertook to crush for the public at 14s. per ton, and it was agreed that he should be subsidised 2s. a ton on all ore so crushed. The venture came to an untimely end very soon after the machinery was started, owing to a judgment being obtained against the owner, under which the plant was sold by the bailiff.

16. *Subsidies to private batteries.*—During 1904 the system of giving small subsidies to privately-owned batteries to induce them to crush for the public under specified conditions and at terms fixed by the Minister has been continued, a total sum of £1,055 15s. 7d. having been expended in this way.

The following list shows the names of the parties so subsidised, the tonnages crushed, and the amount of subsidy paid:—

Battery Owner.	Place.	Tons.	Rate.	Amount paid.
				£ s. d.
Pauley & McCoy	Edjudina ...	2,899½	1s. 6d. and 2s.	222 10 10
Londonderry G.M.	Londonderry ...	1,224½	1s.	61 4 3
W. Mt. Morgans G.M.	Mt. Morgans ...	4,641½	2s.	464 3 0
State Battery	Mulwarrie ...	25	7s. 6d.	9 7 6
Jas. Berry	Randalls ...	730	2s.	73 0 0
Smith & Langford	Lawlers ...	1,165	2s.	116 10 0
H. Poole	Lawlers ...	400	2s.	40 0 0
W. E. Gull	Tampa	363½	2s.	36 7 0
Devon Consols G.M.	Kalgoorlie ...	326½	2s.	32 13 0
		11,775	...	£1,055 15 7

17. *Boring for coal in the Irwin River basin.*—The work done in 1903 was described in last annual report. The second bore, put down to verify the alleged discovery of coal at Mingenew, got into very bad order, and ultimately the Goldfields Diamond Drilling Company, who had a contract for boring, decided to bore afresh from surface rather than try to continue it. The bore was therefore abandoned after reaching a depth of 817 feet, without finding any coal. Another bore was then begun and carried down to 1,250 feet without encountering any trace of the alleged coal seam said to have been cut at 906 feet. At this depth the Irwin River Coal Prospecting and Development Syndicate decided to abandon the bore, but on the advice of the Government Geologist the Minister authorised its being continued

another 250 feet. At 1,433 feet, however, it was found impossible to continue, owing to losing the water in the bore, and the bore was stopped. It passed through soft sands and clays, with occasional hard bands, throughout its depth, and proved very difficult boring, The total expenditure by the Government for 1904 was £563 6s.

18. *Westralian Mining and Oil Corporation: Boring for petroleum at Warren River.*—In Appendix No. I. to my annual report of 1903 the progress made in this company's boring operations was fully described, their No. 3 bore having then reached a depth of 917 feet. There was very great delay in getting on with the boring owing to the soft nature of the ground and delays in getting casing strong enough for the work. The Goldfields Diamond Drilling Company, the contractors for the boring, found themselves unable to deepen the No. 3 bore, and therefore started another one close alongside. This was carried to a depth of 1,138 feet by the end of 1904, but was eventually deepened to 1,717 feet by the end of February, 1905. No oil was found. The ground passed through below the depth of 917 feet previously reported was almost all sand, and the bottom of the formation was not reached. The Government subsidised the work from 900 feet downwards, at the rate of £2 for £1, the amount authorised for 1904 being £820, and expended £262 18s. 7d.

19. *Boring on Admiral G.M.L.* 245P, *Peak Hill.*—The owners of the "Admiral" and "Commodore" leases at Peak Hill having applied to the Minister for assistance in boring with a diamond drill to cut the Peak Hill lode, and a favourable report having been made by the Government Geologist, an advance of £400 was agreed to, on security of a mortgage on the lease 245P and owners' plant thereon, to be expended at the rate of £1 for £1 spent by the lease-owners in boring. The Department's "H" diamond drill was used and the work done under our foreman's charge. The bore went done to 965 feet, and lode matter, believed to be the Peak Hill lode, was passed through from 812 to 832 feet, containing a very little gold according to assays. Boring in a second bore was still in progress at the end of 1904. The Government expenditure up to that date was £186 0s. 9d.

20. *Messrs. McIver, Stuart, and Rollo: Boring at Kanowna.*—An advance of £250, on the basis of £ for £ expended by the boring syndicate, was made to enable them to put down bores with a hand-boring plant in the vicinity of Nos. XXIII. and XXIV. of the "diagonal series," described in the annual report of the Geological Survey for 1900. Little progress was made up to the end of 1904, to which date the Government expenditure amounted to £41 0s. 1d.

21. *Providing camels for prospectors.*—The expenditure on the purchase of camels and their equipment, and on attending to them when returned to the depôt at Menzies, amounted to £994 10s. 1d. for 1904.

22. *Drainage, North Lead, Kanowna.*—The work done in sinking the pumping shaft on the North Lead at Kanowna was fully described in my last year's annual report, and was practically completed at the end of 1903. A few items unpaid in 1903, and the caretaker's wages during 1904, bring the expenditure on this work for 1904, to £57 0s. 9d. The further boring described in this year's report was charged to "General Loan Fund, Eastern Goldfields," and its cost amounted to £778 19s. 4d.

23. *Purchase of a diamond drill.*—During the year a diamond drill was purchased and put to work at Peak Hill, under the Mines Water Supply Branch. The cost of purchase and further equipment of the drill amounted to £1,078 14s. 1d. paid during 1904.

24. *Purchase of portable drilling plants.*—The expenditure under this heading for 1904 amounted to £10 11s. 1d.

OTHER APPLICATIONS FOR ADVANCES DURING 1904 ACCEDED TO BUT NOT GONE ON WITH.

There were several cases during the year in which applications were made for advances, but from one cause and another, after assistance had been promised, were not proceeded with by the applicants. The following were some of the more important instances:—

South Cornwall M.L. 300, *Greenbushes.*—This property was described in part of my last year's annual report relating to the Greenbushes district. The Minister approved an advance up to £500 for sinking shafts and crosscutting to prove the stanniferous ground, but the owners of the lease in the end did not see their way to go on with this work.

Boulder Telluride G.M.L. 3963E.—An application was received from this company for assistance, first to deepen their shaft from 160 to 200 feet and do some crosscutting, but which was afterwards altered to a request for assistance in proving their lode by boring. An advance of £300 was agreed to on condition that the company should put down at least three bores of 500 feet or more in depth. They were, however, unable to go on with the work and applied for and obtained exemption from working their lease.

Eclipse Extended G.M.L. 264M.—The owners of this lease at Boogardie applied for assistance to enable them to sink their shaft below the 156 feet level. An advance of £300 was agreed to, half to be spent in purchase of machinery and half in sinking the shaft, at least an equal amount being spent by the owners. The shareholders in the meantime, however, had sold their interests and the application lapsed.

Green Harp G.M.L. 835Y, *Bulong.*—An application from the tribute party on this lease for assistance in crosscutting and driving at the 300-feet level to prospect reefs and obtain a supply of water for their public crushing mill, was favourably considered and an advance of £300 on £1 for £1 principle agreed to, the party being bound to crush for the public at not more than 14s. a ton. The agreement was duly signed but nothing more was done, the owners asking the advance to be cancelled as they wished to sell their property.

Morning Star G.M.L. 320M, *Mount Magnet.*—The Municipal Council of Mount Magnet applied, in the interests of the district, that assistance should be given to sink the main shaft of this mine at least 100 feet below the 300-feet level, and a formal application to that effect was later on made by the owners of the lease. An advance of £700 was approved by the Minister, but the owners did not go any further with the proposition.

Boring in Lake country.—Messrs. J. Flannery and party applied for assistance in boring in the lakes at Southern Cross and Lake Austin for alluvial gold. The Minister intimated his willingness to supply a hand-boring plant and foreman, and an agreement was drawn up, but the party did not go on with the work.

Prospecting deep lead at Smithfield.—Messrs. McDonald and party applied for assistance to enable them to sink their prospecting shaft, and the Minister intimated his willingness to make advances up to £100. The prospectors did not, however, go on with their application.

Golden Zone G.M.L. 1694E, *Kalgoorlie.*—This company made an application for assistance in testing their ground with a diamond drill, by boring eastward horizontally at the 400-feet level. It was agreed to advance £100 on the £1 for £1 principle, but nothing more was done during 1904. In March, 1905 the company decided to do some boring without assistance, and bored 53 feet, cutting a lode at 39 feet, which did not give payable assays. The application for assistance was therefore abandoned.

Senate G.M.L. 539R, *Edjudina.*—The owners of this lease made application for an advance of £500 for sinking their main shaft deeper, and an advance of that amount was approved by the Minister. On finding from the agreement sent to them for signature that the Act required that no money should be paid over until the borrowers exhibited paid vouchers for an equal amount, the applicants asked that the loan be cancelled, which was done.

Bonnie Jean G.M.L. 1112X, *Kanowna.*—To get a supply of water for their Huntington mill on the "Moonlight" lead at Kanowna, Messrs. E. and E. Jones applied for assistance by the loan of 300 feet of piping belonging to the Department that had been used in the North Lead pumping shaft. This was granted and enabled the mill-owners to obtain all the water available in the shafts close to their plant. This soon gave out, and they applied for further assistance in sinking a water shaft. The Minister approved an advance of £150, on condition that the applicants should crush for the public at 10s. a ton, but owing to inability to go on with the work they withdrew their application.

Application for assistance in obtaining supplies of Water.

Several subsidies, mostly small, have been paid during 1904 for supplying mines with water, which have not been dealt with under the provisions of the Mining Development Act, but have been put under various special authorities and votes. The following are cases which have passed through my hands at one stage or another:—

Water Supply (Duncan's Mill), Kanowna.—In order to assist Mr. W. Duncan to obtain a supply of water fit for carrying on his treatment of the Kanowna "Pug" by the decantation cyanide process, the Minister agreed to contribute £40 towards the cost of connecting the mill with the Goldfields Water Supply mains if Mr. Duncan would pay £20, the sum advanced being recouped to this Department in six months if the connection proved to bring satisfactory business to the Goldfields Water Supply. The sum advanced appears as an expenditure for 1904, but has since been recouped (on 25th May, 1905), the services from the pipe extension having proved profitable. Mr. Duncan himself, however, only purchased £35 worth of water before having to close down his plant, but services to adjoining claims made up for this.

Water Supply—The Iron King G.M.L. 4053, *Bulla Bulling.*—To assist the owners of this lease to obtain a supply of water from the Goldfields Water Supply, the Minister approved the purchase of water up to the amount of £25.

Golden Cube G.M.L. 594, *Yilgarn.*—The owners of this lease having applied for assistance in obtaining a water supply for milling purposes, boring was undertaken by the Mines Water Supply Branch, and 13 bores were put down, aggregating 1,050 feet bored. In No. 13 bore, about 1¼ miles from the "Golden Cube" mine, a supply of about 200 gallons per hour of salt water was struck at 133 feet. The sinking of a well on this bore at an estimated cost of £550 was deferred until the mine had been better proved, and nothing further was done during 1904, the mine at the end of the year being under partial exemption.

O'Brien and Crichton's sluicing near Coolgardie.—Assistance was given to this party by laying pipes, at a cost of £24 3s. 8d., to enable them to get water from the Goldfields Water Supply; the work proving unpayable the pipes were removed to the Mines Water Supply Store at Coolgardie.

Haddon G.M.L., Yilgarn.—To assist the owners of this lease to obtain water the Minister approved a subsidy of 1s. per 1,000 gallons on 300,000 gallons of water, equal to a total of £15, to be paid to the Goldfields Water Supply, but not to be claimed by them unless they were unable to obtain payment for the water supplied.

Maritana G.M.L. 790E, *Kalgoorlie.*—A subsidy of 6d. per 1,000 gallons was granted to the party working the "King of the Hills" alluvial claim on water bought by them from the Goldfields Water Supply. Only 80,000 gallons were so supplied, the total subsidy therefore amounting to £2.

Rotary Puddler and Sluicing Company, Kalgoorlie.—The owners of the rotary puddler described in Appendix No. V. to this report having applied for assistance in procuring a water supply for the trial runs of their machine, the Minister agreed to supply water at 3s. 6d. per 1,000 gallons up to £150 worth.

Ada G.M.L. 4044, *Coolgardie.*—The owners of this lease applied for assistance in getting a connecting pipe from main to Bonnievale, and after some negotiations the matter was dealt with by the Goldfields Water Supply.

Applications refused or not gone on with.

In addition to the foregoing, a considerable number of applications for State assistance were made during 1904 which were refused as not being within the intention of "The Mining Development Act, 1902," or in consequence of unfavourable reports from the inspecting officers, and several others were not gone on with by applicants beyond the preliminary stages, and lapsed accordingly.

Appendix No. II.

Trial of Heads' "Reliance" Furnace.

In November, 1903, Mr. R. W. Heads, of Greenbushes, approached the Minister for Mines requesting assistance to enable him to exhibit a trial run in Perth of his "Reliance" water-jacketted smelting furnace, which he had been using very successfully at Greenbushes for re-smelting tin slags from the reverberatory furnaces. He wished to demonstrate that the furnace could be used for smelting the copper ores of the Phillips River Goldfield in preference to a blast furnace, and asked for 30 tons of ore for a working trial. It was claimed for the furnace that it was simpler and cheaper in construction and working than the ordinary blast furnace, and had advantages in its method of taking in the blast by indraught instead of forced blast. The Minister eventually agreed to provide 30 tons of ore and to pay £100 for the smelting of it, or at the rate of £3 6s. 8d. a ton, provided 90 per cent. of the assay value was returned as marketable copper or matte of assay value not less than 65 per cent. copper.

The trial of the furnace took place in February and March, 1904. The furnace was a small round water jacketted one, similar in the body to an ordinary round copper smelting blast furnace, but with a closed top and an adjustable crucible. The top consisted of a conical feeding hopper closed by a balanced iron cone, similar to the "bell" used in iron smelting furnaces. By lowering the cone the charge in the hopper slipped down into the furnace, and by raising it again the feed aperture was closed. From the side of the furnace near the top a pipe was taken off to a "Körting" steam ejector, by means of which a strong draught was induced through the furnace. When the bell was opened to allow ore and flux to enter, the draught through the furnace charge of course ceased for the time being, beginning again when the top was closed. This intermittent action of the draught is at variance with established blast furnace principles, in which much importance is attached to maintaining regularity of blast; but, so far as the trial run showed, no evil effect could be distinguished as arising therefrom. Obviously, this defect could be overcome by using a double bell and so ensuring an absolutely closed top all the time.

The body of the furnace being supported independently of the crucible, the latter could be readily removed. It was fitted with elevating screws by which it could be raised or lowered, and the annular space between it and the bottom of the furnace body thereby closed up or opened out. This annular space served for taking in the air into the furnace, owing to the partial vacuum produced in the top by the ejector. The inventor claimed that by raising or lowering the crucible he could very readily vary the amount of air taken into the furnace, more easily than can be done in ordinary blast furnace practice with tuyers of fixed size. Regulation of the amount of steam supplied to the ejector also allowed rapid variation of the draught. He claimed, moreover, advantages in drawing in the air equally all round the furnace instead of at the points of the tuyers only, and that the outside of the furnace is simplified by the removal of the encumbering bustle-pipe or wind-box and tuyere pipes. Localisation of the draught, if desired, could be easily secured by temporarily plugging portions of the aperture with clay. It is evident also that if there were found to be any advantage in delivering the blast into the interior part of the furnace by means of nozzles, these could be fixed in the annular aperture very readily, closing the remainder of the slot with clay, as an induced draught could be brought into any part of the furnace through a nozzle just as well as a forced blast.

The use of induced instead of forced blast on blast furnaces is unusual, but I do not think that it is entirely new, though I have been unable to lay my hands on a description of another case in actual operation. There does not seem to be any very strong reason why it should not be equally effective with a forced blast, the penetration of the air being due to the difference in pressure at top and bottom of the charge, which may be brought about either by forcing from below or exhaustion from above. The positive blast from below is probably more uniform, as its pressure is constant, while that caused by the ejector must vary a good deal in accordance with the completeness of the vacuum produced, owing to varying resistance from time to time of the furnace charge to the passing of the blast. The vacuum caused by the ejector must become the more complete the less air gets through the charge, and consequently the pressure forcing the air through the latter must increase. There would, therefore, result a certain amount of automatic regulation of the pressure in accordance with the resistance of the charge. This seems an advantage, but extended practical trials would be required before it could be relied upon to be such in reality. In the short trial run there seemed to be no difficulty in maintaining a very satisfactory blast, and keeping its pressure fairly constant, and the induced draft did not seem in any way inferior to the ordinary forced blast in the working of the furnace. If means were adopted to automatically regulate the exhaust apparatus (ejector or exhaust fan) so as to maintain a fairly uniform amount of vacuum above the charge, it seems to me that there would be some advantages in the use of the induced draught rather than the forced, in that the gauge would show the effective difference in pressure between the outside and inside of the furnace after the resistance of the charge was overcome, instead of the pressure of blast before encountering the resistance.

The induced draught has the advantage that all gases and products of combustion of the furnace are constantly drawn inwards, and that in tapping there is no blowing out of slag or flame, as may happen with the pressure greater inside the furnace than outside. This tends to lessen the production of metallic fumes, which at times are so disagreeable and even poisonous when they escape on the tapping floor.

The most important question as between induced and forced draught is the relative cost of producing the necessary amount of air-current by each method. On this point the trial run gave no

available figures, as there were no means of measuring the amount of steam used in the ejector. The efficiency of an ejector as a draught-creating device being somewhat low, it is probable that production of blast by it is more costly than by the ordinary blowers used for positive blast; but a well-designed exhaust fan, suitable for handling hot gasses, would probably give a better efficiency than these, though not quite so good, on account of the higher temperature of the air handled, as that of a good blowing fan or blowing engine.

The use of the closed furnace top is attended with a very serious disadvantage that it does not permit of "barring down" the charges, as is continually being done in small blast furnaces. Working doors could doubtless be arranged to permit the insertion of bars, but while they were in the draught would necessarily be stopped, and unless these doors and the charging bell fitted very closely there would also be leakage of air into the furnace top, which would unnecessarily increase the work of the exhaust apparatus. After taking the alleged advantages of the induced draught furnace into consideration, it did not appear to me that they were of such consequence as to warrant a departure from the ordinary well-approved and well-understood type of blast furnace when installing a plant at the State smelting works at Phillips River.

The trial run in Perth was conducted under a good many disadvantages that would not exist in regular working, and though not as successful as it might have been, it was sufficiently so to demonstrate that the induced draught type of furnace is capable of doing good work. Under favourable circumstances, with men experienced in its use and regular supplies of ore and fluxes, it would doubtless do just about the same work as a blast furnace of the same size. Owing to want of ironstone flux, the metallurgist in charge used a good deal of metallic iron for the purpose of providing the protoxide of iron necessary for the slag. With a highly sulphurous charge this might have been a success, but in the case in question, with a charge low in sulphur, it appeared to me to be a mistake; and, in point of fact, several stoppages were caused by the filling of the crucible with solid metal, which contained more iron than copper. The oxidation of the metallic iron was evidently altogether incomplete, and much of it fell in a molten form into the crucible. Owing to these stoppages and the short run of the furnace, there was a good deal of material obtained that was not finished marketable product, and which would be treated over again in ordinary running. There being no provision for catching flue dust, and the ore being very pulverulent, there was also considerable loss of flue dust. The result of the run was not, therefore, by any means a conclusive test of what the furnace could do in regular work.

The net weight of ore smelted was 24 tons 6cwt. 0qrs. 8lbs. containing, according to assay, 17·74 per cent., equal to 4·3135 tons of copper; and there were returned:—

	Tons.	According to local assays.		According to European assays.	
Small lumps of metal ...	·8620	containing (45·89 per cent.)	·3956 tons	(42·24 per cent.)	·3641 tons
4 large bottoms	2·9791	„ (39·5 „)	1·1756 „	(44·7 „)	1·2760 „
53 bags matte	2·6848	„ (45·10 „)	1·2108 „	(42·9 „)	1·1518 „
56 bags matte	2·5397	„ (28·10 „)	·7137 „	(27·4 „)	·6959 „
Total	9·0656	containing (38·5 per cent.)	3·4957 tons	(38·4 per cent.)	3·4878 tons

Taking the mean of the assays 3·49175 tons, the return amounted to 80·9 per cent. of the copper originally present.

The net cash return from sale of the products and of some ore that was not smelted was £160 12s. 10d., and the total expenses incurred in purchase of the ore, bringing it from Phillips River to Perth, and treating it, were £379 2s. 2d., the net expenditure by the Government on the working trial of the furnace being therefore £218 9s. 4d. The amount authorised for the purpose of the trial was £250.

APPENDIX No. III.

Report on the Progress of the Phillips River Goldfield and State Smelting Works.

The Hon. the Minister for Mines, Perth.

SIR, Department of Mines, Perth, 28th June, 1905.

I have the honour to submit hereunder a report on the progress of the Phillips River Goldfield, with special reference to the mines containing more or less auriferous copper ores, and the erection and working of the State smelting works.

2. For convenience, it will be useful to regard this report as a supplement to my previous report of 28th February, 1903, which was published in bulletin form, though I visited the field in the interim in February, 1904, and made a few comments as to the State purchase of ore in my annual report dated 27th June, 1904, published in the annual report of the Department of Mines for the year 1903. This year I accompanied the late Minister, the Hon. Mr. Hastie, to Ravensthorpe, in March, reaching the field on the 2nd and leaving it on the 11th of that month, and with him visited all the mines in which any considerable amount of active work was being done.

3. The progress made in the last two years is somewhat disappointing, very few men having been employed and little energy having been shown in opening up the mines. Want of capital has been mainly responsible for the poor progress made, but it seemed to me also that the leaseholders might, in a great many instances, have done much more work than has been the case if they had devoted their time and energies more closely to their mines. In several instances the progress visible is absurdly small for the number of men alleged to have been at work during the time. The state of uncertainty that has prevailed as to being able to realise on the ore raised, and the necessity for picking only the best ore for sale, have had much to do with the slackness in working that has prevailed; but, while excusing it, these considerations do not seem to me entirely to remove the reproach from the mine-owners of having failed to do their own best for the development of the field.

4. I have little to add to my previous report so far as the geological structure of the field is concerned. It is interesting to note, however, that in the Elverdton and P.L.P. mines, near Mount Desmond, the copper lodes are very closely connected with intrusive dykes of a somewhat basic igneous rock, probably diabase, which penetrate the granite country. In the P.L.P. the dyke was small and formed a narrow hard band in the centre of the lode; in the Elverdton it is larger, and the ore is mainly on the contact between it and the granite. I now think that the dark schist or slate formerly described by me in the latter mine will prove to be simply a portion of the dyke rendered more or less fissile and laminated by pressure and faulting movement of the country on the dyke fissure. In both mines the ore seems to me to be largely formed by replacement of part of the material of the dyke, due probably to circulation of metalliferous solutions along its sides. Should further observations confirm this view, it will be important for prospectors to look out for traces of other similar dykes, as ore would be liable to occur alongside of them also. In the Last Chance Proprietary mine, however, a very similar dyke, eight to 12 feet thick, cuts right through the lode, and is therefore plainly of later date of formation. A sample of this dyke rock was examined by Mr. E. S. Simpson, at the Geological Survey Laboratory, his report being —"This rock is considerably decomposed. Its main constituents appear to have been augite plagioclase and hornblende. I should call it a hornblende diabase."

5. A very similar dyke seems to cut through the Mount Stennett lode, though the actual contact has not been opened up by mining work. The Phillips River field appears, indeed, to be a complex of igneous rocks of very considerable difference in age, and a detailed geological survey will be required before the relations of these to one another and to the metalliferous lodes are made clear.

6. A further examination of the large ironstone and quartzite outcrops on Mount Desmond and the Ravensthorpe Range has confirmed my previously-expressed opinion that there exists therein a large "formation" of essentially lode character. Some work that has been done by costeening on veins of ironstone and quartz in it has shown these to be more or less auriferous, gold being visible in some ore that I saw, though not in payable quantity. The prospecting done in the Gladstone Proprietary mine at the head of the "Gladys" Gully (in which a good deal of alluvial gold has been obtained) shows strong veins or lodes of brown iron ore, in which rich gold is stated to have been obtained in scattered bunches. These lodes seemed to me to be very well worth sinking upon, being pretty certain to turn to pyrites at no very great depth, and in a copper-bearing district there is always hope that pyritic deposits will prove cupriferous. The great size of the mineralised zone or "formation" which constitutes the top of the Ravensthorpe Range makes it unlikely that it will anywhere be payably metalliferous across its whole breadth, but it is very likely that good, and possibly large, ore bodies will be found scattered through it, and energetic prospecting is strongly recommended.

MINES VISITED.

7. In the *Mount Cattlin Mine* the two principal shafts have been sunk to the water level, about 100 feet and 80 feet respectively, and have proved the existence of a large but somewhat low-grade ore

body, which seems from the surface outcrops and costeens to be of very considerable length. The work last done in the bottom of the west shaft shows a wide body of quartzose ore carrying a good deal of copper pyrites, and said to carry also from five to 10dwts. of gold to the ton. The average content of copper in the stuff raised was estimated by the owners at six to eight per cent., which is somewhat too poor to send to the smelting works under present conditions. The ore is, besides, for the most part very silicious, and therefore difficult to smelt. This silicious ore is not very favourable concentrating material, the ore being often finely impregnated through dense hard quartz, but would have to be concentrated, and would probably be best dealt with by progressive crushing and dressing by rolls, stamps, jigs, buddles, slime tables, and similar appliances. At the values stated by the owners, this grade of ore should be highly profitable if dressed in a scientific manner. This mine requires considerable capital to bring it into a profit-making condition, but would, I think, be a good proposition if well handled on a fairly large scale. At present it has no water for dressing purposes, but probably would get a good supply when the shafts are sunk a little deeper. There is an excellent natural site for a large fresh-water dam close to the mine, in which a considerable amount of storm-water could be impounded without great cost.

8. In the *Marion Martin Mine* a good deal of work has been done, several shafts having been sunk, the deepest of which is down 116 feet. In the drive from the bottom of one shaft I saw a nice body of yellow copper ore from 18 inches to two feet thick, and in another very good ore was being broken from a width of about three feet of lode stuff, but was more scattered than in the first instance. The lode is somewhat small, averaging about three feet in width between smooth, well-defined walls. The ore appears to be in short shoots, but a number of these have been opened up along its length, and the probability is the lode would pay for stoping right along it if there were facilities for dressing the second-class ore.

9. In the *Sunset Mine* a shaft has been sunk a little over 100 feet and connected with an older one by a short drive. In the bottom of the new shaft there is a fine large lode from six to eight feet wide, showing a good amount of yellow copper ore. The country is fairly hard at this depth.

10. The *Surprise Mine*, next to the Sunset, has two shafts about 70 feet deep, from which a little driving has been done, and which are being connected. Some good oxidised ore was got near the surface, and fair bunches of copper pyrites in the bottom; but, on the whole, the lode has been rather small and poor. There is, however, every reason for persevering with it in the hope of improvement.

11. The *Mount Benson Mine* was formerly known as the *Kingston*, and was described under that name in my previous report. Several small shafts have been sunk, but the principal workings are from two whip shafts 80 feet deep, which are connected together. About 160 feet of driving have been done at the 80 feet level, and a winze has been sunk 15 feet in black ore, composed of copper pyrites and indigo copper, about two feet wide. The drive is just on the bottom of the oxidised part of the lode. There have been several nice bunches and shoots of ore in the distance driven. The lode is a distinct fissure vein with smooth walls, and from two to four feet in width. The ore carries a fair amount of gold, which brings up its value materially. This mine has every prospect of being a good concern if systematically worked with machinery.

12. To the North of the Mount Benson lease the same or a parallel lode has been cut near the south boundary of the *Mount Benson Extended* ground, from which some nice oxidised ore has been taken. Very little work has, however, yet been done. The ore is stated to carry a good deal of gold.

13. In the *Mary Mine* steam machinery, consisting of vertical boiler and small winch, has been put in the main shaft, which is down 180 feet. A shoot of nice copper pyrites was followed down in the shaft, but proved to be only about 26 feet long by two to five feet wide. It was being underhand stoped at the time of my visit at the 160 foot level. Very little driving has been done, the ground going east proving very hard. The lode has smooth, well-defined walls, and seems persistent for a considerable distance on surface, where it has been traced by costeens and shallow shafts. There are several other lodes also in the property on which a small amount of work has been done, but in all of these the ore has been bunchy and irregular. The shoot at the main shaft seems to be going down very consistently, but is, unfortunately, very short. In the bottom of the shaft there is a good deal of water, said to be over 300 gallons per hour, which renders working very uncomfortable. It is baled at present with the winch, but a pump is much wanted. The water is very salt. At present the water is a great drawback, but it will in time prove a very valuable asset to the mine, as it will allow of concentration of the low-grade ore. The lease will, I think, prove a valuable one when it is opened up, but a good deal of capital expenditure is necessary to bring it into proper mining shape.

14. In the *Federal Lease* a shaft is down about 30 feet, close to a deeper old shaft in which a good deal of iron pyrites was obtained. Some bunches of fair ore have been got, but on the whole the lode has been poor as yet.

15. The *Kilmore Lease* has two shafts about 60 feet deep, connected by a drive from which some stoping has been done. The ore has, unfortunately, been too much scattered for profitable working. A good deal of concentrating ore is, however, obtainable, and driving on the lode might reveal better shoots.

16. In the *Emily Hale Mine* the principal shaft is down 63 feet, and about 60 feet of driving has been done. The lode has been rather poor on the whole, though some very good stuff was among it. The present owners are unable to sink deeper on account of water, which they say comes in at the rate of 100 gallons per hour. There are several indications of ore on the surface on which a little work has been done, but the property requires prospecting on a more extensive scale than has been possible to the present owners.

17. The *Last Chance Proprietary Mine* has turned out a fair tonnage of good ore, and has the reputation of being one of the most profitable on the field. Two shafts have been sunk about 60 feet

deep and some driving done to connect them. In the north end a very nice shoot of oxidised ore is visible about 30 feet from the shaft, which was sunk in the south end of the same shoot. The lode is about four feet wide, carrying up to two feet of good ore, oxides, and sulphide of copper, with copper pyrites and bornite. Between the two shafts the above-mentioned dyke cuts through the lode.

18. The *Elverdton Mine* has its main shaft 140 feet deep, and at the bottom level drives have been made both north and south. Some very good copper pyrites has been stoped out, and there is a large amount of second-class ore in sight which requires dressing. The drive south from the main shaft is not yet far enough forward to reach the rich shoots of ore worked in the upper levels. It has already been proved, however, in the portion worked that good yellow copper pyrites exists under the rich oxidised ores, and the latter appear to be merely the pyrites oxidised rather than secondary concentrations. The outlook for the mine is, in my opinion, very encouraging, but it requires steam machinery and some expenditure of capital in sinking deeper and in opening out two or three levels so as to provide stoping ground. The record of ore produced from this mine is a very good one indeed from the small amount of ground that has been opened.

19. On the *Mount Desmond Mine* the principal shaft is down to 100 feet, and shows some very fair copper pyrites in the bottom. Good ore has been obtained also in the other two shafts on the lode. This is a strong, well-defined lode, requiring opening up on a liberal scale, and has good prospects of being payable. It is just now being worked by tributers, who naturally cannot be expected to do much development or prospecting work.

20. North of the Mount Desmond is M.L. 199, known as the *P.L.P.*, on which there is a shaft down 43 feet on a lode carrying some very good yellow copper ore and oxidised ores of copper. Some of the ore is much mixed with magnetite. The ore seems to be in two veins on the edges of a dyke of basic igneous rock penetrating the granite.

21. South of the Elverdton, some work has been done on the *Welcome Stranger Mine* on somewhat small veins in granite country, which have, however, turned out some fair ore. I was told the shaft is about 100 feet deep, but did not visit it.

22. On the *Mount Stennett Lease*, two shafts have been sunk to 100 feet, the ore remaining oxidised at that depth. In a shaft towards the north of the lease sulphides have been obtained. Some very good ore has been raised, but the owners have not been able to drive on the lode, as is necessary to develop it properly. This mine has very promising prospects, and deserves to be worked properly.

23. The *Harbour View Mine* appears to me to be a good proposition, so far as one can judge from merely casual inspection, records of the mine, and information received on the spot. In the drive south from the south shaft at 80 feet deep, a fine lode of oxidised ore has been exposed up to 14 feet in width, apparently of good fluxing quality. The richer ore is in veins through the bulk, and a good deal of the latter would probably have to be milled. Going northwards, the outcrop of the lode has been opened by shallow cuts at intervals right through the lease, and the manager informed me that for some 1,700 feet in length he thought that his tests would give an average gold value of about 6dwts. per ton. The lode is a good, well-defined fissure vein, with smoothed walls. At the north end, close to the *Omaha* boundary, a shaft has been sunk 103 feet to get under the old workings. In the bottom of this shaft a big lode is seen, consisting of two veins with a "horse" between, which seems likely to prove to be a dyke, as in the Elverdton. There was not much copper ore visible, but the manager informed me that a good deal had been saved during the progress of the work, and that the rest of the lode stuff had carried good gold. The ore is still oxidised at the 103-foot level, and water has not yet been reached. The mine seems well worth the outlay of the necessary capital for equipment with winding machinery and doing necessary development work. The returns from it have been good, but it has been worked in a very hand-to-mouth manner.

24. There are several lodes on the Harbour View lease besides the main one, of which two or three have been worked to some extent. From a small one on the "Omaha" boundary some fair auriferous quartz was raised, which was clean milling gold ore with very little copper. Near the "Medic" boundary a shaft has been sunk 80 feet on another smallish reef, from which clean milling quartz with fair gold was being raised at the time of my visit. There is also a large outcrop of ironstone with quartz which has not been opened up on account of being poor on the surface; this seems well worth testing by a prospecting shaft.

25. The *Medic Lease* is on the north-west side of the Harbour View, and on it a shaft has been sunk about 50 feet to work a lode of gold-bearing quartz 18 inches to 2 feet wide. A crushing from this is stated to have returned between 14 and 15 dwts. to the ton.

26. On the *Red, White, and Blue Lease* a new shaft has been sunk 100 feet on the underlay of the main lode, and connected with the old shallow stopes. A shoot of ore pitching northward has been worked, with 12 inches to two feet of ore, carrying copper and good gold. The ore contains much iron, and seems excellent smelting material. This mine also deserves to be handled on a much larger scale than is possible for the present tributers to undertake.

27. The *Mosaic Lease* is situated on the east of the Ravensthorpe Range, quite outside the line of country in which the above-mentioned mines occur. There is a large mineralised "formation" on it which requires to be cut through in several places to show what it really is. In this a small vein has been found carrying rich fahl ore,—(in this case both arsenical and antimonial varieties of tetrahedrite, or grey copper ore). This ore contains high values in silver, assays of over 100ozs. to the ton having been

obtained. The vein has been worked to a shallow depth, but much more extensive working is required to ascertain what is the worth of the mine. The arsenic and antimony in the ore are a drawback as regards smelting with other pure copper ores.

28. The gold mines of the district were doing very little at the time of my latest visit. The "Maori Queen" (Phillips River G.M.) mine was doing a little development work at the bottom level, but had a bar of very hard ground to contend with. When the hard bar is cut through there seems good hope that this mine may again have a considerable output. Rock drills have been introduced upon it, but the whole working outfit of the mine requires improvement. In the meantime, the sands accumulated at the battery are being treated by the cyanide process.

29. The *Gilbert G.M.* (better known locally as the Floater) has been shut down for some time, the shoot of ore having become poor in the bottom of the mine. The main shaft is down 236 feet, and from the bottom level a winze was sunk 50 feet to another small level from which another winze has been sunk 30 feet, making the total depth of the workings 316 feet. The short length of the shoot of gold in this mine has been very much against it, necessitating constant sinking to maintain the supplies of ore. The ground in the bottom of the mine is very hard, and prospecting consequently costly. The mine has now come to a stage where active prospecting work is necessary either by boring or by again sinking and crosscutting. The ore occurrence presents considerable similarity to that in the Kalgurli mine, at Kalgoorlie, where the ore-body has been found to vary very rapidly in parts in both size and value, and also to the manner in which the ore is found in several of the Menzies mines where the blocks of payable stone have been irregular and discontinuous in their distribution. The Gilbert ore-body seems to me, however, to approach more to the Kalgurli type of occurrence than to the Menzies one, and the experience of the former has, up to the present, been favourable, the ore "making" again below the narrow and poorer portions. In my opinion, there is a great probability of this occurring also in the "Gilbert," below the poor ground now in the bottom of the mine. Whether such improvement would be sufficient to constitute a payable mine is a question to which no answer can possibly be given until the ground has been actually opened up. The risk of loss in doing so is undoubtedly very considerable, but does not appear to me to be by any means outside the bounds of fair mining speculation. The upper levels have returned very good values, and the nature of the ore is such as to negative any notion that this is likely to be due to enrichment from chemical concentration of values in the superficial portions of the lode; so there is good reason to think that gold will continue to be found in depth, and a bold policy of sinking seems to have a fair chance, as mining ventures go, of being successful. Horizontal boring at the 286 foot level is also advisable, as there is a possibility that the gold-bearing part of the lode is still to one side of the present workings.

30. On the *Plantagenet Lease* work has been carried on with a few men, and a five-head battery of heavy stamps has been erected, but the developments do not appear to be very promising.

31. On the *Grafter Lease* a prospecting battery of very light stamps has been erected, and some crushings put through, but no one was at work at the time of my last visit.

Returns from the District.

32. The following table shows the total production from the field to the end of 1904, as recorded by the Mines Department, from the sworn returns sent in by the mine owners. In the case of the ore smelted outside the State, the copper, gold, and silver actually paid for are taken as the amount exported, and there is, therefore, an unknown additional amount of these metals constituted by the smelter's deductions. The returns for copper are probably quite 12 per cent. too low, and those for gold and silver from smelted ore are very much too low. In the same way the ore sent to the State smelting works has been returned as containing the amount of metals paid for and its value at the amount paid locally. The bulk of the gold produced has, however, been obtained by milling. The returns are the best available at present, and can be made absolutely correct, except for the amount of ore sent to smelters outside the State, when the results of smelting at the State smelting works have been finally determined. Until the smelter started the production of the field could only be stated on the figures at which the ore was purchased at the sampling works, but it will now soon be possible to substitute the more exact ones obtained by assays of the furnace products actually shipped.

Table I.—*Showing Amount and Value of Gold and Copper produced from the Phillips River Goldfield to end of 1904.*

Year.	Tons.			Gold.		Copper.		Total Value.
	Smelted.	Milled.	Total.	Fine ounces.	Value.	Tons.	Value.	
					£		£	£
1900	34·00	...	34·00	...	...	10·19	725	725
1901	1,089·14	192·00	1,281·14	208·05	884	225·62	12,918	13,802
1902	308·25	9,390·25	9,698·50	7,398·37	31,426	23·36	1,238	32,664
1903	1,561·33	8,179·75	9,741·08	6,807·45	28,916	214·59	10,984	39,900
1904	3,468·89	6,269·60	9,738·49	3,926·62	16,679	485·02	24,280	40,959
Alluvial	...	...	...	267·88	1,138	...	...	1,138
Dollied and Specimens	...	...	...	602·84	2,561	...	...	2,561
Total	6,461·61	24,031·60	30,493·21	19,211·21	81,604	958·78	50,145	131,749

33. The total tonnage of ore sent to the State smelting works by each of the mines, and the total amount paid for it, up to 22nd April, 1905, are shown in the following table:—

TABLE II.

Name of Mine.	1st Period. From 2nd July, 1903, to 24th February, 1904. Ore bought by Government.		2nd Period. From 29th April, 1904, to 24th January, 1905. Ore held on option and eventually bought by Government.		3rd Period. From 24th January, 1905, to 22nd April, 1905. Ore bought by Government.		Total from 2nd July, 1903, to 22nd April, 1905.	
	Net.		Net.		Net.		Net.	
	tons cwt. qrs. lbs.	£ s. d.	tons cwt. qrs. lbs.	£ s. d.	tons cwt. qrs. lbs.	£ s. d.	tons cwt. qrs. lbs.	£ s. d.
Elverdton	1,002 19 3 20	3,005 18 5	683 18 2 12	2,429 16 6	161 0 2 22	541 4 1	1,847 19 0 26	5,976 19 0
Mary	522 3 3 7	1,986 2 8	36 11 2 16	161 13 6	117 6 3 12	417 0 1	676 2 1 7	2,564 16 3
Marion Martin	229 12 1 7	1,072 2 1	242 17 3 17	1,239 12 1	137 0 3	574 10 4	609 11 0 14	2,886 4 6
Last Chance	376 14 0 19	1,795 15 5	148 8 2 25	857 3 9	...	...	525 2 3 16	2,652 19 2
Sunset	165 7 0 25	650 4 6	206 16 1 20	757 19 7	21 4 1 3	61 7 3	393 7 3 20	1,469 11 4
Mt. Benson	132 15 2 1	728 16 6	105 16 1 15	463 19 11	45 1 2 15	74 4 1	283 13 2 3	1,267 0 6
Mt. Stennett	128 10 0 27	579 11 0	37 3 0 7	195 11 7	...	...	165 13 1 6	775 2 7
Surprise	24 11 3 10	57 17 6	129 7 3 3	668 11 3	...	...	153 19 2 13	726 8 9
Mt. Desmond	40 13 2 9	175 14 6	77 6 3 16	434 9 6	30 5 0 6	100 9 6	148 5 2 3	710 13 6
Mt. Cattlin	44 17 3 25	218 7 2	57 5 2 14	219 10 1	...	...	102 3 2 11	437 17 3
Emily Hale	50 18 1 21	208 6 6	...	...	...	...	50 18 1 21	208 6 6
Kilmore	31 18 2 5	174 13 11	29 15 1 27	106 5 6	9 1 1 11	27 3 10	70 15 1 15	308 3 3
Zealandia	23 19 2 8	48 6 2	...	...	...	...	23 19 2 8	48 6 2
Gt. Oversight	20 12 3 8	102 3 11	13 17 3 13	63 13 5	...	...	34 10 2 21	165 17 4
Mosaic	20 5 2 13	124 15 8	13 8 3 14	137 11 2	13 16 0 15	21 14 2	47 10 2 14	284 1 0
Last Chance Proprietary	19 7 1 15	55 1 10	...	...	...	...	19 7 1 15	55 1 10
Red, White, and Blue	18 13 2 18	125 16 2	...	...	73 14 0 17	869 12 9	92 7 3 7	995 8 11
Welcome Stranger	18 1 2 2	78 11 4	...	...	...	...	18 1 2 2	78 11 4
Australia	11 19 3 0	89 9 11	...	...	...	...	11 19 3 0	89 9 11
Omaha	9 3 0 0	60 18 6	...	...	...	...	9 3 0 0	60 18 6
British Flag	8 6 0 9	68 5 2	9 16 2 24	66 1 10	...	...	18 2 3 5	134 7 0
Harbour View	6 13 2 19	73 15 9	48 0 3 17	481 6 5	44 13 2 4	296 18 4	99 8 0 12	852 0 6
Rio Tinto	6 10 0 2	40 3 4	...	...	...	...	6 10 0 2	40 3 4
Blue Ribbon	6 6 0 12	34 18 3	5 0 3 6	34 9 6	...	...	11 6 3 18	69 7 9
Mt. McMahon	5 0 1 12	22 11 7	...	...	...	...	5 0 1 12	22 11 7
Federal	4 13 2 12	...	3 19 2 26	24 17 2	...	...	8 13 1 10	24 17 2
Grimsby	4 9 0 0	4 9 0	5 10 3 26	11 1 10	...	...	9 19 3 26	15 10 10
P.P.A. 12	3 6 2 7	19 19 4	...	...	...	...	3 6 2 7	19 19 4
Mt. Pleasant	1 19 0 10	8 14 4	1 19 0 19	6 11 9	...	...	3 18 1 1	15 6 1
Duke of York	1 16 1 6	0 9 1	...	...	...	...	1 16 1 6	0 9 1
Nil Desperandum	4 5 1 6	4 5 4	5 2 1 21	7 13 7	...	...	9 7 2 27	11 18 11
Flag Mining Company	...	...	40 5 0 12	415 13 11	...	...	40 5 0 12	415 13 11
Puzzler	...	...	32 18 3 13	136 9 9	...	...	32 18 3 13	136 9 9
C.D.C.	...	...	18 8 2 6	82 13 1	7 10 0 8	38 19 3	25 18 2 14	121 12 4
Mt. Garritty	...	...	15 0 0 16	120 1 1	...	...	15 0 0 16	120 1 1
Christmas Gift	...	...	12 3 0 19	153 1 3	4 19 3 26	47 19 10	17 3 0 17	201 1 1
Copper Horseshoe	...	...	12 6 0 3	48 2 3	...	...	12 6 0 3	48 2 3
Marnoo	...	...	9 7 0 8	53 2 6	...	...	9 7 0 8	53 2 6
P.L.P.	...	...	7 8 1 21	32 7 1	14 12 3 25	75 1 1	22 1 1 18	107 8 2
Jas. Henry	...	...	6 0 3 22	38 9 2	...	...	6 0 3 22	38 9 2
Turn of the Tide	...	...	4 4 1 0	...	...	...	4 4 1 0	...
D. Southerland	...	...	2 17 0 2	5 15 6	...	...	2 17 0 2	5 15 6
Lady Jessie	...	...	0 16 1 21	11 18 10	...	...	0 16 1 21	11 18 10
Kundip	...	...	1 4 2 0	12 5 0	...	...	1 4 2 0	12 5 0
Whittaker Bros.	...	...	1 6 2 22	6 0 1	...	...	1 6 2 22	6 0 1
Red Hill	...	...	0 15 0 17	3 8 1	...	...	0 15 0 17	3 8 1
O.K.	...	...	...	...	6 13 1 15	30 0 2	6 13 1 15	30 0 2
Afric	...	...	...	...	6 0 1 5	21 1 0	6 0 1 5	21 1 0
Acrasia	...	...	...	...	5 7 1 4	32 3 9	5 7 1 4	32 3 9
Content	...	...	...	...	5 2 1 6	13 16 3	5 2 1 6	13 16 3
Mt. Desmond Extended	...	...	...	...	5 8 0 11	47 0 6	5 8 0 11	47 0 6
Tattersall's	...	...	...	...	4 19 3 26	46 11 9	4 19 3 26	46 11 9
Phillips River Smelting Co.	...	...	...	...	0 2 2 20	7 17 11	0 2 2 20	7 17 11
Total	2,946 12 3 27	11,616 4 10	2,027 8 1 16	9,487 7 6	714 1 2 18	3,344 15 11	5,688 3 0 4	24,448 8 3

34. It will be seen from the above that 53 different mines have sold ore to the works, totalling 5,688 tons 3cwt. 0qrs. 4lbs. net, for a sum of £24,448 8s. 3d., equal to £4 5s. 11½d. per ton.

35. This return from the copper-bearing lodes must be regarded as very satisfactory, considering the small amount of work that has been done on most of the mines to produce the ore. The high average value per ton is also a good feature, particularly as the accumulations of second-class ore, rejected when picking out the best stuff for sale, were inconsiderable. This is largely due however to only the richest bunches of ore being worked, and in many of the mines there is a lot of lower grade material unbroken that will require either concentration or much cheaper smelting treatment before it can be profitably handled. As the mines have got down to the sulphide ore the amount of dressing ore available has greatly increased, and no doubt in the future a great part of the output of the mines will in this field, as in most others, be poorer ore requiring concentration. A very satisfactory feature about the lodes is that so far as they have been opened the ore below the oxidised zone is almost entirely chalcopyrite (yellow copper pyrites), and shows no sign of changing into cupreous iron pyrites. This leads me to be very hopeful as to the valuable ore being persistent in depth. The rich bunches of oxidised ore that have been found near surface appear also to be the result of oxidation of copper pyrites more or less directly, and not merely chemical concentrations. Copper pyrites is an ore which is found persisting unchanged to great depths, and the evidence now available seems to me to show that it is the ore which prevails in the portions of the Phillips River copper lodes that lie below the zone of oxidation. There is a little marcasite (white iron pyrites) in some of the mines, but it seems to me to be of secondary origin and likely to disappear in depth.

STATE SMELTING WORKS AND PURCHASE OF ORE.

39. In order to obtain thorough comprehension of the considerations which have led to the establishment of a State Smelting Works on this field, it is necessary that a brief historical sketch should be given of the developments which have brought about the existing position.

40. The Phillips River District was proclaimed a goldfield on 14th September, 1900, and during that year sent out 34 tons of ore valued at £881. It was soon found that the heavy expenses of getting the ore to market rendered it impossible for the field to make much active progress, and in July, 1900, a deputation waited on the Minister for Mines urging the erection of a local smelter. This was followed by a petition from residents on the field, and inquiries were made as to plant necessary, and reports obtained from Messrs. H. P. Woodward and G. C. Klug. After much consideration the Government decided in May, 1902, to offer a bonus of £1,000 to any person who would, under certain conditions, erect a suitable furnace, and later on announced their willingness to increase the bonus if good cause were shown. No response being made to this offer, it was resolved by Parliament in September, 1902, that the Government should consider the advisability of themselves erecting suitable Smelting Works. Immediately upon my taking up the duties of the State Mining Engineer's Office in November, 1902, I was instructed to report on the field, and in a report dated 28th February, 1903, submitted the outlines of an extensive scheme covering the work necessary to be done to handle the mines to the best advantage. This comprised the construction of a tramway from Hopetoun to the mines as well as the establishment of a Smelter, it being clear that the heavy expenses of carriage of goods to and from the field were the principle obstacle to its successful development. It also contemplated the ultimate erection of a central concentrating mill, for the treatment of the low-grade ores and highly silicious ores unsuitable for smelting. It was not however recommended that the whole of this scheme should be gone on with at once, as the then existing condition of the field did not warrant such an expense, the object of bringing it forward being to lay down a plan of equipment that could be completed step by step as progress warranted. As a first step, the purchase was recommended of a quantity of ore at a price better than then could be obtained by shipping it, but which would be payable with local smelting and tramway communication with the coast, in order to afford a local market for the ore to the leaseholders and enable them to open up their mines sufficiently to demonstrate the permanency of the field. As the Government could not send the ore to a smelter outside the district any cheaper than private owners could, it was obvious that this course involved a risk of loss to the State if eventually the ore had to be carted out and sold. After much consideration the Government decided to take this risk in order to prove the field, and authorised an expenditure of £1,100 for the remaining portion of the financial year 1902-3, for erection of an assay office, laying down of sampling floors, appointment of an ore-buyer, and purchase of ore. A sum of £15,000 was next provided on the Estimates for "Purchase of Ore and Erection of Smelter" during 1903-4, and purchase of ore was commenced in July, 1903. There was at first no guarantee that a Smelter would be erected, and the Government retained the right to dispose of any of the ore either by smelting or by sale. After purchase of ore had gone on for a few months it was found that ore was coming in freely to the sampling floors, but to provide it the most easily accessible ground was being gouged out without proper attention being paid to development, and in consequence the ore-buyer was instructed to refuse ore from any mines in which a reasonable amount of development was not going on; and shortly afterwards, as the vote was rapidly being exhausted, purchases were restricted to ore from development work only. In January, 1904, purchases were terminated in order to retain portion of the vote for the purchase of a smelting plant, and after a visit of the late Minister for Mines, Mr. Gregory, to the field in February, 1904, it was definitely decided by the Government on 18th March, 1904, to proceed with the erection of a Smelter, the order for which was placed with the Australian Metal Company on 9th April, 1904.

41. In the meantime no money was left available for further purchases of ore until the Estimates for 1904-5 were passed by Parliament, and this stoppage of the local market came very hardly upon the mine-owners. In order to provide temporary relief, an arrangement was come to in April, 1904, whereby ore presented to the ore-buyer was weighed, sampled, and assayed by him, and a certificate issued of the weight and value, the Government taking the option of purchasing any such ore within nine months of the date of the certificate, under the same conditions as their previous purchases. The mine-owners then were able to obtain advances upon these certificates from the Western Australian Bank, up to 75 per cent. of the value shown upon them, and carrying interest at 8 per cent. This arrangement was the best that could be done until more money was available for ore-purchase, but it caused a great restriction of the output, as only the very best ore could be sent to the sampling floors with any profit. On the Estimates for 1904-5 a sum of £30,000 was passed by Parliament for purchase of ore, and cash purchases of ore were resumed in January, 1905, that held under option being then taken over.

42. The total quantities of ore purchased during each ore purchase period are shown in the table before given.

43. Portion of the smelting plant obtained from the Australian Metal Company was in Adelaide, and reached Hopetoun on 24th May, 1904. The engine and blower had a trial run on 8th July, but the blast-furnace, which was ordered from America, and should have left New York at the end of May, was greatly delayed in transit, and did not arrive at the works till 10th October, 1904. It was put in blast on 18th October. Pending its arrrival the remainder of the plant had been erected and housed in, dams made and pump and boiler provided for water supply, 10-ton weighbridge put in, and water tanks erected. Sampling machinery, a hot-blast stove, a matte-breaker, and a slag hoist have since been added to the plant.

Smelting Results.

44. Up to the date of starting smelting (18th October, 1904) the ore received at the works amounted to 4,819 tons 14cwt. 0qrs. 13lb. gross, or 4,501 tons 0cwt. 3qrs. 18lb. net. The first run of the furnace was mainly on the ore purchased up to the end of January, 1904, but a small parcel of antimonial ore was omitted, as being likely to damage the copper produced, and a small amount of ore received later was included for fluxing purposes. The run was completed on 15th April, 1905, the total tonnage of ore smelted being 3,298 tons 3cwt. 2qrs. 10lb. gross, or 3,098 tons 9cwt. 0qrs. 22lb. net. The total ore received at the works up to this date was 6,075 tons 4cwt. 0qrs. 14lb. gross, equal to 5,690 tons 0cwt. 1qr. 24lb. net, so that the total received during the smelting period was 1,255 tons 10cwt. 0qrs.

11b. gross, or 1,188 tons 19cwt. 2qrs. 6lb. net. During the run there were several stoppages, due to want of coke in November, and the Christmas holidays, amounting altogether to about four weeks. Inclusive of stoppages, the run extended over 26 weeks, giving an average amount smelted of 119·2 tons (net) per week, or exclusive of stoppages at the rate of 140·8 tons (net) per week. The supplies of ore during the same period have come in at the rate of 46 tons net, per week, or little more than one-third of the amount smelted.

45. The net amount of ore smelted, 3,098·4597 tons, contained according to assay 510 tons 8cwt. 3qrs. 15lb. of copper, equal to 16·47 per cent.; 449ozs. 5dwts. 4grs. of gold, equal to 2·9dwts. per ton; and 2,911ozs. 1dwt. of silver, equal to 0·94ozs. per ton, of which 417 tons 9cwt. 1qr. 11b. of copper (13·47 per cent.) and 148ozs. 0dwts. 3grs. of gold (·96dwts. per ton) were paid for under the conditions of purchase. The total value was:—

	£	s.	d.
Copper: 417·4629 tons at £50	20,873	2	11
Gold: 148·0062ozs. at 72s.	532	16	5
	21,405	19	4
Less smelting charges, 3,098·4597 tons at £3	9,295	7	7
Total paid	£12,110	11	9

46. The matte and black copper returned from the smelting run contained:—

	Copper tons	Gold ozs.	Silver ozs.
Matte: 568·443 tons net, assaying 66·45 per cent. copper, ·5525ozs. gold per ton, and 3·78ozs. of silver per ton	377·7563	314·066	2,147·9
Black Copper: 31·933 tons	30·0000	128·000	295·0
Total	407·7563	442·066	2,442·9
Equal per net ton of ore smelted to	13·16%	2·85dwt.	0·79oz.
Or a recovery of the total amount shown by assay of	79·9%	98·4%	84·0%

There were also on hand, however, at the conclusion of the run some unfinished products estimated to contain about 5 tons of copper, 5ozs. of gold, and 30ozs. of silver, which would bring the recovery up to 80·86 per cent. of the copper, 99·6 per cent. of the gold, and 85 per cent. of the silver.

47. The loss of copper in this run, neglecting the unfinished products, amounted to (510·4442—407·7563 tons)=102·6879 tons, or 3·31 per cent. of the net ore treated, the deduction of three units from the assay made to cover losses thus proving insufficient on this occasion by 0·31 units. Deducting the smelting charges as above (£9,295 7s. 7d.) from the total amount at which the copper was valued (£20,873 2s. 11d.), it will be seen that the price actually paid per ton of copper purchased (417·4629 tons) was £11,577 15s. 4d., or at the rate of £27 14s. 8d. per ton. (To simplify calculations it is best to count all charges against the copper alone, irrespective of the gold.) Gold, however, was recovered in excess of the amount paid for, and the whole of the silver recovered was a gain. Taking the gold as likely to realise 82s. an ounce and the silver 2s. an ounce, we have:—

			£	s.	d.
Gain on gold recovered in excess of paid for	442·066 —148·0062 = 294·0598	at 82/- ...	1,205	12	11
„ silver „ „ „ ...	2442·9	at 2/- ...	244	5	9
			1,449	18	8
Loss on copper paid for in excess of recovered	417·4629 —407·7563 = 9·7066	at 554/8 ...	269	3	11
Balance (gain)			£1,180	14	9

If we take credit for the copper and precious metals estimated in the unfinished products, viz., £162 3s. 4d., the total gain of metal over and above the quantity paid for on the purchase scale becomes £1,342 18s. 1d.

48. The tariff deduction of £3 to cover expenses of smelting however proved insufficient in this instance for several reasons. Firstly, a fair proportion of the cost of receiving, weighing, and sampling the ore prior to the erection of the works, including some months when very little ore was being received, had to be charged against it, and it will readily be understood that this was much higher than when ore is coming in regularly and in larger quantities, and the works are running. It has been necessary to charge the actual cost (10s. 11·7d. per ton) against all the ore received up to the time of starting smelting. Secondly, there were several stoppages in the work due to want of coke through bad weather on the coast, repairs and small additions to plant always found necessary in a first run, and want of experienced furnace labour. Thirdly, the beds smelted contained one very large parcel of highly silicious second-class ore, which was expensive on account of requiring more than the average amount of coke and flux, and reducing the output of the furnace. Sundry expenses charged in the books to "Smelting Costs" also have to go against this run, though they would more fairly perhaps be distributed over a longer period. The total costs of smelting divided by the quantity smelted for the run, thus give an average of £3 6s. 11·1d. per net ton of ore, or a total average cost, inclusive of the above charge for weighing and sampling, and assaying (10s. 11·7d.), of £3 17s. 10·8d. per ton. This is very high indeed, but must be looked upon as a figure due to the initial difficulties of starting the smelting establishment, and not as a fair average cost

As a matter of fact, the cost for the six weeks ending 13th May, 1905, inclusive of weighing, sampling, and assaying the ore received during that period, has fallen to £2 19s. 5·425d. per ton smelted, and is expected to be still considerably reduced.

Taking the cost at 17s. 10·8d. in excess of the amount charged to cover smelting expenses, we have:—

	£	s.	d.
Loss: 3,098·46 tons at 17s. 10·8d.	2,773	2	5
Gain on metals as above	1,342	18	1
Balance (loss)	£1,430	4	4

equal to 9s. 3d. per net ton smelted. There is every prospect that this loss will be more than regained on the smelting of the remainder of the ore-heaps now in hand.

49. The matte produced has been shipped to Europe for sale, but the returns are not yet all to hand. The costs of cleaning, bagging, weighing, sampling, and assaying it are included in the above-mentioned smelting costs. The costs of realisation paid in this State have averaged as follows:—

	Per ton of matte (gross). £	s.	d.
Cartage to the coast	1	12	6
Agency and wharfage, Hopetoun	0	2	0
Freight, Hopetoun to Albany, and storage at Albany ...	0	17	8
Agency and wharfage, Albany	0	1	10
Insurance, Hopetoun to Europe	0	2	0
	£2	16	0

The matte has to be double bagged, taking 40 bags to the ton equal to about 56lbs. weight, so that each ton gross contains only ·975 tons of matte. The costs per *net* ton of matte are therefore £2 17s. 6d. The freights to Europe from Albany are variable, ranging from 22s. 6d. to 30s. a ton in the shipments that have been made. There are, however, further expenses in conveying the matte from its port of arrival to its ultimate destination, which depend on the market in which it is sold, and have to be added to the freight from Albany.

50. The smelting or "returning" charges in Europe at present appear to range from 1s. 9d. to 2s. per unit, for matte of 60 to 70 per cent. copper. The copper is usually bought on the price of "best selected" copper, with a deduction of 1·3 units from the wet assay. Gold is paid for at from 80s. to 82s. per ounce fine, and silver usually at standard price (about 2s. 2d. at present). Payment is usually made at two months from date of sampling, or by cash less two months' interest at 5 per cent., at the buyers' option.

51. The first parcels of matte were shipped through several different firms, as under, with the results shown:—

(1.) Parcel shipped per "Agapanthus" to Dunkirk, 6th January, 1905, per Messrs. G. Wills & Co.:—

	tons	cwts.	qrs.	lbs.
Gross weight as sent from works	29	16	3	26
Net weight sold	29	1	1	21
Bags, moisture, and loss in transit	0	15	2	5

Equals 2·6 per cent.

Average price best selected copper, March 21-31 ... £72 5s. per ton.
Average price standard silver, March 21-31 ... ... 26·4375d. per oz.

Tons net.	Agreed Assay, less 1·3 units Copper.	Tons Copper.	Rate.	Amount. £	s.	d.
29·072	Copper, 63·95 per cent. ...	18·591	at £72 5 0	1,343	4	0
	Gold, ·36ozs. per ton	ozs. 10·466	at 4 0 0	41	17	3
	Silver, 4·8ozs. per ton ...	139·5	at 26·4375d.	15	7	4
			Gross value ...	1,400	8	7

Charges:—

	Per net ton of Copper. £	s.	d.	Total. £	s.	d.	
Telegrams	0	10	8·01	9	18	4	
Weighing, sampling, and assaying...	0	8	2·11	7	12	0	
Insurances	0	3	10·10	3	11	5	
Shipping expenses	3	2	4·37	57	19	5	
Commission	0	13	3·27	12	6	9	
Interest	0	4	6·87	4	5	0	
Smelting charges, 1s. 9½d. per unit	8	19	2·02	166	10	11	
	14	2	0·75	...			262 3 10
Net return	...			...			1,138 4 9

(2.) Parcel shipped per "Medic" to Liverpool, 11th January, 1905, per the Fremantle Smelter, Limited:—

	tons.	cwt.	qrs.	lbs.
Gross weight as sent from works	49	11	2	0
Net weight sold	48	13	0	3
Bags, moisture, and loss in transit	0	18	1	25

Equals 1·9 per cent.

Average price best selected copper ... ... £72 10s.
Average price standard silver ... ... 27d. per oz.

Tons.	Agreed Assay, less 1·3 units Copper.	Tons Copper.	Rate.	Amount.
				£ s. d.
48·6513	Copper, 64·42 per cent. ...	31·3411 at	£72 10 0	2,272 4 7
	Gold, ·372ozs. per ton ...	ozs. 18·098 at	82s.	74 3 10
	Silver, 3·62ozs. per ton ...	176·118 at	27d.	19 16 4
	Empty bags, 10cwt. 1qr., less charges			1 18 0
		Gross return ...		2,368 2 9

Charges:—

	Per net ton of Copper.	Total.	
	£ s. d.	£ s. d.	
Telegrams	0 1 4·4	2 3 0	
Insurances	0 3 2·3	5 0 2	
Weighing, sampling, and assaying...	0 5 7·4	8 16 0	
Shipping expenses	2 9 10·9	78 4 4	
Commission	0 3 9·4	5 18 4	
Interest	0 8 11·6	14 1 1	
Smelting charges, 1s. 10·8d. per unit	9 10 0·0	297 14 10	
			411 17 9
	13 2 10	...	...
Net return	...	...	1,956 5 0

(3.) Parcel shipped per "Commonwealth" to London 29th January, 1905, per Messrs. F. H. Snow & Co.:—

	tons	cwts.	qrs.	lbs.
Gross weight as sent from works	66	10	1	12
Net weight sold	65	5	2	24
Bags, moisture, and loss in transit	1	4	2	16

Equals 1·85 per cent.

Average price best selected copper, 24th March-7th April ... £71 18s.
Average price standard silver ... ... 25·7375d.

Tons.	Agreed Assay, less 1·3 units Copper.	Tons Copper.	Rate.	Amount.
				£ s. d.
65·2856	Copper, 67·32 per cent.	43·9503 at	£71 9 0	3,160 0 6
	Gold, 0·362ozs. per ton ...	ozs. 23·635 „	82s.	96 17 11
	Silver, 3·85ozs. „ ...	251·350 „	25·7375d.	26 19 1
		Gross return		3,283 17 6

Charges:

	Per net ton of Copper.	Total.	
	£ s. d.	£ s. d.	
Telegrams	0 0 5·4	0 19 10	
Insurances	0 2 9·1	6 1 2	
Weighing, sampling, and assaying ...	0 5 4·3	11 15 6	
Shipping expenses	2 8 4·2	106 4 11	
Commission	0 13 2·3	29 0 0	
Interest	0 4 8·1	10 5 6	
Exchange	0 0 7·6	1 7 10	
Smelting charges, 1s. 9d. per unit	8 15 0	384 11 3	
			550 6 0
	12 10 5·0	...	...
Net return ...	...	...	2,733 11 6

52. The full account sales are not yet to hand for the following parcels:—

(4.) 31 tons 16cwt. 3qrs. 21lbs. shipped to Baltimore, U.S.A., per "Afric," on 9th February, 1905, per the Mount Lyall Mining and Railway Company, Ltd. Advice has been received of a payment of £1,316 16s. on account of this shipment.

(5.) 21 tons 12cwt. 2qrs. 13lbs. shipped to London per "Afric" on February 9, 1905, per Messrs. D. C. Griffith & Co. Cabled advice has been received of the payment of £855 16s. 1d. as the Agents' net return.

(6.) 57 tons 5cwt. 3qrs. 23lbs. * shipped to London per "Warrigal" on February 20, 1905, per Elliott's Metal Company. Cabled advice has been received of the payment of £2,230 15s. 6d. as the Agents' net return.

(7.) 35 tons 17cwt. 1qr. 22lbs. shipped to London per "Warrigal" on February 20, 1905, per Messrs. D. C. Griffith & Co., from which a net return of £1,517 11s. 9d. is advised by cable.

(8.) 188 tons 18cwt. 2qrs. 6lbs. shipped to London per "Wakool" on April 1, 1905, consigned to the Agent General, who advises by cable the payment of £5,500 in part payment.

(9.) 190 tons 11cwt. 2qrs. 6lbs. shipped to London per "Wilcannia" on May 22, 1905, consigned to the Agent General.

53. Taking the three completed returns together, the tare and losses in transit average two per cent. of the gross tonnage shipped, and the losses alone amount to ·75 per cent. of the net tonnage of matte. The three parcels contained 93,882 tons of copper which were paid for, and the expenses enumerated totalled £1,224 7s. 7d., or an average of £13 0s. 10d. per net ton of copper. The average price obtained was £72 3s. 5d. per ton of "best selected" copper, but as the price has since fallen it is not likely that the remainder of the parcels now in the market will realise this. The average price obtained for the whole of the proceeds of the first smelting run is expected to be on the basis of about £70 10s. for "best selected" copper.

54. We can now arrive approximately at the probable net return from the first smelting run on the average figures above obtained:—

Matte		568·443 tons	564·180 tons.
Less ·75 per cent. estimated loss in transit		4·263 tons	

66·45
1·30

Tons.		Tons.		Amount.
564·18 at 65·15 °/₀ Copper		367·563 at	£70 10s. 0d. ...	£25,913·1915
		ounces.		
564·18 „ ·55 oz. Gold		310·299 „	£4 2s. 0d. ...	1,272·2259
564·18 „ 3·78 „ Silver		2,132·6004 „	26d. ...	231·0317
	Gross Value			£27,416·4491

Equal to £48 4s. 7d. per net ton of matte at Ravensthorpe.

Charges:—

Costs to Albany 568·443 tons at £2 17s. 6d. (equals £4 8s. 11d. per ton of Copper)	£1,634·2736	
Shipping and Returning Charges 367·563 tons at £13 0s. 10d.	4,793·6341	6,427·9077
Net Value		£20,988·5414

The expenses amount to £11 6s. 2d. per net ton of matte produced at the Works, and the return to £36 18s. 5d. The expenses per net ton of copper sold are £17 9s. 9d.

55. No figures are yet to hand for the realisation of the Black Copper produced, but the following are taken from an actual quotation received for this material (viz.: Copper by electrolytic assay less 1·3 units at Standard Copper price less two and a-half per cent. discount, Gold at 82s. per ounce, Silver at Standard price. Returning charge £5 per ton of Black Copper) *plus* shipping and other charges at the same rate as on the matte.

Black Copper.—31·933 tons, containing 30 tons Copper—93·94 °/₀.

93·94 °/₀
1·30

Tons.	£ s. d.	
31·933 × 92·64 = 29·583 Copper ...	66 0 0	
	1 13 0 = 2½°/₀	
		£
Copper, 29·583 tons at	64 7 0 ...	1,903·666
Gold, 128 ounces at	4 2 0 ...	524·800
Silver, 295 ounces at	26d. ...	31·958
Gross Value	...	£2,460·424

Equal to £77 1s. per ton at Ravensthorpe.

Charges:—

	£	
Costs to Albany 31·933 tons at 56s.	89·4124	
Returning charge, 31·933 tons at £5	159·6650	
Shipping and other Charges at £13 0s. 10d. per ton of Copper, less £9 0s. 10d., the average Smelting Charge per ton of Copper for matte = £4 — 29·583 tons at £4	118·3320 ...	367·4094
Net Value	... ...	£2,093·0146

* P.S.—It was found on delivery that three more bags were sent than were tallied, making the total 57 tons 9cwt. 0qr. 4lbs. They probably belonged to the shipment to Messrs. Griffiths & Co. by the same vessel.

The expenses according to this reckoning amount to £11 10s. 1d. per ton of Black Copper despatched from the Works, or £12 8s. 4d. per ton of fine copper sold, and the return to £65 10s. 11d. per ton of black copper, or £70 15s. per ton of fine copper sold.

	£
Estimated net value of matte	20,988·5414
Estimated net value of black copper	2,093·0146
Total return	£23,081·5560

	£ s. d.
Equals	£23,081 11 1
Amount paid for ore, and smelting charges as above	£21,405 19 4
Balance	£1,675 11 9

	£ s. d.
On 3,098·46 tons smelted	0 10 10
Average amount paid per ton on delivery at Works	3 18 2
Total average return	£4 9 0

56. It will be noted that there is little difference in the above figures between the expenses per ton of matte (£11 6s. 2d.) and those per ton of black copper (£11 10s. 1d.). At the assays given, however, one ton of matte would yield ·707 tons of black copper, the expenses on which would be only £8 2s. 8d. There would therefore be a saving by sending away black copper instead of matte of £3 3s. 6d. per ton of matte, from which, however, would have to be deducted the cost of the conversion. This should not exceed 30s. per ton of matte, so that there should be a substantial profit by converting the matte into black copper locally.

57. There has been much discussion in Ravensthorpe as to the price per unit of copper which should be paid by the Government, it not being sufficiently recognised by most people how heavy the deductions are from the full price of the metal. It has been shown that though the matte produced contained 377·7563 tons of copper according to assay, losses in transit and Smelter's deductions reduce the amount on which payment is finally made to 367·563 tons, being a loss of 2·7 per cent. Taking the average price of the copper as above at £70 10s. per ton (best selected), we have on every net ton of fine copper leaving the Works in the form of matte:—

			£ s. d.		£ s. d.
Loss and Deduction	·027 tons at	70 10 0	...	1 18 1
Charges as above	·973 „	17 9 9	...	17 0 4
	1·000 tons			£18 18 5

therefore, £70 10s. less £18 18s. 5d. gives £51 11s. 7d. a ton, or 10s. 4d. a unit, as the utmost price that could be paid locally for copper in matte under existing circumstances with best selected copper at £70 10s. a ton. or, say, £65 10s. to £66 for ordinary copper bars (G.M.B.'s). If the smelting were carried to black copper, the charges on which have been shown to amount to £12 8s. 4d. per ton of fine copper contained in it, the local price would be a little better, the charges from the works, taking losses and deductions, as in the case of matte, being equal to £13 19s. 8d. per net ton of fine copper. There would, however, be in addition the extra cost of smelting, say two tons of 50 per cent. matte to black copper at 30s. a ton, equal to say £3 per ton of fine copper. The ore smelted was nearly all purchased between July, 1903, and January, 1904, during which period the average value of G.M.B. copper was £56 16s. 9d. a ton, and "best selected" £61 to £61 10s. It is clear, therefore, that a much higher price was paid than the market then justified.

58. At present there is no prospect of the expenses of realisation of the matte being reduced materially, the expectation being rather that they may be somewhat increased. The contractors for cartage between the smelter and Hopetoun find their freight rate an unpayable one, and there seems at present no chance of reducing freights from Hopetoun to Albany and from Albany to Europe, or of getting any improvement in the returning charges in Europe. The construction of the tramway from Hopetoun to the works would effect a great saving, about £1 per ton on both coke and furnace products. The consumption of coke has averaged about 0·26 tons per ton of ore, and as each ton of ore has returned ·1282 tons of copper, actually sold, the coke consumption amounts to 2·03 tons per ton of metal, and the saving of £1 a ton on coke would therefore amount to £2 0s. 7d. per ton of copper. There would likewise be a saving in freight of £1 per ton of matte, equal on the above figures to £1 10s. 11d. per ton of copper sold, making a total saving in freight of £3 11s. 6d. per ton of copper, equal to 8½d. per unit or 20·4 per cent. of the present total charges per net ton of copper sold in matte.

59. Considerable improvements in the return to be obtained from the ore are also to be looked for in reduction of smelting losses, and lowering of smelting costs. The losses in the first smelting run were undoubtedly very high, and were due to a heavy loss of flue-dust owing to the pulverulent character of much of the ore, and to heavy losses in the slags owing to the high grade of matte produced in one operation. The recovery of copper was only 80 per cent. of the total shown by assay, and by minimising the above losses should not be less than 90 per cent., which would mean one-eighth added to the tonnage of copper returned. The latter was 397·146 tons, so the total at 90 per cent. recovery would have been 49·643 tons more, or 446·789 tons in all. At £51 11s. 7d. per ton the local value of this additional copper would have been £2,560 10s. 11d. This would have wiped out the smelting loss of £1,430 4s. 4d. and given an additional sum of £1,130 6s. 7d. The erection of dust chambers to catch the flue-dust is urgently necessary and would do a great deal to reduce the loss. To lower the percentage of copper left in the slags it will be necessary to run a much lower grade of matte in the first concentration, say 45 to

50 per cent. copper. This can then be brought to a higher grade regulus or even to blister copper either by smelting in a reverberatory furnace or by roasting and smelting again in a second blast furnace. In either case all the slags from the treatment of the rich material would be re-smelted in the ore furnace. The advantages in producing blister copper instead of matte have already been pointed out. Extension of the plant to make it capable of producing blister copper is therefore very necessary in order to work in the most economical fashion.

60. Under present conditions mine owners find it necessary to expend much time and labour in picking and cleaning the ore before sending it to the smelter, and it is most important to bring about such a reduction of costs as will enable a lower grade of ore to be dealt with profitably. To do this, smelting and realisation costs must be reduced to the utmost. The most important factor in doing so is undoubtedly tramway communication from the mines to the smelter, and between the smelter and the port. Cartage charges to the works could thus be reduced from three to eight shillings a ton of ore, according to the position of the mines, and it has been above pointed out that the saving on carriage of coke and matte would amount to about £3 11s. 6d. per ton of copper (equal to 6s. 5d. per ton of 10 per cent. ore, with a recovery of 90 per cent.) not to speak of the saving in the cost of other mining and smelting supplies. Outside the saving in freights, the principal means of lowering smelting costs is by attaining a greater output per diem by the use of larger furnaces. This, however, involves that correspondingly larger supplies of ore are sent in to the works. The mines are quite capable of maintaining these supplies if energetically worked, but most of them need some capital expended upon them to put them into a condition to become large producers. Smelting 60 tons of 10 per cent. ore a day, to matte only, Mr. G. C. Klug has calculated that even without the tramway the cost could be reduced to 30s. a ton, With a complete and larger smelting plant, therefore, and the tramway system, there is every expectation that the costs per ton of ore can be reduced very much below those now incurred for smelting and realisation, so as to enable even 8 per cent. ore giving a return of, say, 7 per cent. of copper actually sold, to be sent in from the mines with profit to the owners, thus:—

	£ s. d.	£ s. d.
Value of 1 ton ore, yielding ·07 tons copper, at £70 10s.		4 18 8
Costs—		
Smelting to matte, one ton	1 10 0	
Smelting to blister copper, say, ·145 tons matte at 30s.	0 4 3	
Freight and realisation expenses, ·07 tons copper at £12 8s. 4d. ...	0 17 5	
	£2 11 8	
Less saving due to tramway, ·07 tons copper at £3 11s. 6d.	0 5 0 ...	2 6 8
		£2 12 0

If the tramway connected the Smelting Works with the mine from which the ore came, the mine owners would also save from 3s. to 8s. a ton on their present cost of carting ore of eight per cent. assay, then giving them a return on the mine of, say, £2 9s. a ton. The gold and silver values would be in addition to this return for copper.

61. As the present smelter is more than able to deal with the quantity of ore brought to it, there is not yet any justification for erecting a larger one. The figures just quoted, however, show that there is a possibility of treating as low as eight per cent. ore profitably by working on a considerable scale, and with plant sufficiently complete to ensure an extraction of 90 per cent. of the copper value. Of course, ore of this value could not be bought under the existing conditions of purchase; so some other scheme will have to be devised for dealing with low-grade material. The best course to follow, in my opinion, is to first perfect the plant and treatment until a return of 90 per cent. of the assay value can be guaranteed, and then alter the purchase conditions accordingly, at the same time lowering the charge for smelting, as experience shows that this can be done without loss. This would allow the grade of ore presented to the works to be gradually lowered, and the quantity increased until a larger furnace would be necessary.

I have, etc.,

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

POSTSCRIPT.

Since writing the above report the following further returns have been received:—

(a.) *Shipment of 31 tons 16cwt. 3qrs. 2lbs. sent to Baltimore, U.S.A., per the Mount Lyell Mining and Railway Co. Ltd., on 9th February, 1905, per ss. "Afric."*—

	tons.	cwt.	qrs.	lbs.
Gross weight as sent from works	31	16	3	2
Net weight as sold—31·3451 tons	31	6	3	17
Bags, moisture, and loss in transit	0	9	3	13

Equals 1·55% of gross weight.

	£ s. d.	
Price realised for best selected copper	71 0 0	per ton
Price realised for gold (fine)	4 2 0	per ounce
Price realised for silver (fine)	0 2 $2\frac{7}{16}$	per ounce

	Copper.	Gold.	Silver.
Agreed assays	67·2075 % ...	·5656oz. per ton ...	4·032oz. per ton
Less	1·3		
	65·9075		

Tons (net).	Assay.	Amount paid for.	Rate.	Amount.
			£ s. d.	£ s. d.
31·3451	at 65·9075 %	20·6588 tons copper	at 71 0 0	1,466 15 4
31·3451	„ ·5656 ozs.	17·7288 ozs. gold	„ 4 2 0	72 13 9
31·3451	„ 4·032 ozs.	126·3834 ozs. silver	„ 0 2 $2\frac{7}{16}$	13 18 5
		Gross total value		1,553 7 6

Charges—Per net ton of fine copper sold, 20·6588 tons :—

	Per net ton of copper.	Total.	
	£ s. d.	£ s. d.	
Freight	2 6 2·8	47 15 2	
Sampling and assaying	0 3 0·3	3 2 6	
Interest and exchange	0 0 7·1	0 12 3	
Commission	0 12 10·9	13 6 9	
Returning charges	10 12 6·0	219 10 0	
Telegrams	0 0 2·3	0 4 1	
Insurance	0 4 8·5	4 17 2	
			289 7 11
	14 0 1·9	...	...
Net return	...	...	1,263 19 7

(*b.*) *Shipment of 21 tons 12cwt. 2qrs. 13lbs. sent to London per "Afric" on 9th February, 1905, per Messrs. D. C. Griffith & Co.*—

	tons.	cwt.	qrs.	lbs.
Gross weight as sent from works	21	12	2	13
Net weight sold—21·2058 tons	21	4	0	13
Bags, moisture, and loss in transit	0	8	2	0

Equals 1·96% of gross weight.

	£ s. d.	
Price realised for best selected copper	71 15 0	per ton
Price realised for fine gold	4 2 0	per ounce
Price realised for fine silver	0 2 $2\frac{5}{16}$	per ounce

	Copper.	Gold.	Silver.
Agreed assays	65·50 % ...	·565ozs. per ton ...	4·00ozs.
Less	1·30		
	64·20		

Tons (net.)	Assay.	Amount paid for.	Rate.	Amount.
			£ s. d.	£ s. d.
21·2058	at 64·20 %	13·6141 tons copper	at 71 15 0	976 16 3
21·2058	„ ·565ozs.	11·9813 ozs. gold	„ 4 2 0	49 2 6
21·2058	„ 4·0 ozs.	84·8232 ozs. silver	„ 0 2 $2\frac{5}{16}$	9 6 0
		Gross total value		1,035 4 9

Charges—Per net ton of fine copper sold, 21·2058 tons :—

	Per net ton of copper.	Total.	
	£ s. d.	£ s. d.	
Freight and shipping expenses	2 4 2·8	30 2 2	
Sampling and assaying	0 4 7·5	3 3 0	
Commission	0 6 7·1	4 9 9	
Interest	0 3 9·4	2 11 7	
Telegrams	0 3 10·8	2 13 2	
Insurance	0 2 7·8	1 16 1	
Returning charges	10 2 10·0	138 1 3	
			182 17 0
Total	13 8 7·4	...	...
Net return	...	...	852 7 9

(c.) *Shipment of 57 tons 9cwt. 4lbs. sent to London per "Warrigal" on 20th February, 1905, per the Elliotts' Metal Company.* (Three bags weighing 3cwt. 9lbs. belonging to the next parcel appear to have been included in this one in error.)—

	tons.	cwt.	qrs.	lbs.
Gross weight as sent from works	57	9	0	4
Net weight sold—56·6875 tons	56	13	3	0
Bags, moisture and loss in transit	0	15	1	4

Equals 1·33% of gross weight.

	£	s.	d.	
Price realised for best selected copper	69	15	0	per ton.
Price realised for gold	4	0	0	per ounce.
Price realised for silver	0	2	$2\frac{3}{16}$	per ounce.

	Copper.	Gold.	Silver.
Agreed assays	65·56 %	·56ozs. per ton	4·0ozs. per ton
Less	1·30		
	64·26		

Tons (net.)	Assay.	Amount paid for.	Rate.	Amount.
			£ s. d.	£ s. d.
56·6875	at 64·26 %	36·4274 tons copper	at 69 15 0	2,540 16 3
56·6875	„ ·56 ozs.	31·745 ozs. gold	„ 4 0 0	126 19 7
56·6875	„ 4·0 ozs.	226·75 ozs. silver	„ 0 2 $2\frac{3}{16}$	24 14 10
Credit due to fractions in computation by a different method ...				0 3 7
		Gross total value		2,692 14 3

Charges—Per ton of fine copper sold, 36·4274 tons:—

	Per ton of copper.	Total.	
	£ s. d.	£ s. d.	
Freight and shipping expenses	1 19 11·6	72 16 0	
Sampling and assaying	0 5 4·0	9 14 0	
Commission	0 6 4·7	11 12 10	
Interest	0 7 3·1	13 4 5	
Telegrams and cables	0 0 10·4	1 11 9	
Insurance	0 3 0·5	5 10 11	
Returning charges	10 0 0·0	364 5 6	
Total	13 2 10·3	...	478 15 5
Net return	...	...	2,213 18 10

(d.) *Shipment of 35 tons 14cwt. 1qr. 13lbs. sent to London per "Warrigal on 20th, per Messrs. D. C. Griffith & Co.* (Three bags belonging to this parcel weighing 3cwt. 0qr. 9lbs. included in error in parcel sent to Messrs. Elliotts').—

	tons.	cwt.	qrs.	lbs.
Gross weight as sent from works	35	14	1	13
Net weight sold—34·3205 tons	34	6	1	18
Bags, moisture, and loss in transit	1	7	3	23

Equals 4·02% of gross weight shipped.

	£	s.	d.	
Price realised for best selected copper	70	5	0	per ton
Price realised for gold	4	2	0	per ounce
Price realised for silver	0	2	$4\frac{1}{8}$	per ounce

	Copper.	Gold.	Silver.
Agreed assays	71·37 %	0·50ozs. per ton	5·57ozs. per ton
Less	1·30		
	70·07		

Tons (net).	Assay.	Amount paid for.	Rate.	Amount.
			£ s. d.	£ s. d.
34·3205	at 70·07 %	24·0484 tons copper	at 70 5 0	1,689 8 0
34·3205	„ ·5 ozs.	17·1603 ozs. gold	„ 4 2 0	70 7 2
34·3205	„ 5·57 ozs.	191·1652 ozs. silver	„ 0 2 4⅛	22 8 0
		Total value		1,782 3 2
		Credited through difference in method of computation ...		0 0 5
		Credited for empty ore bags sold		2 5 4
		Gross total value		1,784 8 11

Charges—Per ton of fine copper sold, 24·0484 tons :—

	Per ton of copper.	Total.	
	£ s. d.	£ s. d.	
Freight and shipping expenses	2 11 6·4	61 19 3	
Insurance	0 4 3·4	5 3 0	
Commission	0 6 5·6	7 15 7	
Sampling and assaying	0 3 2·4	3 17 0	
Interest	0 4 9·4	5 15 1	
Telegrams and cables	0 2 4·5	2 17 2	
Returning charges	9 10 0·0	228 9 2	
			315 16 3
Total	13 2 7·7	...	...
Net return	...	...	1,468 12 8

(e.) *Shipment of 188 tons 18cwt. 2qrs. 6lbs. sent to London per "Wakool" on April 1st, 1905, consigned to the Agent General, and sold through Messrs. H. A. Watson & Co., Liverpool:—*

	tons.	cwt.	qrs.	lbs.
Gross weight as sent from works	188	18	2	6
Net weight sold—184·1473 tons	184	2	3	22
Bags, moisture, and loss in transit	4	15	2	12

Equals 2·53% of gross weight shipped.

	£ s. d.	
Price realised for best selected copper	69 8 9	per ton
Price realised for gold	4 2 0	per ounce
Price realised for silver	0 2 3⅛	per ounce

	Copper.	Gold.	Silver.
Agreed Assays	64·90% ...	0·59ozs. per ton ...	4·44ozs. per ton
Less	1·30		
	63·60		

Tons (net).	Assay.	Amount paid for.	Rate.	Amount.
			£ s. d.	£ s. d.
184·1473	At 63·60%	117·1231 tons copper	At 69 8 9	8,132 14 8
184·1473	„ ·59	108·4776ozs. gold	„ 4 2 0	444 15 2
184·1473	„ 4·44	818·350ozs. silver	„ 0 2 3⅛	92 9 10
		Total value		8,669 19 8
		Credited through difference in method of computation ...		0 0 8
		Credited for empty ore bags sold		13 17 6
		Gross total value		8,683 17 10

Charges—Per ton of fine copper sold, 117·1231 tons :—

	Per ton of copper.	Total.	
	£ s. d.	£ s. d.	
Freight and shipping expenses	2 13 0·4	310 10 11	
Insurance	0 3 1·0	18 1 6	
Commission	0 6 6·8	38 8 10	
Sampling and assaying	0 3 2·4	18 15 0	
Interest	0 12 1·9	71 4 5	
Telegrams	0 0 9·2	4 9 7	
Returning charges	8 10 0·0	995 10 11	
			1,457 1 2
Total	12 8 9·7	...	...
Net return	...	...	7,226 16 8

Taking all the shipments of which full returns are to hand we get:—

Gross weight of matte shipped	481·5179 tons
Net weight of matte sold	470·7152 „
Tare moisture and loss in transit	10·8027 „

Equals 2·24% of gross weight shipped.

The loss is made up of—

Weight of bags	7·7460 tons	equals 1·60% of gross weight.
Moisture	·3638 tons	equals 0·08% of gross weight.
Loss in transit	2·6929 tons	equals 0·56% of gross weight.
	10·8027	2·24%

The actual net weight of the matte sent from the works was 472·8844 tons, so the loss in transit, 2·1692 tons, is 0·459 per cent. of the net dry product of the smelter.

The average price obtained for best selected copper was ...	...	£70 11 8·65	per ton.
Do. Do. for gold		4 1 7·75	per oz.
Do. Do. for silver		0 2 2·8	per oz.

The copper sold was 305·7542 tons, of gross value £21,581 19s. 7d. This is a return of 64·95 per cent. of copper per ton of matte, equal to an average assay value of 66·25 per cent. of copper. The gold sold was 239·292 ounces, of value £976 17s. 2d., equal to a return of 0·51 ounces per ton of matte. The silver sold was 2014·439 ounces, of value £224 19s. 10d., equal to 4·3 ounces per ton of matte.

The following statement shows the total gross value and charges from Albany, in the same form as used above:—

Tons (net).	Net Assay.	Amount paid for.	Rate.	Amount.
			£ s. d.	£ s. d.
470·7152	At 64·95%	305·7542 tons copper	At 70 11 8·65	21,581 19 7
Do.	„ ·51ozs.	239·292ozs. gold	„ 4 1 7·75	976 17 2
Do.	„ 4·3ozs.	2014·439ozs. silver	„ 0 2 2·8	224 19 10
		Total value of metals		22,783 16 7
		Credited from sale of ore bags, etc.		18 5 6
		Gross return		22,802 2 1

Charges—Per net ton of fine copper sold, 305·7542 tons:—

	Per net ton of copper.	Total.	
	£ s. d.	£ s. d.	
Freight and shipping expenses	2 10 1·0	765 12 2	
Insurance	0 3 3·3	50 1 5	
Commission	0 8 0·5	122 18 10	
Weighing, sampling, and assaying ...	0 4 4·4	66 15 0	
Interest and exchange	0 8 0·8	123 7 2	
Telegrams	0 1 7·5	24 16 11	
Returning charges	9 2 9·7	2,794 13 10	
			3,948 5 4
Total	12 18 3·2	...	...
Net return	...	...	18,853 16 9

It will be seen that the realisation costs now average 2s. 7d. per ton of fine copper sold less than the figure taken in the foregoing report of 28th June, 1905 (£13 0s. 10d.), and that the price at which the copper was realised was a very little higher. These differences, however, are not sufficient to materially affect the conclusions drawn from the earlier figures, which are still substantially correct as regards the price payable locally per unit of copper, and the economies possible under improved conditions of working.

A. MONTGOMERY,
State Mining Engineer.

6th September, 1905.

State Smelting Works.

PHILLIPS RIVER GOLDFIELD.

To 30th June, 1905.

Ore Purchased and Smelted.

	Net Weight.	Metal Contents.			Paid for		
		Copper.	Gold.	Silver.	Copper.	Gold.	Silver.
	tons.	tons.	ozs.	ozs.	tons.	ozs.	ozs.
Smelted	4,731·4930	789·6073	972·8712	4,954·959	648·2317	547·0774	206·6338
On hand...	1,376·5162	234·1790	405·0267	3,508·123	192·9768	213·8693	1,343·500
Total	6,108·0092	1,023·7863	1,377·8979	8,463·082	841·2085	760·9467	1,550·1338
Furnace Products Matte	905·393	593·9076	585·8223	3,651·011	...	...	..
Black Copper	36·580	33·6170	305·8088	345·681	...	...	...
Total	941·973	627·5876	891·6311	3,996·692	...	...	...
Extraction	...	79·48°/₀	91·65°/₀	80·66°/₀	96·82°/₀	162·98°/₀	1934·2°/₀

Profit and Loss Account (pro forma).

To 30th June, 1905.

Dr. Cr.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Purchase of ore	26,733 0 3		By Gross value of matte sold—		
Less ore on hand	6,509 2 0		Accounts to hand	22,802 2 1	
		20,223 18 3	Balance estimated	24,301 16 0	
„ Smelting costs	...	17,160 6 10			47,103 18 1
„ Realisation costs—			„ Sale of ore	...	115 0 4
Transport to Albany	2,596 4 3		„ Loss	...	1,912 7 6
Transport estimated outstanding	250 0 0				
		2,846 4 3			
„ Freight to Europe—Insurance, selling, and smelting charges accounts to hand	3,777 18 6				
„ Charges estimated on balance ...	3,650 1 7				
		7,428 0 1			
„ Depreciation of plant	...	1,472 16 6			
		£49,131 5 11			£49,131 5 11

Balance-sheet to 30th June, 1905.

Liabilities.	£ s. d.	£ s. d.	Assets.	£ s. d.	£ s. d.
To Colonial Treasurer	27,875 13 3		By copper matte and black copper in transit	...	10,426 8 0
„ Beart and Timms (percentage retained)	38 5 7		„ Ore on hand—		
„ Adelaide SS. Co. (percentage retained)	46 18 10		Purchase of ore	6,509 2 0	
„ Hill and Morley (percentage retained)	4 19 0		Receiving, weighing, and sampling	666 4 4	
		27,965 16 8			7,175 6 4
Less balance from Profit and Loss Account = Loss ...	...	1,912 7 6	„ Stores on hand	...	1,811 19 7
			„ Horses, vehicles, and harness ...	...	18 6 8
			„ Furniture and fittings	...	26 10 8
			„ Erection of smelter	7,875 4 5	
			Less depreciation	1,472 16 6	
					6,403 7 11
			" Accident insurance (to 30-6-06)...	...	192 0 0
		£26,053 9 2			£26,053 9 2

State Smelting Works.

PHILLIPS RIVER GOLDFIELD.

To 30th June, 1905.

Net Tons smelted, 4731·493.	Copper.		Gold.		Silver.	
	Tons.	Per ton of Ore.	Ounces.	Per ton of Ore.	Ounces.	Per ton of Ore.
Metal contents, according to assays of ore	789·6073	16·69 per cent.	972·8712	0·2 ozs.	4954·459	1·05 ozs.
Return, according to State Smelting Works assays	627·5876	13·26 „	891·6311	0·188 „	3996·692	0·85 „
Recovery of assay value	...	79·48 „	...	91·65 per cent.	...	80·66 per cent.
Metal actually sold (partly estimated)	605·75	12·80 „	794·042	0·168 oz.	4183·5	0·88 oz.
Recovery of assay value	...	76·72 „	...	81·62 per cent.	...	84·43 per cent.
Loss of metal	183·8573	23·28 „	178·8292	18·38 „	771·459 Loss.	15·57 „
Loss in smelting	162·0197	20·52 „	81·2401	8·35 „	958·267 Gain.	19·39 „ Loss.
Loss in realisation	21·8376	2·76 „	97·5891	10·03 „	186·803	3·77 „

Metal Recovered.

	Copper.			Gold.			Silver.		
	Tons.	Rate.	Value.	Ounces.	Rate.	Value.	Ounces.	Rate.	Value.
		£	£		£	£		s. d.	£
Actual returns	305·75	70 11 8·65	21,581 19 7	239·292	4 1 7·75	976 17 2	2014·439	2 2·8	224 19 10
Estimated returns—									
"Wilcannia"	113·4	71 0 0	8,051 8 0	110·6	4 2 0	453 9 2	632·0	2 3	70 19 6
"Afric" ... "Suevic" ... "Persic" ...	186·6	74 0 0	13,808 8 0	444·15	4 2 0	1,821 0 4	1537·1	2 3	172 18 5
Total	605·75	average 71 14 4	43,441 15 7	794·042	average 4 1 11	3,251 6 8	4183·5	average 2 2·9	468 17 9

The gross value of the "Wilcannia" return, which has been taken as above in order to arrive as nearly as possible at the average prices obtained for the metals, can be arrived at more closely by adding :—

	£ s. d.
Net return cabled (less payments in W.A.)	7,088 11 8
And estimated expenses	1,410 17 7
Take gross value at	£8,499 9 3

Total Value.

	£ s. d.	£ s. d.
Actual Returns—Metal	22,783 16 7	
Sale of bags	18 5 6	
		22,802 2 1
Estimated Returns—"Wilcannia"	8,499 9 3	
"Afric," "Suevic," and "Persic"	15,802 6 9	
		24,301 16 0
Total		£47,103 18 1

	Per ton of Ore (4731·493 tons).	Per ton of Copper shown by ore assays (789·6073 tons).	Per ton of Copper sold (605·75 tons).	Amount.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Costs—Purchase of ore	4 5 6	25 12 3	33 7 9	20,223 18 3
Smelting costs	3 12 6	21 14 8	28 6 7	17,160 6 10
Realisation (partly estimated) { Smelter to Albany	0 12 0	3 12 1	4 14 10	2,846 4 3
{ Albany to England	1 11 5	9 8 2	12 5 3	7,428 0 1
Depreciation of plant	0 6 3	1 17 3	2 8 7	1,472 16 6
Total	10 7 8	62 4 5	81 2 2	49,131 5 11
Less sale of ore	0 0 6	0 2 11	0 3 10	115 0 4
	10 7 2	62 1 6	80 18 4	49,016 5 7
Total value	9 19 1	59 13 1	77 15 2	47,103 18 1
Loss	0 8 1	2 8 5	3 3 2	1,912 7 6

Appendix No. IV.

On the Deposit of Oil Shale at Coolgardie.

For several years past it has been known that there exists at Coolgardie a deposit of carbonaceous shale of considerable thickness, and experiments have been made from time to time on this to determine its suitability for fuel purposes. The large amount of non-combustible matter contained in it, however, makes it quite unsuitable for burning in any ordinary grate, and as a coal it must be regarded as quite valueless. More lately it has been tried by retorting it for oil, with the result that a yield of about 30 gallons of crude oil per ton is stated to have been obtained from it. The oil has a fair illuminating power, and seems likely to be of some value. The yield is too low to give very much hope of the deposit being worked profitably, but until the oil has been refined and the products obtainable from it examined by skilled authorities, it is too soon to pronounce positively one way or the other.

The deposit occurs in the curious patch of "deep ground," probably of Tertiary Age or even older, near Colreavy's Dam on Reserve 3142, of which a plan and sections are given in the Annual Report of the Geological Survey for 1900. In the prospecting shaft the shale is stated to have been struck at 40 feet, and to have continued to the bottom at 110 feet. The bores on the Geological Survey section show that there is no very regular bed of the material, the deposit apparently changing laterally into less carbonaceous sedimentary strata; but it is very evident that, with the thickness exposed in the shaft, a very large tonnage of shale is obtainable in a small area.

The shale is of a dark grey to brown colour, sectile, with waxy appearance on the cut surface, and breaking with conchoidal fracture. On exposure to the weather it rapidly crumbles, losing water in doing so. It does not take fire rapidly unless subjected to considerable heat, when it burns with a smoky flame.

The following analyses have been made of the shale:—

—	No.	Moisture.	Volatile Hydro-carbon.	Fixed Carbon.	Ash.	Total.
		%	%	%	%	%
Geological Survey Laboratory	529	30·56	23·62	9·45	36·37	100·00
Do. do.	624	41·73	19·35	7·84	31·08	100·00
Do. do.	700	24·24	29·81	5·51	40·44	100·00
Do. do.	3,984	16·81	33·12	10·32	39·75	100·00
Do. do.	4,086	18·32	23·65	10·57	47·46	100·00
Do. do.	4,117	14·86	26·65	10·95	47·54	100·00
Western Australian School of Mines	...	9·50	30·80	10·10	49·60	100·00
Dr. Boverton Redwood, London	...	19·50	22·00	15·30	43·20	100·00
Average	...	21·94	26·13	10·00	41·93	100·00

In order to obtain authoritative advice as to the value of this mineral and the best method of proceeding to have it thoroughly tested, a small parcel was sent to the Agent General, who put it in the hands of Dr. Boverton Redwood, one of the foremost authorities on oils of the present day, for preliminary examination and advice as to commercial testing. According to his report, the sample consisted of fragments of moderate size, with a quantity of approximately similar material in a more or less fine state of division.

"Portions taken from the three larger fragments yielded the following results:—

Moisture.	Other volatile matters.
A.—20·5 per cent. ...	... 21·0 per cent.
B.—22·4 „ ...	... 21·7 „
C.—23·9 „ ...	... 21·4 „

"The pulverulent material gave the following results:—

Moisture.	Other volatile matters.
19·2 per cent.	... 26·7 per cent.

"An average sample of the whole furnished the following results:—

Moisture	19·5 per cent.
Other volatile matters	22·0 „
Fixed Carbon	15·3 „
Ash	43·2 „
	100·0 per cent.

"These results are not very promising, the proportion of moisture being very high, and that of other volatile matters (represented in practical working by oil) somewhat low. It is evident that the larger fragments are fairly uniform in respect of yield of oil, whilst the pulverulent portion is considerably richer.

"The best, if not the only, way of obtaining a thorough practical test of the shale would be to have about 50 tons of the material distilled at one of the Scottish oil-works, as it would be difficult otherwise to determine the yield of ammonia in addition to that of oil, to obtain data for a decision as to the form of retort best adapted to the particular character of the shale, to ascertain the percentage and quality of the various commercial products, including solid paraffin, yielded by the crude oil, and generally to form an opinion as to the commercial value of the shale and practibility of working it profitably. I could probably arrange for this, having already had to supervise such tests.

"The expense in this country of the test in question would, I think, judging from previous experience, not exceed £100, and might be considerably less if one of the Scottish oil companies would accept the crude oil and products in part payment for out-of-pocket expenses, as has been done when the company's routine work happens not to be seriously interfered with by the experiments.

"Before, however, this is done, a further laboratory examination of a considerable number of carefully taken separate samples should, in my opinion, be made, with the object of obtaining information for guidance in mining the large sample for the practical test.

"If the pulverulent portion of the sample sent me represents a comparatively friable seam of shale which can be mined separately from the portion represented by the larger fragments, it is evident that this should be the material to be practically tested. It is also important to ascertain whether the shale cannot be obtained with far less moisture, as the quality of oil obtainable per ton of shale distilled would obviously be increased proportionately to the reduction in the percentage of moisture in the material."

The syndicate interested in the deposit subsequently entered into negotiations with persons engaged in the shale-distillation industry in Scotland to have a parcel of 50 tons treated, and the Minister for Mines agreed to pay one-half the cost of carrying it on the railway from Coolgardie to Fremantle. Arrangements were also entered into to have a retort made so that distillation trials might be carried out locally, but up to the time of writing nothing further has been made known to this department as to the results of any trials made.

Appendix No. V.

Trial of Rotary Puddling and Sluicing Machine at Kalgoorlie.

A somewhat improved form of Marshall's Puddler, described in my last year's Annual Report, was tried for a short time in Kalgoorlie during 1904, and Mr. F. B. Allen, M.A., B.Sc., Director of the School of Mines of Western Australia, has supplied the following description of the work done:—

"The company's property on which the puddler is erected is situated on the old Hannans Consols ground, between the Reward mine and Williamstown. The 35 acres held include the alluvial at the base and up the eastern and south-eastern slopes of the hill. The material proposed to be worked consists of about five feet in depth of more or less loose alluvial, with some four feet of underlying compacted 'cement,' and has been turned over by dryblowers, who have, however, left blocks of solid ground. It is estimated that some hundreds of thousands of tons of material will be available for treatment, and the locality has a good reputation. The gold won by the dryblowers has been generally fine, with occasional slugs, while much of the gold left in the alluvial is very fine, and after sluicing is found mixed with considerable quantities of black sand. No exact figures are available as to the quantity of gold obtained from the surface in the early days, but dish prospects of the alluvial at the present time are said to be consistent, and are taken to indicate an average of 1dwt. of gold per ton, while the underlying cement, which will require additional labour in treatment, is estimated at a higher value, and crushings of small parcels from it some years ago are reported to have yielded 3dwts. to 4dwts. per ton.

"The machine built by Forwood, Down & Co., in Adelaide, is a modification of the puddler designed and erected by Mr. George Marshall, in Coolgardie, which was worked during part of 1903 with good results so far as the machine itself was concerned. The present model is a great improvement on the old one, and full advantage has been taken of the experience gained during the run of the Coolgardie machine.

"The diameter of the inside drum has been increased six inches, with a corresponding increase in the length of the beaters. The heavy wooden frame which carried the drum has been replaced by a special steam frame attached to the casing, giving free access to all parts round about the machine. Additional grids have been placed in the bottom of the puddler. The top of the casing is made removable. The bottom of the elevator has been made easily accessible. A new arrangement for the easy disposal of the coarse stones has been fixed in the sluice boxes, and in many ways important and valued improvements have been made which will tend towards more economical working.

"As the work proceeds the existing 18-inch gauge metal tramway will be extended to provide several working faces. The alluvial will be hauled in one-ton iron trucks by an electric hoist, and the material dumped into a 16 feet by 8 feet hopper, partly covered by a sloping grizzly made of half-inch bars with 4-inch centres. The hopper is 3 feet 6 inches deep in front, and has a one to one slope at the back and ends towards the discharge door at the bottom, through which the material, by occasional barring down, will run into elevator buckets, by which it will be raised to the feed opening at the top of the puddler at the rate of 25 to 30 tons per hour.

"The elevator consists of a 9-inch rubber belt running at about 120 feet per minute over flanged 18-inch drums at the top and bottom 26 feet apart, and has rivetted to it 49 steel buckets 8 inches wide, 6 inches broad, 5 inches deep with sloping sides and curved bottom at $13\frac{1}{2}$ inches apart, centre to centre along the belt. The whole elevator is enclosed in a wooden casing 10 inches wide, giving $\frac{1}{2}$ inch clearance for the belt on each side, and when the buckets are running, say, two-thirds full, the elevator will deliver 25 to 30 tons per hour to the puddler. The puddler consists of two main parts, viz., a drum revolving in a steel casing close to a false bottom of steel liners, and is a neat compact machine weighing altogether $13\frac{1}{2}$ tons. The revolving drum is 6 feet 6 inches in diameter with a 17 inch face. It weighs 32cwt. and carries 24 beaters $1\frac{1}{4}$ inches x $\frac{7}{8}$ inch secured to the drum by a 1 inch bolt and projecting 15 inches radially from the circumference. The beaters are made of 45lb. steel rails and are placed alternately in such a way that the larger stones left unbroken by the machine can find a zig-zag passage between the beaters until they are thrown out from the discharge opening.

"The drum beaters revolve on a horizontal shaft five and a-half inches in diameter carried by the casing which forms the main frame of the machine, and they have a clearance of half an inch from the sides and false bottom of the watertight trough in which the material is disintegrated. The lower portion of the casing is 10 feet 4 inches x 6 feet deep, made of $\frac{3}{8}$ inch steel plates secured to stout angle iron and is protected on the inside with $\frac{1}{8}$ inch cast steel liners. The false bottom, formed of $1\frac{1}{4}$ inches hematite liners extending from the feed opening at the top of the trough right round to the discharge door, is fixed about 6 inches above the bottom of the trough and contains one main grid at its lowest point formed of straight cast steel bars $\frac{1}{2}$ inch thick with $\frac{3}{4}$ inch spaces and two finer zig-zag grids between this point and the discharge opening, the bars of the middle grid being $\frac{5}{16}$ inch and those of the last one $\frac{1}{8}$ inch apart.

"Each grid is kept clear by an upward jet of water from an inch pipe, and gold and black sand passing through collect on the floor of the trough under the false bottom. At the lowest point of the trough where this space is a foot high, a door covers a 7in. x 5in. opening, which allows of the easy

removal of rich concentrates, while there are two mud holes 9in. x 3in., one under the discharge opening at the front and the other at the same level at the back, which allow the space under the bottom liners to be inspected and kept clear. A larger man-hole, two feet by one, fastened by a door provided with an inside steel liner, is situated just above the false bottom, in one side of the casing, to allow of easy access to the under side of the revolving drum and enables any obstruction to be removed from the beaters. The top portion of the casing is of $\frac{5}{16}$in. steel plates forming a removable cover for the drum, while to prevent gravel, which may be carried up by the beaters, from working down between the drum and the inside liners, shields $2\frac{1}{2}$in wide are fixed to the casing on each side just above the upper circumference of the drum. The height that the material in the trough has to be lifted by the beaters before escaping at the discharge opening is 24 inches, and this opening is covered by a swinging baffle plate $1\frac{1}{8}$in. thick and 20in. x 28in., which tends to return unbroken material to the machine and prevents excessive splash outside.

"The working of the puddler is as follows:—The wash dirt is hauled from the workings in one-ton trucks by the electric hoist and dumped over the grizzly into the hopper which feeds the elevator. The material is lifted at the rate of 25 to 30 tons per hour and dropped into the feed opening of the puddler, straight on to the beaters of the revolving drum along with the return water from the dam which is led in by a 3in. pipe. There are also two 2in. feed water pipes supplying water from the Government main to make up the loss in working. One of these delivers near the feed opening, but most of the extra water is supplied near the discharge to keep the machine at that end running free. It is estimated that 25 tons of alluvial will require 5,000 gallons of water per hour and that 80 per cent. will be returned.

The material fed into the puddler is broken up by the combined action of the water and the beaters which making 45 to 50 revolutions per minute with only half an inch clearance from the liners, effectively disintegrate the wash dirt and lift it up against the baffle plate at the discharge opening.

A portion of the black sand and a large proportion of the gold fall through the grids in the bottom liners and collect under the false bottom, the ascending jets of water preventing any excessive accumulation of other and worthless material. The bulk of the disintegrated material is driven through the discharge opening into sluice boxes, the first 14 feet of which are 20 inches wide, 15 inches deep, with double ripples of perforated plates and three venetian ripples which catch a further quantity of black sand and fine gold. At the bottom of this run is an adjustable grid with $\frac{3}{4}$in. openings, set at an angle of 45 degrees which allows water and fine material to pass on to the next stretch of 24 feet of cocoanut matting but separates out the coarse stones, which fall down below the sluice boxes and can be easily removed. The sluice boxes are set at an inclination of two inches to the foot, but this is adjustable and at the end is a small under current leading on to 12ft. by 3ft. 10in. table covered with baize in two divisions designed to catch any escaping fine gold.

The black sands and their gold contents are worked up in a small 2ft. 6in. Wheeler pan with mercury. The water escaping from the tailings dump flows to the dam 200 yards away, which is capable of holding $1\frac{1}{2}$ million gallons and from there it is pumped back to the puddler through a 3in. pipe by a 4in. centrifugal pump run at 900 revolutions per minute.

The pump works against a head of 23 feet when delivering to the machine, and 27 feet when supplying water to the 5,000 gallon tank, which is placed at an elevation on the floor side of the ore bin as a reserve in case the regular water supply should temporarily fail.

There are two power-houses, one placed on a level with the top of the ore bin and containing a nine h.p. electric motor for working the hoist hauling the trucks of alluvial up to the hopper, a height of 15 to 20 feet, the other on the flat near the end of the sluice boxes. This latter contains a $13\frac{1}{2}$ h.p. motor, which runs at 750 revolutions per minute, and works by means of a 6-inch cross-canvas belt, an intermediate shaft 30 feet away. A 70-inch pulley on one end of the drum shaft of the puddler is driven at from 45 to 50 revolutions per minute by a 9-inch belt off this intermediate, and at the other end of the drum shaft an 18-inch pulley works, by means of a 3-inch canvas belt, the fast and loose pullies of the elevator. These are 36 inch in diameter. The Wheeler pan and the pump are both run off the intermediate shaft by belting. It is estimated that six and a-half h.p. will suffice for the puddler and another five h.p. for the elevator, pan, and pump.

As regards cost of working, figures will not be obtainable until a run of some weeks has been made, and the quantity of water first lost has been measured; but judging by the results obtained by the less efficient machine of the same type at Coolgardie, the costs should be finally placed under 2s. per ton, and it is confidently hoped that they may be reduced to 1s. 9d. or even less. A small $\frac{3}{4}$in. meter is provided on the Government supply pipes and will give the figures for water required to make good the working loss, and it only requires another and larger meter on the return water pipes to enable the total water used to be accurately determined.

The trial run held on Monday, June 27, by Mr. Kyle, under whose direction the puddler has been erected, naturally afforded but little information as to working costs, quantity of water required, or the actual value of the alluvial on the property. Right through the test there appeared to be a deficiency of water for the quantity of material passing through the machine, and I understand that a 2in. meter is to be at once substituted for the $\frac{3}{4}$in. one now on the ground, but I consider that the puddler is essentially one that will effectively treat a large quantity of material with a small consumption of water at a comparatively small cost. There are, however, various details inseparable from a first trial which will require attention. Evidently the elevator casing could with advantage be made wider or be entirely removed, a launder under the trap-door of the puddler would facilitate the clean up, attention should be directed to keeping the space under the false bottoms from becoming packed with unconcentrated alluvial; and the sluice boxes could be kept clear of rough stones by increasing the water supply, lowering the false bottoms, or narrowing the boxes.

It was noticeable that a certain amount of material discharged from the puddler was not completely disintegrated. This is a matter which requires a protracted run to afford the information necessary for proper adjustment, for whereas the puddler can easily be made to discharge anything up to 30 tons or over per hour, it is necessary by experiment to determine the quantity which should be fed to the machine, so that every portion may remain long enough in contact with the beaters to be effectively puddled. The quantity of water and the number of beaters have an important bearing on this question for each particular speed of the puddler.

Altogether the test was considered to satisfactorily demonstrate the value and efficiency of the puddler, and all are sanguine as to its success as soon as the initial difficulties are surmounted.

Western Australia contains large areas of alluvial which have been partly worked by the primitive methods of the dry-blower, and if the present machine comes up to what may be reasonably expected of it, working as it does a large tonnage with a small consumption of water, many of these dry-blown patches will be made to yield up a further quantity of gold.

Report of the Board of Examiners for Colliery Managers' and Under Managers' Certificates under the Coal Mines Regulation Act, 1902.

The Secretary for Mines, Perth.

Department of Mines,
Perth, 11th August, 1905.

SIR,

I have the honour to forward to you, for the information of the Honourable the Minister for Mines, the following Report of the above Board for the year 1904.

The Board held two (2) meetings during the year, the first on April 29th and 30th and the second on 18th October, 1904. A written and oral examination was held at Collie on 7th, 8th, and 9th April, at which two candidates attended, one of whom, Mr. Rees Bevan, succeeded in passing, and was granted a First-Class Certificate of Competency. The other candidate failed to obtain the requisite percentage of marks for a pass. Another examination was arranged for the 6th, 7th, and 8th October, but was not held, as no candidates for examination presented themselves. The examination papers set at the April Examination are appended to this report.

Three applications for First-Class Certificates of Competency without examination were dealt with during the year, the applicants forwarding certificates obtained by them in other countries. The applications of Messrs. C. E. White and A. McDonald, who forwarded First-Class Certificates of Competency under the Coal Mines Regulation Act of Great Britain, were held over pending receipt of evidence required by Section 21 (4) (*b*) of "The Coal Mines Regulation Act, 1902," that the holders were still entitled to practice as colliery managers in the country wherein they obtained their certificates. The third application did not disclose proof of colliery experience, and was adjourned for production of further evidence.

I have, etc.,

A. MONTGOMERY, M.A., F.G.S.
State Mining Engineer, Chairman of the Board.

THE COAL MINES REGULATION ACT, 1902.

EXAMINATION FOR FIRST-CLASS CERTIFICATES OF COMPETENCY.

SUBJECT—ARITHMETIC.

Thursday, 7th April, 1904.
9·30 to 10·30.

Possible Marks.		
20	...	1. At a colliery where the output of coal is 6,114 tons of large coal, and 1,123 tons of small coal per week, what is the percentage of small to the total quantity and proportion of small to large?
20	...	2. What is the square root of the following numbers:—24336, ·3, and ·000256?
30	...	3. What is the cube root of the following numbers:—1295029 and ·73?
20	...	4. Simplify $\frac{3}{4} \times \frac{8}{7} \div \frac{4}{5}$ and $\frac{4}{5}$ of $\frac{7}{12} \div \frac{6}{7}$ of $\frac{14}{15}$.
20	..	5. Subtract 5161·4568 from 6124·32, and add together 14·632, 347·5631, 18,763·14, ·6218 and ·013568.
15	...	6. Multiply ·00426 by 4·124 and divide 83·6 by ·346.
15	...	7. Convert ·5282, ·023, and ·134 to vulgar fractions, and $\frac{9}{10}$, $\frac{1}{25}$, and $\frac{19}{20}$ to decimals.
15	...	8. If 2,533 tons 10 cwts. of coal cost £430 12s. 3½d. to get, what is the cost per ton in pence and decimals?
25	...	9. If the hewing price of a seam of coal is 2s. 1½d. per ton, and this price is 35 per cent. above the standard, how much would the hewing rate be increased by an advance of 7½ per cent. on the standard?
20	...	10. How many cubic feet of water are there in a sinking bucket when quite full; the bucket is 6ft. deep, 3½ft. in diameter at the top, and 3¼ft. at the bottom?
200		

Subject—SURVEYING.

Thursday, 7th April.

10·30 to 12·30.

Possible Marks.		
50	...	1. Describe the transit theodolite and show how it would be used in carrying out an underground survey.
40	...	2. Explain how to level and plot a section.
20	...	3. Find the quantity of coal per acre in a seam 6ft. 8ins. thick, taking the specific gravity at 1·25.
50	...	4. A, B, and C are three bore-holes piercing the same bed of coal at depths respectively 390, 900, and 474 feet. The height of A above a common datum is 150 feet, of B 180 feet, and C 114 feet. From A to B is 2,400 yards, A to C is 880 yards, and B to C is 2,300 yards. At what depth would a main shaft (X), put down within the triangle formed by the three bore-holes, intersect the seam; AX being 1,953 yards, BX 450 yards, and the height of X 423 feet above the datum?
40	...	5. How would you embody the information required by Section 38 of the Coal Mines Regulation Act upon a colliery plan, and what method would you adopt for the preservation of plan?
200		

Subject—GEOLOGY.

Thursday, 7th April, 1904.

1·30 to 3·30.

Possible Marks.		
15	...	1. How is sand converted into a useful building stone? Define the terms shale, slate, limestone, unconformity, and washout.
15	...	2. Distinguish between normal and reversed faults, and show by means of a sketch the effect of each upon the outcrop of a coal seam.
20	...	3. Describe the structure, composition, and mode of occurrence of (*a*) Granite and (*b*) Basalt.
15	...	4. How would you determine the full dip of a coal seam from observations upon its apparent dip?
15	...	5. Describe briefly the characters of the different classes of coal.
20	...	6. Give a succinct account of the salient geographical features of any coal field with which you may be acquainted. Illustrate your answer by a geological section of the field.
100		

Subject—COAL MINES REGULATION ACT.

Thursday, 7th April, 1904.

3·30 to 4·30 p.m.

What does the Act require regarding—

Possible Marks.		
20	...	1. Plan of workings of Mine.
20	...	2. Duties and responsibilities of Managers.
10	...	3. Plan of abandoned seam or mine.
20	...	4. Making known the provisions of the Act and Special Rules.
10	...	5. Who shall not be employed in mines.
20	...	6. Payment by weight.
100		

Subject—MACHINERY.

Friday, 8th April, 1904.

9·30 to 12·30.

Possible Marks		
40	...	1. A double-acting pump, with ram 7 inches diameter and 2 feet stroke, is required to pump up a shaft 180 yards in depth with a steam pressure of 45lbs. to the square inch. What diameter must the steam cylinder be, allowing one-fifth added to diameter for friction, and what quantity of water would be pumped at 40 strokes per minute, deducting 10 per cent. for slip?
20	...	2. Explain why there is a tendency to freeze in cylinders of engines worked by compressed air.
50	...	3. A winding engine, with drum 20 feet diameter and two cylinders each 30 inches diameter and 5 feet stroke, has during a winding an average effective pressure of 50lbs. per square inch. The average speed is 40 revolutions per minute. What is the horsepower, the average speed of the cage, and speed of piston in feet per minute?
20	...	4. What is meant by factor of safety? What factor of safety would you allow in colliery winding ropes? Give reasons.
20	...	5. Which colliery winding rope is most likely to have the longest life, the one passing over or the one passing under the drum, and why?
30	...	6. Name the principal parts of a continuous current dynamo, and enumerate the various purposes to which electricity may with advantage be applied for colliery work?
20	...	7. What are the arguments in favour of frequent renewal of winding rope cappings?
40	...	8. Water has risen 36 fathoms up a circular shaft 14 feet diameter, the feeder is equal to 250 gallons per minute. How long will a 16-inch set with 8 foot stroke going 6 strokes per minute be in pumping out the water?
40	...	9. How many 3-inch pipes are required to run off as much water as one 12-inch pipe, all being of equal length?
20	...	10. Explain how you would get the guide ropes into position in a shaft 500 yards deep.
300		

Subject—MINING OF COAL.

Friday, 8th April, 1904.

1·30 to 4·30.

Possible Marks.		
20	...	1. Describe the Diamond Drill method of boring for coal.
20	...	2. How is metal tubing affected in a furnace shaft?
15	...	3. Describe a bricking curb and method of fixing same.
20	...	4. Why is a circular shaft adopted in most modern collieries in preference to the square, oblong, or other shape?
15	...	5. Describe a type of coal-cutting machine with which you are acquainted.
40	...	6. Suppose you were the Manager of a mine and were informed a serious explosion had occurred, what would you do? State fully.
15	...	7. What is the pressure per square inch due to a column of water 20 fathoms in height?
25	...	8. Describe the working of a cut chain incline.
15	...	9. Describe a good type of safety lamp.
30	...	10. Describe and illustrate the workings of a seam of which you have intimate knowledge.
30	...	11. What must be the gradient of a horse road when the loaded set consists of 10 trucks of 20 cwts. each and the empty set 10 trucks of 6 cwts. each (friction 1/40) so that the resistance may be the same both ways?
20	...	12. Give sketches with dimensions showing how you would construct an air crossing to pass 60,000 cubic feet of air per minute.
15	...	13. How would you arrange the guards on a self-acting incline?
20	...	14. Explain in detail how you would guard against a coal dust explosion.
300		

SUBJECT—VENTILATION AND DANGEROUS GASES.

Saturday, 9th April, 1904.

9·30 to 12·30.

Possible Marks.		
50	...	1. A ventilating fan, working at 80 revolutions per minute, produces an air current of 130,000 cubic feet of air per minute, with a water gauge of 2·5 inches; what is the horse-power of ventilation? If it were necessary to increase the quantity of air to 200,000 cubic feet, what fan-speed would be required? What would be the water gauge?
30	...	2. Give a description of the various gases generally met with in coal mines, their properties, and effects.
40	...	3. Two air-ways, A and B, are of the following dimensions:—A 2,000 yards long, 5 feet high, and 10 feet wide; B 3,000 yards long, 5 feet high, and 6 feet wide. If 50,000 cubic feet of air per minute are split into these two airways, what quantity would pass through each?
20	...	4. State the benefits derived from splitting the air, where should the splits begin, and where should they join again to obtain the greatest advantage?
30	...	5. The velocity of an air current is reduced from 600 to 300 feet per minute. How much could the length of the air current be increased so that the water gauge might remain the same?
30	...	6. Supposing 9,000 cubic feet per minute circulate through a regulator 30 inches x 20 inches, how much air will circulate if made 30 inches x 30 inches?
40	...	7. A small fan and a large fan, both acting together on a mine, produce 100,000 cubic feet of air per minute; when the large fan is stopped, the small fan gives 20,000 feet. What quantity would the large fan above give? Give reasons for your answer.
20	...	8. What shapes of air-ways are the best, and why?
20	...	9. What do you understand by "ascensional" and "descensional" ventilation? What do you prefer? Give reasons.
20	...	10. How would you increase the volume of air in a mine or part thereof without increasing the power? State fully.
300		

Report of the Advisory Board of the School of Mines of Western Australia.

To the Secretary for Mines, Perth.

Department of Mines,
Perth, 31st August, 1905.

SIR,

I have the honour to report that the Advisory Board of the School of Mines of Western Australia held two meetings during 1904, both at Kalgoorlie, at which numerous matters relating to the regulations and working of the school were discussed, and recommendations thereon forwarded to the Minister for Mines.

I have, etc.,
A. MONTGOMERY, M.A., F.G.S.,
State Mining Engineer, Chairman of the Board.

DIVISION III.

Report by the Superintendent of State Batteries for the Year 1904.

To the Secretary for Mines, Perth.

SIR,

I have the honour to submit my annual report for the past year, for the information of the Hon. the Minister for Mines, being the seventh bearing on the progress of State batteries.

As stated in my last annual report, a number of batteries were nearing completion at the close of the last year, and I am now in a position to give particulars of the progress made.

The Menzies 10-head battery and cyanide plant, then reported as nearing completion, started crushing in January.

The Wiluna battery started operations in February, while the cyanide plant in connection with the Leonora battery was also in work during the same month.

The slimes plant at Mulline had trial runs in April, in which month also the Black Range battery started to crush.

The Boogardie cyanide plant was first cleaned up in May.

The Coolgardie 10-head plant, the manufacture of which was entrusted to local people, was erected and started to crush in June, while the cyanide plant erected at the same time was first cleaned up in September.

The above constitutes the work arranged for or in progress at the close of last year.

Since then, a cyanide plant was arranged for at the Niagara battery, and the treatment of tailings commenced in June.

At the Burtville battery a cyanide plant was also erected, the first clean up being effected in November.

A second-hand battery was purchased at Pig Well, in October, and, after certain overhauls were undertaken, started crushing in November.

The work of erecting a new 10-head battery and cyanide plant is being proceeded with at Duketon.

Three second-hand plants were purchased—one for Yarrie, one for Randalls, and one for the North-West. All three had to be dismantled, and their re-erection is in hand. Cyanide plants are being added to each.

A cyanide plant for Black Range battery is in course of erection, and it is intended to increase the number of stamps at this battery from 5 to 11.

PARTICULARS OF PLANTS PLACED AT THE VARIOUS DISTRICTS ABOVE NAMED.

Menzies.—Ten-head battery by Thompson & Co., two Cornish boilers by Thompson & Co., compound engine by Robey, cyanide plant complete (vats of galvanised iron) and all necessary requisites. All the machinery and plant were new, except the engine, which was in good order and well adapted for the work. The battery, since starting operations, has treated 5,067 tons for 4,717ozs., and the cyanide plant has dealt with 3,440 tons valued at £2,791.

Wiluna.—When the battery was first arranged for the prevailing opinion was that the department would not be justified in going to any more expense than would give the field a fair trial. With this object in view, the plant provided consisted of a 10-head battery, portable boiler and engine. The engine has been found sufficiently powerful for all requirements, but it was not provided with boiler power under the local conditions, viz., inferior fuel and water. To overcome this difficulty, an additional vertical boiler was provided, and matters would have doubtless proceeded under those conditions, but the first-named boiler gave a lot of trouble through tubes leaking, and its use was discontinued and the Cornish boiler substituted, since which time crushing has proceeded as stone was forthcoming; 3,410 tons for 2,232ozs. have been treated to the end of the year. The sands at this battery are being treated by a private individual, at the express wish of the prospectors. It was apparent that for a considerable time after starting the plant the department would not be justified in erecting a cyanide plant, and as the prospectors were desirous of securing an early return from their sands they recommended that Mr. Urquhart (who had previously treated a small dump of sands at the Tuckanarra State battery after it had ceased to be run by the department) be granted the right to erect a plant on the battery lease under an agreement with the department to treat their tailings at Government rates. The department agreed to accede to their request, and the plant was erected and started in September, the department reserving the right to purchase at a valuation or order removal at three months' notice.

Leonora.—The cyanide plant, which consists of vats of galvanised iron, is complete with all assay apparatus and chemicals. Since operations commenced, 4,751 tons have been cyanided for a return of £4,162.

Mulline.—The slimes plant consists of one Dehne filter press, three and a-half ton capacity; two agitating vats, 16 feet diameter, seven feet deep, made of steel plate; one vortex mixer, one three-throw pump, necessary pumps for delivery of slimes and solution, tramway, trucks, hoisting gear, sumps, driving-engine, with all necessary shafting, pulleys, and belting. The whole plant is compact and simple in design. On initiatory work being started, everything was found to work smoothly, except the filter pressing. Here it was found that a well-pressed cake could not be obtained from the filter press, which was fitted up with three-inch frames. Several experiments were made to ascertain whether the slime heap could not be worked to allow of a mixed sample of slime being operated upon, but to no effect. It was then decided to put two-inch frames into the filter press instead of three-inch. This change had the desired effect. Owing to one of the boilers on the battery failing to warrant the required pressure being granted it to work conjointly with the boiler alongside, a new one had to be provided, and this delayed the starting of the slimes plant, as the portable boiler removed from Paddington puddler intended to run the plant was condemned on inspection by the boiler inspector. The plant is now running successfully, being supplied with steam from the main boilers to portable engine. Owing to the several drawbacks, only 691 tons were treated at the close of the year.

Black Range.—This battery was originally erected at Yalgoo, and afterwards at Paynesville, and crushed since starting to the close of the year 3,558 tons for 4,765ozs. The plant consists of one Cornish boiler, stationary engine, five single-stamp boxes, rock breaker, Berdan pans, and general accessories. The district seems to warrant an increase of plant, and it is proposed to proceed early in the new year with this work.

Boogardie.—The cyanide plant consists of three settlers and three leaching vats, with necessary sumps, galvanised iron, set up on wooden frame, and is fed direct by tailings wheel from the battery. The plant is well equipped with all necessary apparatus. Since starting 2,256 tons have been treated for a return of £2,057. The extractions at this plant have been at times somewhat disappointing, owing to the nature of several parcels of ore received for treatment producing a heavy, close-lying sand and slimes which make percolation difficult. The sands being treated almost simultaneously with their being collected affords practically no time for draining, and parcels of dense material have not produced as high an extraction as would probably have been realised under more favourable circumstances. Any change of system would, however, prevent the sands being treated without necessitating an extra handling and consequent expense.

Coolgardie.—The plant consists of a new 10-head battery and all accessories, manufactured by a Perth firm, Messrs. J. & E. Ledger; two Cornish boilers by Cowley & Co., of Ballarat; compound condensing engine, by Thompson & Co. (second-hand); two Phœnix weir concentrators; Berdan pan; cyanide plant complete, with four leachers; six settlers, sumps, etc.; tailings wheel for delivery of sands to settling vats. The battery is very complete, and is supplied by water from the Coolgardie Water Scheme. Since starting, the plant crushed to the close of the year 4,111 tons for 3,856ozs., while the cyanide plant treated 949 tons for £1,060.

Additional Plant provided during the Year.

Niagara.—An opportunity presented itself to acquire a cyanide plant consisting of steel vats and many accessories, at a price considerably below the cost of new material, even if the vats were made of galvanised iron instead of steel. The purchase being effected, action was taken to remove it from the Britannia mine, some few miles away, and erect it on the battery site, where previously an arrangement existed, with the consent of the prospectors, that a private firm would treat the tailings on certain conditions. The plant was sufficiently advanced to allow of the treatment of sands in June. Between the interval of the department deciding to erect a cyanide plant and its starting, the prospectors' tailings were sampled, and are being paid for on the basis of extraction as proved by actual operations. Up to the close of the year, 4,412 tons had been treated for £2,998. Intermixed with the accumulated tailings were those collected from crushings in the meantime. After the accumulated heap has disappeared, it is contemplated to make the plant more complete by erecting another of the purchased vats over the present leaching vats, and then utilise the tailings wheel for the delivery of sands.

Burtville.—The cyanide plant consists of six settling vats, three leaching vats, necessary sumps for solutions, and extractor boxes, all of galvanised iron; solution pump, and all necessary adjuncts; complete assay and smelting outfit, together with all apparatus and chemicals. From time of starting to close of the year, 515 tons had been treated for a value of £905.

Pig Well.—A decision having been arrived at to grant a battery to the locality known as Pig Well, in the Mt. Malcolm district, two parties offered their plant to the department, viz., the Harriston Mine Company and W. A. Snell, who offered the Ironstone battery, eight miles distant. An inspection was made of these properties, and it was eventually agreed to purchase the Harriston mine plant, with full water rights, for £1,500. The plant consisted of one large Lancashire boiler, 10 head of stamps, two vertical boilers, stationary engine, shaft pumps, and sundries. On taking the plant over some repairs were effected, and crushing was proceeded with. It is intended to erect a cyanide plant in conjunction with the battery; portions of the plant were secured with the battery when purchased. An ample water supply is available, and it now rests with the prospectors to supply ore to keep the stamps going. During the two months the plant ran to the end of the year, 706 tons were treated for 485ozs.

Duketon.—Here a new 10-head battery, locally manufactured by Messrs. J. & E. Ledger, is being erected; two Cornish boilers by Martin & Co., South Australia; one compound condensing engine by Thompson & Co., Victoria; steam pumps, cyanide plant, ore bins and elevating gear, rock-breakers, and ore-feeders. The whole will form a very complete plant, and will give a good opportunity of settling a much discussed question, viz., whether the addition of rock-breaker, elevated ore bins, and automatic feeders will reduce the cost of treatment at State mills with intermittent crushings of various tonnages. I have always maintained that where loss of time is caused by the numerous small crushings usually received at each battery, the automatic system loses its beneficial effects; and further, where fuel is a serious item (as it undoubtedly is in nearly all cases), each additional horse power called into requisition adds to the working costs, and in many instances will total the wages paid for manual labour. I shall be only too pleased to acknowledge that the introduction of the gear above referred to will produce results more than counterbalancing the additional employment of labour, and above all, warrant the initial outlay in districts left to the Government to support.

Yarrie.—At this place a second-hand battery and cyanide plant was purchased for £2,450. This plant was erected on the Glengarry mine, 16 miles distant from its present position. The plant consisted of a 10-head battery, two Cornish boilers, engine and condenser, cyanide plant, tailings-wheel, rock-breaker, ore bins, ore-feeders, and a large quantity of general plant and sundries and buildings. Although the various portions of the plant gave every indication of being in good running order, many minor defects were noticeable after dismantling was proceeded with, and on re-erection it was necessary to effect many necessary repairs. The plant is being erected with every care. On account of the battery being designed to receive the ore from the main shaft poppet head gear, it was necessary to add to the plant elevating gear. This will be done, and the plant, on being in a position to start crushing, should be very complete. This plant will also afford a further opportunity of comparing working costs at automatic-fed batteries with those at hand-fed batteries, under conditions as existing at State plants. I would like to make it clearly understood that I favour automatic-fed batteries where the supply is assured and parcels extend over a lengthy period; but, unfortunately, this result is not always attainable in State batteries. Owing to a suitable site not being available closer than two miles from the well, a pipe line and pumping plant has to be supplied for the supply of water.

Randalls.—The department purchased a second-hand plant, formerly the property of the Santa Claus mine, for £1,250. This plant, as a battery, was not by any means one that could not be cavilled at, but what regulated the purchase was the material on the spot worth securing. The boilers and engine were of a satisfactory character in their respective lines, and as a considerable length of pipes was necessary whether this particular battery was purchased or not, the fact of the seller guaranteeing 13,000 feet of 3-inch pipes on the site made the purchase, which included general outfit for a ten-head battery, a reasonable offer. The only portions discarded were the two stamp boxes, which were replaced by new ones. It is intended to add a cyanide plant to the battery, also a Phœnix weir concentrator, with provision for a second one if the field warrants its erection. Owing to the water supply being secured from a water shaft near the lake, a pumping station has been placed there; a large storage tank and windmill being erected to assist in obtaining an ample supply, which in turn will be pumped to the battery. A condensing plant is being added to provide fresh water for boilers, and, if necessary, for domestic use among the prospectors.

Twenty-Mile Sandy, North-West.—On its first being arranged to provide a battery for the North-West, it was intended to send a new ten-head battery there, but in the interval between ordering one and the delivery of same, a second-hand battery was offered by the British Exploration Co. As the erection of a new battery meant a considerable sum in freight and cartage alone, and the time to land a battery also a lengthy period, an inspection of this battery was effected. Dismantling was arranged for and its re-erection undertaken. A cyanide plant is being erected to run in conjunction with the battery, and it remains to be seen whether the first effort of the department in providing a State plant will meet with more success than attended a subsidised plant a few years ago.

Black Range.—The cyanide plant, which represents the last of the work in hand at the close of the year, is being built on similar lines to the one at Burtville.

Established Batteries.

At the close of the year 1903, there were 16 batteries, seven cyanide plants, one tin-dressing plant, and one Huntingdon mill operating in different districts. This number has increased by five batteries, six cyanide plants, and one slimes plant, the additions being:—Menzies, battery and cyanide plant; Leonora, cyanide plant; Wiluna, battery; Black Range, battery; Boogardie, cyanide plant; Niagara, cyanide plant; Mulline, slimes plant; Coolgardie, battery and cyanide plant; Burtville, cyanide plant; Pig Well, battery.

Mulline.—This battery was established in 1899, with 10 head of stamps, and owing to the advancement of the district consequent on the battery's operations, was increased to 20 head, and in August, 1901, a cyanide plant was added. At this battery also the quantity of slimes warranted the erection of a slimes plant, which, as previously stated in the report, started during the year. The plant has crushed since its inception 39,394 tons for a yield of 52,681ozs., valued at £188,836. The slimes plant will add considerably to the sum already secured from the district. The district during the past year has not given evidence of retaining its pride of place amongst the State batteries. The principal "feeders" to the battery have either been worked out or lost their payable chute, and unless further development work provides a fresh lease of life to the district, the battery will suffer proportionately.

Norseman.—This district was granted a State battery in 1898, when a second-hand plant was purchased and run as a State plant. Each successive year the defects in this plant became more apparent, and in 1903 a new 10-head plant was decided upon. The accumulated sands were treated at the site of the old plant. A small slimes plant was erected some three years ago, the principle being to agitate the slimes direct by air in a closed vat, and then force the prepared slime into a filter press by the same power. The preliminary trials were not as satisfactory as anticipated, and the treatment of the slimes was deferred pending the results of the treatment of similar material at Mulline. At the new battery only the leaching plant is yet in existence. The district has not provided that increased quantity of stone which it was expected would follow the erection of a new battery. The ore treated to the close of the year has been 17,344 tons for 18,085ozs., valued at £68,387.

Lennonville.—The fact of this district only providing 2,376 tons for the year is conclusive proof of the decline in the output of stone on the field. Its close proximity to the Boogardie battery has to a certain extent been responsible for some of the patronage accorded the Lennonville battery in former years, but for a considerable time past no fresh developments have taken place to assist the battery, with the result that the year's operations are not of an encouraging nature. The total tonnage treated has been 17,328 for 26,123ozs., valued at £99,103.

Boogardie.—This plant was only granted to the field in March, 1903, and its career has in no way been the success anticipated by those advocating its erection. The yields have been on the average amongst the lowest established at State batteries, and in very few instances have the crushings proved the continuance of any lengthened chute of payable ore. The year's operations, which amount to 2,830 tons, point to the fact that it has not had that patronage generally expected and frequently realised in the earlier stages of a battery's life. A cyanide plant was erected in conjunction with the battery during the year, and has treated, to the close of the year, 2,256 tons, for a gold return of 484ozs. Some considerable trouble was experienced in obtaining an adequate supply of water in the battery well, and, previous to this being obtained, the water was secured from an adjoining property, the right being granted by the owner, Mr. J. Stephens.

Mulwarrie.—This battery started in December, 1901, and gave promise of a good future, but has suffered considerably by the indirect benefit the State has reaped through the presence of a battery. It has enabled no less than three different mines in the vicinity to be proved and sufficiently developed to warrant the owners of the property erecting their own batteries. The Golden Pole, the Waihi, and the Eileen can be named, and the natural result of the development has had its effect on the stone available for the State battery. Nevertheless, it would undoubtedly be a great factor in the system of State batteries if each battery brought about its own downfall by similar means. Unfortunately, the true reason is not, in many cases, understood, and critics are prepared to speak disparagingly of the district because of the poor support now accorded the State plant. The year's tonnage, 3,548 tons, hardly conveys the true meaning of the present outlook on the field, as the coming year, unless assisted by fresh developments, does not promise well. The cyanide plant has worked in conjunction with the battery, and has overtaken any accumulated tailings that formerly lay at the battery. The tonnage treated to the close of the year was 14,100 tons, for 17,451ozs., valued at £66,081.

Laverton.—This was started in May, 1902. At the outset of this battery's existence, the prospects were not of a highly encouraging nature, and although a preliminary effort on the part of the prospectors produced fairly good results for a time, the year's work, 1,773 tons, is evidence of the dullness existing, and at the close of the year no fresh developments had occurred to anticipate an improvement. The tailings treated by cyanide have been very poor throughout, the year's operations only producing 132 ounces from 2,133 tons. The district has only provided crushing material to the extent of 6,473 tons for 6,530ozs., valued at £24,681.

Meekatharra.—Started in March, 1901. This field, although producing at times exceptionally good crushings, does not on the whole present a very good average. The tonnage for the year, 3,830 tons, proves the inability of either the prospector or the field to keep the battery going full time. Although the water supply is not too good, yet for the year it has generally been sufficient to provide a supply for two shifts of the battery. This was frequently more than was sufficient to cope with the stone forthcoming for crushing. The cyanide plant has been regularly kept going, and the extraction has been good. The battery has treated 16,173 tons for 16,977ozs., valued at £63,798.

Darlot.—This district at the time a State battery was purchased was in a very backward state, and fears were entertained that it would not prove a success. It is pleasing to report that the field has gradually improved, and it now occupies a very prominent position amongst the State batteries. The tonnage put through for the year, 3,766 tons, hardly indicates the capability of the field, while the average exceeds most other places where a State battery exists. Since the abandonment of the old light 10-head battery for a more modern heavy stamp mill, the progress of the field continues, and there is every prospect of the battery having another successful year. The sands are free cyaniding, and the results at each clean up satisfactory, although the values are very low, 3,266 tons producing only 316ozs. The battery has crushed 10,045 tons for 19,849ozs., valued at £74,895.

Southern Cross.—At no time in the history of this battery has there been any evidence of a satisfactory mining revival. The plant erected was of a more temporary nature than some other plants, in so much that the boilers and engine were of a portable character. The year's operations, 3,365 tons, are considerably short of what should have been crushed, considering the mill had only started in December of the previous year. It is apparent that placing mills in old established districts, where other mills are catering for public stone, is not desirable, for it is only a matter of time when the privately run plants can secure the patronage of the prospector, who in many cases appears to take undue advantage of the presence of privately run plants, and look for unreasonable concessions from the Department or decline to crush at the State plants. The yields have with few exceptions been of a very low nature, and this combined with the intermittent nature of the supply of ore, makes the financial aspect of the battery a very poor one, and certainly not very encouraging after the promises of support at prices not increased between the time the battery was promised and granted. The prospectors feel that the presence of other batteries strengthens their demand for further reductions in charges not considered warranted. The arrangements entered into for the supply of salt water from the Fraser's South Extended was not altogether of a satisfactory nature, but there never seemed to be any inducement for the Department to incur the initial expenditure of connecting with the Coolgardie Water Scheme, and subsequent monthly payments for water, whilst the monthly tonnages offered were not sufficient to keep the mill going half time. The present prospects of the battery are anything but encouraging, and it devolves upon the prospectors who desire to retain the battery to show their willingness to assist by providing stone. The tonnage to the close of the year was 3,758 tons for 1,946ozs., valued at £7,223.

Menzies.—Here, again, is a battery located amongst other batteries catering for the public, and although the district has provided more stone than the Southern Cross district previously referred to, yet the same feeling is apparent that the prospector anticipates concessions from the Department much beyond what he expected from those running batteries previous to the installation of the State plant. The cyanide plant erected in conjunction with the battery has been running successfully, and this plant is one of five (Mulline, Norseman, Meekatharra, Lennonville, and Menzies) where the direct purchase of tailings on a 75 per cent. basis of extraction has recently been granted, thus giving prospectors an opportunity of realising early on their tailings. It remains to be seen whether many will avail themselves of this privilege, and remove the criticisms against the Department for withholding payment until the sands are actually treated and gold recovered.

Leonora.—This is one of the early batteries, having been erected in 1899. For a time the field became very quiet, and the removal of the battery was more than once contemplated. Fortunately, however, the plant was not dismantled, and new life sprang into the place. The quantity treated, 6,008 tons, when compared with many other batteries erected years later, gives some indication of the renewed vigour of the prospectors of the field, and although there appears to be another lull in the development work, it is hoped that this will prove of only a temporary character. The cyanide plant, which was erected to treat the accumulated sands, has had the effect of assisting many shows, which otherwise may not have proved remunerative without this additional profit being made available. Since the opening of the plant in February last, 4,751 tons have been treated for a return of 979oz., valued at £4,162. The tonnage credited to the battery since inception is 18,342 tons for 17,357ozs., valued at £66,097.

Niagara.—The battery located here was first erected at Yerilla, where it was placed in 1899. Owing to the almost total collapse of this field for the time being the battery was removed into Niagara in 1900. Although the Niagara field was an old-established one, yet there were many opportunities for prospectors owing to the number of lodes to operate upon. The choice was a fairly good one, as the battery has all along had a very fair share of patronage, and the tonnage for the year, 6,587, is only surpassed by that of Mulline, where 20-head of stamps were at the command of the prospector. The field promises to yet provide a fair quantity of stone for future treatment. The sands at this battery were for the first few years handled by a private syndicate, but since the Department undertook the treatment of the sands prospectors have had a fair return, especially for sands collected from the time of suspending operations by the private syndicate. The total tonnage through the battery is 17,996 tons for 19,778ozs., valued at £73,496.

Burtville.—This plant, which was erected in 1903, has treated good grade ore, although the tonnage is not what might be desired. 3,927 tons is not much more than half-time running, yet the field on original inspection for a battery gave indication of small tonnage with exceptionally good results in most cases. The district is one that may fairly be termed a poor man's field, as the veins are small but good, and no better assistance could have been given the field than the establishment of the battery by the State at the time of its erection. Many of the reefs are now worked to water level, and it will be a regrettable feature if want of funds prevent present holders from testing and proving their lodes to a depth. The cyanide plant now working in connection with the battery is successfully treating the sands. The battery records are 4,998 tons for 11,287ozs., valued at £41,938.

Yundamindera.—At this place a Huntingdon mill was erected instead of a stamp battery, for several reasons. The place hardly gave promise of developing into a big mining centre, and as many centres did not warrant the erection of a ten-head battery, it was thought they might be granted a reducing plant of a more temporary nature, and, with this object in view, the Huntingdon mill driven by portable engine and boiler was decided upon. Unfortunately the prediction that the place would not develop into a big centre has proved too true, and the tonnage brought forward for treatment, 2,335 tons, has not enabled the plant to run constantly enough to prove the full merits of the mill from a financial standpoint. The costs of running have been higher than at stamp mills, while the portable boilers have not been the success hoped for. Although there has been a great desire by the prospectors to secure a cyanide plant for the treatment of their sands, there has not been sufficient inducement for the Department to authorise the necessary expenditure up to the present. The tonnage since the starting of the plant is 2,803 for 2,939ozs., valued at £14,774.

Mt. Ida.—In the earlier stages of the State battery system the Mt. Ida district was a good second on the list, and for a considerable time gave promise of developing into a permanent field. Returns, however, gradually fell off, until very few claims were working, and the battery is now run very intermittently. One property, the Federation, still produces good quality ore, but the quantity available on the field is much too small for the plant, as the tonnage, 2,105 tons for the year, indicates. The cyanide plant attached to the battery was not a success, owing to the percentage of copper in the tailings being more than was anticipated, and the existence of carbonates allowed a general contamination of the whole heap. Several other parties have tried the heap since the Department closed down, but none have succeeded in doing any good. Although the battery is doing so little, yet its distance from any other mining centre affords prospectors who still linger in the locality an opportunity of following their desires, and some fresh developments may yet throw new vigour into the field. During the year a concentrator was attached to the battery, many prospectors arguing that there was sufficient sulphide present in their ore to warrant extracting same from their tailings, and that by so doing their tailings would be amenable to cyanide treatment. It generally, however, became an admitted fact that carbonate of copper was too freely present to allow of the purification of the tailings, nor are the sulphides of sufficient value to become a marketable product. Since the inception of the plant 15,135 tons have been treated for 18,618ozs. valued at £70,377.

Leased Batteries.

The Tuckanarra battery has remained under lease during the year, and although it gives employment to a few men, and is of use to those still working in the district, yet there is nothing doing to warrant the Department working it departmentally.

Widgiemooltha.—This battery has been under lease, and has also been placed under special agreement with prospectors to try and make its existence justifiable, but on no occasion has there been any return worthy of the time and money spent on the field.

Ravelstone.—This battery was for a part of the year under lease, but most of its time practically idle. Another effort is being made to keep it somewhat open for those who may have interests in the district, and an occasional crushing to put through; but there is very little prospect in view. Considering that the three batteries have only treated 1,597 tons for the year, we have conclusive proof of the dullness existing at these centres.

Greenbushes Tin Plant.—When this plant was erected in 1901, it was hoped that the results would have been much greater than were realised. The plant failed to give that satisfaction which was expected of it, the chief reason being that the class of ore did not at all times accommodate itself to the mode of treatment, and what was more important, the bulk of the ore was too poor to admit of a method of fine treatment by means of concentrators, when handicapped by the comparatively small quantity that could be put through. In November last, a change in the method of handling the battery was decided upon, the rates were reduced to 50s. per eight hours, and prospectors brought to the plant quantities of conglomerate, which, passing through quickly, enabled a larger tonnage to be dealt with at lower rate than when charged at per ton. This concession promises to have the effect of largely increasing the output, and prove of benefit to prospectors.

The relative position of the past two years is as follow:—

1903.—2,009 tons for 61 tons black tin; loss in operations, £153.

1904.—2,337 tons for 80 tons black tin; loss in operations, £165.

Water Supply.—During the year it was found necessary to extend either by sinking or driving the water shafts at Mulline and Meekatharra, at a cost of £311 and £537 respectively, whilst the purchase of water at Coolgardie and Menzies has amounted to £490 and £412 respectively, the former being supplied from the Coolgardie Water Scheme, and the latter from the Mines Water Supply well.

Improvements and Additions.—At Mulline, Meekatharra, and Wiluna new Cornish boilers were supplied at an erected cost of £1,550, whilst a small vertical boiler was supplied at Greenbushes at a cost of £60. Besides these items, there were several additions by way of renewals necessary to keep the plants in a fair state of repair. The cost of the work above alluded to represents an outlay of £3,000, which was paid from revenue, and it would be of advantage if a special vote was set aside for the purpose of paying for work of such a nature that could not be fairly charged to working costs.

Yearly Output.

The following gives a very good comparison of the progress made during the last year, as compared with previous ones. Up to 1901, on three year's operations, the tons crushed and gold obtained were:—

	tons.		ozs.
—	68,719	... ...	77,533
1902	39,517	... ...	57,255
1903	49,233	... ...	58,305
1904	71,616	... ...	78,309
Totals	229,157	... ...	271,402

Regarding cyanide operations, the tonnage stands as follows:—

	tons.
Treated to 1902	29,255
Do. 1903	32,369
Do. 1904	43,251

The year's operations have produced 8,033 ounces fine gold, valued at £34,274. The cost of treatment has amounted to £16,945·33, whilst £15,881 has been paid to owners of tailings, being £4,809 in excess of the previous year.

Revenue and Expenditure.

The results of the year's operations are as follows:—

	£
Revenue from batteries	44,930·22
Do. tin plant	792·27
Do. cyanide	18,393·02
	£64,115·51
Expenditure at batteries	51,353·52
Do. tin plant	957·58
Do. cyanide	16,945·33
	£69,256·43

Financial Results from inception to end of 1901.

(Previous to cyaniding operations.)

	£
Loss for four years	13,515
Average loss per year up to end of 1901	3,379
For year 1902, profit on cyanide operations	2,360
Loss on batteries	675
Profit on whole system	£1,685
For year 1903, profit on cyanide operations	5,800
Loss on batteries	3,261
Profit on whole system	£2,539
For year 1904, loss on batteries	6,588
For year 1904, profit on cyanide operations	1,447
Loss on whole system	£5,141

In this loss is included the sum of £3,000 referred to in a previous paragraph. It is apparent, however, that the ruling rates adopted for crushing have never been sufficient to meet expenditure. Bare working expenses are possible, but each year's work brings with it the necessity for providing for unforeseen expenditure in maintaining the various plants up to a fair standard of repair. Had cyanide charges been brought below their present rate, the profits shown on previous years' operations would not have appeared, and the opportunities of acquiring a reasonable profit for cyanide operations are less now than formerly.

General.—The various tabulated forms give in detail the relative position of each battery. As has been the case each year, very few of the batteries have been supported by those whom the plants were erected to assist, and many results of the year's operations would have been much improved had the promised patronage been forthcoming.

In conclusion, I trust that Parliament will view the loss on State batteries as a direct contribution to State aid in the development and encouragement of mining. Every care is exercised to prevent loss through mismanagement, and although an increase in charges would meet the deficiency, yet the present rates afford full opportunities for prospectors to fully test their properties, and in doing so, an occasional development may recoup the State for losses sustained in continuing the State battery system as a means of advancing the mining industry.

I have, etc.,

DAVID H. WHITE,

Superintendent of State Batteries.

State Batteries.

Return showing the number of Tons Crushed, Gold Yield, Average per Ton and Value since Inception to 31st December, 1904.

Name of Battery.	Tons Crushed.	Gold Yield	Average.	Value.
		ozs.	ozs.	£
Norseman	17,344·5	18,085·49	1·04	68,387·49
Mulline	39,394·7	52,681·95	1·33	188,836·19
Lennonville	17,328·84	26,123·96	1·5	99,103·07
Mulwarrie	14,100·25	17,451·24	1·237	66,081·18
Laverton...	6,473·75	6,530·45	1·008	24,681·4
Meekatharra	16,173·85	16,977·45	1·05	63,798·37
Darlôt	10,045·25	19,849·05	1·97	74,895·42
Southern Cross	3,758·1	1,946·4	·51	7,223·64
Menzies	5,067·75	4,717·13	·93	17,138·74
Leonora	18,342	17,357·59	·94	66,097·74
Boogardie	5,646·5	2,829·13	·501	10,596·48
Niagara	17,996·5	19,778·06	1·09	73,496·09
Coolgardie	4,111	3,856·8	·93	13,938·7
Burtville	4,998·75	11,287·62	2·25	41,938·84
Yundamindera	2,803·5	3,939·74	1·4	14,774·17
Mount Ida	15,135·9	18,618·41	1·23	70,377·47
Wiluna	3,410·5	2,232·22	·65	8,181·18
Black Range	3,558·65	4,765·61	1·33	17,390·9
Pigwell	706·5	485·07	·68	1,746·25
Tuckanarra	5,559·6	8,583·79	1·54	32,426·43
Widgiemooltha	3,239·5	1,312·4	·405	4,985·59
Ravelstone	5,852	6,150·27	1·05	23,322·23
Batteries closed	8,110	5,842·94	·72	22,197·84
Total	229,157·89	271,402·67	1·18	1,011,615·41
Cyanide	104,022	...	...	94,718
		Tons Black Tin.		
Greenbushes (Tin Plant)	5,525·5	181·2	...	9,761

State Batteries.

Expenditure from Consolidated Revenue Vote "Erection of State Batteries" for Year ending 31st December, 1904.

	£	£
Lake Darlôt	1,914·25	
Mulwarrie	265·38	
Wiluna	943·66	
Norseman	3,336·21	
Meekatharra	13·07	
Boogardie	1,615·75	
Burtville	1,546·71	
Niagara	1,272·67	
Mulline	920·73	
Menzies	716·02	
Yundamindera	95·15	
Southern Cross	127·75	
Coolgardie	4,715·04	
Black Range	2,955·24	
Leonora	527·19	
Greenbushes	140·	
Duketon	4,495·51	
Mount Ida	175·12	
Yarri	3,338·67	
Head Office (Battery Material Suspense Account)	1,146·17	
Sandy Creek (Nullagine)	3,475·61	
Randells	1,281·7	
Pigwell	1,866·72	
		36,884·32
Expenditure from Vote "Erection of State Batteries" to 31st December, 1903		29,556·81
Total of Loan Expenditure to December, 1903		120,000·
Grand Total		£186,441·13

State Batteries.

Return showing number of Tons Crushed, Gold Yield, and Average per ton for Year ending 31st December, 1904.

Name of Battery.	Tons Crushed.	Gold Yield.	Average.
Norseman	3,212	4,084·94	1·27
Mulline	7,502·5	7,048·82	·93
Lennonville	2,375·9	2,980·61	1·25
Mulwarrie	3,547·9	2,921·09	·82
Laverton	1,773·5	1,331·2	·75
Meekatharra	3,830·5	6,069·7	1·58
Darlôt	3,765·5	5,077	1·34
Southern Cross	3,365·1	1,561·95	·46
Menzies	5,067·75	4,717·03	·93
Leonora	6,007·5	6,113·77	1·01
Boogardie	2,830·5	1,279·23	·45
Niagara	6,587	6,923·04	1·05
Coolgardie	4,111	3,856·8	·93
Burtville	3,926·75	8,461·07	2·15
Yundamindera	2,335·5	3,336·74	1·42
Mt. Ida	2,105	3,461·9	1·64
Wiluna	3,410·5	2,232·22	·65
Black Range	3,558·65	4,765·61	1·31
Pigwell	706·5	485·07	·68
Tuckanarra	1,237·5	1,350·63	1·09
Widgiemooltha	54	19·5	·36
Ravelstone	305·75	231·14	·75
Total	71,616·8	78,309·06	1·09
		Tons Black Tin.	
Greenbushes (Tin Plant)	2,337	79·8	...

State Batteries.

Balance Sheet from Inception of Scheme to 31st December, 1904.

	£	s.	d.		£	s.	d.
To Capital Expenditure from Loan Fund	120,000	0	0	By Batteries, Cyanide Plants, etc., as per valuation 31st December, 1904 ...	100,450	0	0
„ Do. do. Revenue ...	68,317	5	0	„ Gross Loss	123,819	5	3
„ Net Loss	35,952	0	3				
Net Loss represents—							
Loss on Working Expenditure ... ... £ 12,929	9	10					
Interest on Loan ... 21,223	5	2					
Do. Revenue ... 1,799	5	3					
	£224,269	5	3		£224,269	5	3

Profit and Loss Account.

	£	s.	d.		£	s.	d.
To Working Expenses, Head Office, and all Batteries	248,534	9	6	By Stores on hand— Approximate value	6,000	0	0
„ Interest at 3½ per cent. and Sinking Fund 1 per cent. on Expenditure from Loan Funds	21,223	5	2	„ Revenue received	229,604	19	8
„ Interest at 3½ per cent. on Capital Expenditure from Revenue ...	1,799	5	3	Balance (Loss) ... ... (Loss—Including Depreciation)	123,819	5	3
„ Depreciation on Plants as per Balance Sheet	87,867	5	0				
	£359,424	4	11		£359,424	4	11

State Batteries and Cyanide Plants.

Statement showing Transactions for the Year ending December, 1904.

Goldfield.	Name of Battery.	No. of Stamps.	Tons Crushed and Tailings treated.	Gold Yield.	Total Expenditure, including Wages, Maintenance, Additions, and Improvements.	Revenue.	Profit.	Loss.	Cost of Treatment.	Remarks.
			tons.	ozs.	£	£	£	£	£	
Dundas	Norseman	10	3,212	4,084·94	2,431·75	2,016·36	...	415·39	·757	
	Do. Cyanide	...	3,009	465·63	1,200·51	1,135·14	..	65·37	·399	*£311 spent on water extension and condensing plant.
North Coolgardie	Mulline	20	7,502·5	7,048·82	4,897·79	5,158·06	260·27	...	·653*†	†£450 spent on boiler.
	Do. Cyanide	...	4,678	1,199·51	2,363·46	2,215·65	...	147·81	·505	
	Do. Slimes	...	691·5	125·88	614	353	...	261	·808	
Do.	Mt. Ida	10	2,105	3,461·90	1,213·95	1,391·11	177·16	...	·577	
Do.	Menzies	10	5,067·75	4,717·03	3,069·96	3,069·73	...	·23	·547	£412 spent for purchase of water.
	Do. Cyanide	...	3,440	656·07	1,443·23	1,465·46	22·23	...	·419	
Do.	Mulwarrie	10	3,547·9	2,921·09	2,284·71	2,203·72	...	80·99	·643	
	Do. Cyanide	...	2,788	540·67	1,435·91	1,263·21	...	172·70	·515	
Do.	Niagara	10	6,587	6,923·04	4,068·05	4,624·63	556·58	...	·617	
	Do. Cyanide	...	4,412	705·38	1,396·71	1,709·28	312·57	...	·316	
Do.	Yundamindera	Huntington mill	2,335·5	3,336·74	2,421·21	1,808·60	...	612·61	1·362	
Coolgardie	Coolgardie	10	4,111	3,856·80	2,656·67	2,463·77	...	192·90	·646	£490 for purchase of water.
	Do. Cyanide	...	949	249·40	319·10	384·81	65·71	...	·262	
Murchison	Lennonville	10	2,375·9	2,980·61	1,827·25	1,466·58	...	360·67	·769	
	Do. Cyanide	...	2,841	670·79	1,105·49	1,365·21	259·72	...	·389	
Do.	Meekatharra	10	3,830·5	6,069·70	3,446·24	2,386·48	...	1,059·76	·899	£537 spent on water.
	Do. Cyanide	...	4,830	1,021·85	1,864·86	2,664·23	799·37	...	·386	£550 spent on boiler.
Do.	Boogardie	10	2,830·5	1,279·23	2,194·67	1,503·78	...	690·89	·775	
	Do. Cyanide	...	2,256·5	483·98	938·73	1,134·18	195·45	...	·416	
East Murchison	Lake Darlôt	10	3,765·5	5,077	2,515·36	2,547·01	31·65	...	·668	
	Do. Cyanide	...	3,266	316·57	1,064·98	1,195·99	131·01	...	·326	
Do.	Wiluna	10	3,410·5	2,232·22	3,562·87	2,114·38	...	1,448·49	1·044	£550 for new boiler.
Do.	Black Range	5	3,558·65	4,765·61	2,667·58	2,319·25	...	348·33	·749	
Mt. Margaret	Burtville	10	3,926·75	8,461·07	2,612·18	2,707·20	95·02	...	·665	
	Do. Cyanide	...	515	212·94	177	277·03	100·03	...	·343	
Do.	Laverton	10	1,773·5	1,331·20	1,329·60	1,073·95	...	255·65	·749	
	Do. Cyanide	...	2,133	132·45	558·85	500·33	...	58·52	·262	
Do.	Leonora	10	6,007·5	6,113·77	2,876·95	3,640·21	763·26	...	·479	
	Do. Cyanide	...	4,751	979·25	1,440·02	1,972·37	532·35	...	·303	
Do.	Pigwell	10	706·5	485·07	570·43	435·87	...	134·56	·807	
Yilgarn	Southern Cross	10	3,365·1	1,561·95	1,942·78	1,682·45	...	260·33	·577	
	Do. Cyanide	...	2,691	291·25	1,022·48	757·13	...	265·35	·379	
	Head Office	...	...	...	2,283·16	...	...	2,283·16		
Broad Arrow	Paddington	puddler	...	...	48	11·25	...	36·75		
Peak Hill	Ravelstone	10	305·75	231·14	262·40	197·90	...	64·50		
Murchison	Tuckanarra	10	1,237·50	1,350·63	6·33	67	60·67			
Coolgardie	Widgiemooltha	10	54	19·5	163·63	40·93	...	122·70		
	Total Batteries	215	71,616·8	78,309·06	51,353·52	44,930·22	1,944·61	8,367·91	·717	
	Cyanide	...	43,251	8,033	16,945·33	18,393·02	2,418·44	970·75	·391	
	Greenbushes Tin-Dressing Plant	5	2,337	79·8 tons black tin	957·58	792·27	...	165·31	·409	£60 for boiler for pumping.
		220	117,204·8	86,421·86	69,256·43	64,115·51	4,363·05	9,503·97		
								4,363·05		
							Loss	5,140·92		

DIVISION IV.

Report by the Chief Inspector of Machinery for the Year 1904.

The Secretary for Mines, Perth.

SIR,

1. I have the honour to submit my annual report upon the operations under the "Steam Boilers Act, 1897," for the year ending the 31st December, 1904. for the information of the Hon. the Minister for Mines.

BOILERS REGISTERED.

2. The total number of boilers registered on the above-mentioned date was 2,884, an increase of 150 compared with the previous year. It is satisfactory to note that included in this increase are 10 new boilers manufactured in Perth, consisting of six Cornish, two vertical, and two multitubular.

Attached to this report please see Appendix "B," which clearly shows how the total boilers registered are classified and distributed.

CERTIFICATES GRANTED.

3. The total number of certificates granted during the year were 2,344, which is a slight increase compared with the previous year. This small increase is accounted for by the fact that in many more cases than in any previous year, the inspectors have been able to grant certificates having a duration of twelve months, whereas in past years, owing to the indifferent manner in which boilers were maintained and worked, this could not be done to such an extent.

In place of the thorough half-yearly inspection that was deemed necessary in many instances on previous occasions, there have been made 277 "working inspections;" such inspections are without notice and during the currency of a certificate.

This class of inspection is most essential, and is made for the purpose of ascertaining:—

(*a.*) Whether or not the boilers under ordinary working conditions are carefully looked after.

(*b.*) To see if the authorised working pressure allowed on the current certificate is not being exceeded.

(*c.*) To test under steam the efficiency of all mountings and fittings necessary to safe working, and

(*d.*) Generally to see if the provisions of the Act are being complied with.

The total number of inspections for the year is 2,824, and in carrying out these inspections it has been necessary for the inspectors to travel, approximately, by trap, railway, and other means no less a distance than 33,000 miles, or an average of 11·6 miles per inspection.

TOTAL REVENUE.

4. The total revenue received, as furnished by the chief accountant, is £3,327 15s., being an increase of £47 3s. 5d. over that received during the year 1903. For the current year I anticipate a very considerable increase in the revenue derived from boiler fees alone, owing to the application of the new schedule of fees prescribed under "The Inspection of Machinery Act, 1904," which is now in force.

TOTAL EXPENDITURE.

5. The expenditure for the year amounted to £5,096 18s. 1d., and is an excess of the revenue by £1,769 3s. 1d. This excess over revenue is caused by the expenditure necessitated by the immense amount of travelling required to carry out the provisions of the Act in the proclaimed districts. The most rigid economy, compatible with efficient work, is enforced, and I have again to express regret that I cannot see how the expenditure can be materially reduced. The sustenance allowance, wages, horse fodder, etc., is a serious item in the Murchison, East Murchison, Mt. Margaret, and North Coolgardie districts when performing inspections in the outlying portions of these districts, and, the inspectors fully realising this, work long hours and sometimes at night, including many Sundays, in order to carry out their duties in the shortest possible time. Many of the stages travelled are most trying and are a serious tax upon both man and beast.

REPAIRS, ALTERATIONS, ETC.

6. During the past year 495 notices were served by the inspectors on owners for various reasons, such as repairs, alterations, etc., and in the great majority of cases the instructions were complied with.

Included in this number are 11 boilers "permanently" condemned, as they were considered completely worn out and not worth repairing for any useful pressure; also 87 boilers "temporarily" condemned owing to their dangerous condition, pending such important repairs as new fire-boxes, shell-plates, stays, tubes, tube-plates, patches, etc., being effected. Most of the "temporarily" condemned boilers have been satisfactorily repaired and brought into use again. The percentage of boilers "temporarily" and "permanently" condemned in relation to those inspected during the year is 3·08 and ·389 respectively,

and in order that comparisons can be made with previous years the results on the same basis are given below:—

Year.	Temporarily Condemned.	Permanently Condemned.
1899	2·64 per cent.	1·42 per cent.
1900	5·21 „	·498 „
1901	4·35 „	·511 „
1902	5·00 „	·958 „
1903	2·43 „	·697 „
1904	3·08 „	·389 „

Prosecutions under the Act.

7. It was found necessary to prosecute four (4) owners under the Act—two for working boilers without certificates, one for refusing to register his boiler, and one for non-payment of inspection fees. All prosecutions were successful, and will have the effect no doubt of showing owners the necessity of complying with the provisions of the Act.

Generally speaking owners have satisfactorily prepared their boilers for inspection, but with a number there is room for much improvement.

It is these latter who cause much inconvenience and loss of time to the department, and if a satisfactory explanation cannot be given in future I intend to institute proceedings in cases where it is considered necessary.

Explosions and Accidents.

8. I am pleased to state that no explosion occurred to any boiler registered under the Act during the period under review, which is no doubt largely due to the rigid and careful inspection now fully installed in all districts.

An accident, fortunately unattended with any serious bodily injury to anyone, occurred in connection with an under-fired multitubular boiler constructed by a leading English firm of manufacturers, and was of similar nature to that outlined in my last annual report. In this case, however, the cast iron column supporting the back end became very much overheated, owing to the "protecting wall" having been knocked down by careless firing, and eventually broke in two, allowing the boiler to drop down, and causing all steam connections to break.

In another case, owing to an excess of oil getting into the boiler through the condensed feed-water which was not treated, the furnace tube became overheated, came down, and cracked circumferentially in the vicinity of the flanged seam for a distance of 12 inches, which was entirely due to insufficient care on behalf of the management.

Staff Appointments and Changes.

9. It was found necessary to appoint an additional assistant inspector of boilers for the South-Western District on 24th November, in order to cope with the increasing work of this large district. The amount of travelling done by this inspector is not included in Appendix "A," as he was principally engaged since his appointment in the metropolitan area. For the purpose of effecting economy a slight readjustment of two districts was made, and I am glad to be able to report that it is giving satisfactory results.

Owing to the offices occupied by myself and staff in the Mines Department building being required by the Superintendent of State Batteries, arrangements were made on the 22nd December last, by which suitable office accommodation was obtained in the Metropolitan Waterworks buildings, Wellington Street. Although the office arrangements are eminently satisfactory, it cannot be said that they are too convenient for the public, with whom the principal bulk of the business is transacted; besides causing much loss of time to myself when having to interview the Minister or yourself on departmental business.

General Remarks.

10. It is most satisfactory to note that steam users now fully realise the benefits derived from periodical inspections, and that they are not only acting upon the advice of inspectors, but are giving much more care and attention to their steam plants.

Steam users are constantly being cautioned against the dangers of allowing oil to enter with the feed-water, and in permitting an excess of scale deposit on the heating surfaces. In such cases where these dangers are likely to occur the attention of the owner or manager is always drawn, and at the same time advice is given. The question, however, of purifying the feed-water before it enters the boiler is far from being universally adopted in connection with permanent power plants erected in this State. This is somewhat surprising, especially when very heavy costs are incurred in removing the scale deposit from the internal surfaces of boilers erected on the Goldfields and other parts of the State. Unless this is done at regular intervals there is a liability of seriously overheating the plates or tubes according to the type of boiler, which may result in serious consequences. Then again, the extraction of oil from the condensed feed-water by some efficient mechanical device is one which has received a good deal of attention here on most of the large steam plants for some time past, but at the same time it is surprising to find how many of these grease extractors and other similar devices are rendered practically useless through not being regularly cleaned and attended to, consequently the oil finds its way into the boilers with its attendant

results. The "Sight feed lubricator" attached to the steam pipe of condensing engines is very largely responsible for this in many cases, and steam users should insist on these lubricating devices being regulated in such a way as to give satisfactory results.

11. On the 1st March last "The Inspection of Machinery Act, 1904," which repeals "The Steam Boilers Act, 1897," came into force. The former Act has a much wider range than the latter, and it also includes in addition to boilers the inspection and regulation of machinery, including most of the river and harbour steamers, inquiries into accidents, and engine-drivers' examinations. The preparation of this technical measure, whilst it was being considered by both Houses of Parliament, and after it was passed, caused a considerable amount of additional work on some of the staff in the Perth office, consequently a great deal of work had to be done outside the regulation hours, sometimes at personal inconvenience, in order to keep up the current daily work and in the preparation and drafting of the necessary forms and registers in connection with the Act mentioned herein.

I have, etc.,

8th May, 1905.

C. J. MATHEWS,
Chief Inspector of Machinery.

Appendix "A."

Statement showing Operations for the Year ending 31st December, 1904.

Districts.	Number of Inspectors.	Total number of Boilers registered.	Approximate number of Boilers either out of use or having no certificate in force on 31st Dec., 1904.	Total number of inspections made.	Approximate number of miles travelled to make inspections.		Approximate number of miles travelled per inspection.	Number of Boilers temporarily condemned.	Number of Boilers permanently condemned.	Number of Notices issued for repairs, fittings, etc.	Number of Certificates granted.	Amount of fees represented.	Amount of fees brought to revenue.
					By rail.	By road.						£ s.	£ s.
South-Western	4	1,102	405	1,222	11,052	3,120	11·5	48	11	235	954	1,203 15	1,180 10
Coolgardie ...	1	259	108	255	788	2,960	11·6	4	...	41	249	363 5	352 5
Yilgarn													
Dundas		49	11	68				2	...	13	66	75 0	75 0
East Coolgardie ...	1	502	177	428	100	3,650	6·9	4	...	18	338	611 10	603 0
N.E. Coolgardie ...		146	45	113				2	...	12	100	205 0	210 0
Broad Arrow ...													
Murchison... ...	1	291	169	247	1,018	4,458	13·8	8	...	46	220	260 15	264 15
Peak Hill ...													
Yalgoo		118	56	149				8	...	34	118	149 15	148 15
East Murchison	1	203	88	174	2,927	2,929	17·1	6	...	39	155	247 10	240 0
North Coolgardie		195	70	168				5	...	57	144	245 10	253 10
Mount Margaret ...													
Pilbarra	...	19	District	not proclaimed.									
West Pilbarra ...													
Grand Totals ...	8	2,884	1,129	2,824	15,885	17,117	12·1	87	11	495	2,344	3,362 0	3,327 15

Appendix "B."

Return showing Classification of the various types of Boilers Registered in each District on 31st December, 1904.

Districts.	Lancashire.	Cornish.	Semi-Cornish.	Vertical.					Loco-type rectangular Firebox.		Loco-type circular Firebox,	Locomotive.	Water Tube.	Return Multitubular Under-fired.		Return Multitubular Internally-fired.		Egg End and other types not mentioned.	Total.
				Stationary.	Portable.	Multitubular.		Water Tube.											
						Stationary.	Portable.		Stationary.	Portable.	Portable.			Stationary.	Portable.	Stationary.	Portable.		
South-Western	17	85	25	290	64	26	6	11	47	260	65	40	42	78	4	28	...	14	1,102
Coolgardie and Yilgarn	9	95	2	72	6	2	...	...	8	15	...	6	10	19	6	2	...	7	259
East Coolgardie	48	179	6	94	2	4	...	2	16	13	5	3	78	40	4	4	...	4	502
North-East Coolgardie and Broad Arrow ...	5	52	2	46	...	1	...	...	14	12	...	3	...	6	2	...	...	3	146
Murchison, Peak Hill, and Yalgoo	16	114	25	73	8	4	...	...	17	11	...	2	1	9	3	7	...	1	291
East Murchison	2	48	3	28	...	1	1	...	8	7	...	5	8	7	...	...	...	...	118
North Coolgardie	14	80	4	64	1	9	...	...	8	8	1	1	...	11	...	...	2	...	203
Mount Margaret	7	76	...	53	...	8	1	..	14	8	...	5	8	12	...	1	...	2	195
Dundas	...	20	3	15	...	...	...	...	3	4	...	...	2	2	...	...	...	...	49
Pilbarra and West Pilbarra	...	...	...	District		not	yet	proclaimed.		...	...	...	...	...	...	...	...	19	19
Grand Totals	118	749	70	735	81	55	8	13	135	338	71	65	149	184	19	42	2	50	2,884

Annual Report of Engine-drivers' Examinations.

The Secretary for Mines, Perth.

SIR,

1. I have the honour to submit, for the information of the Hon. the Minister for Mines, the following Report for the year ending 31st December, 1904, on the work done by the several Boards of Examiners appointed in accordance with the provisions of Section 16 of "The Mines Regulation Act Amendment Act, 1899," and Section 31 of "The Coal Mines Regulation Act, 1902," for the purpose of holding examinations and granting certificates to persons qualified to act as engine-drivers.

2. Some changes in the *personnel* of a number of the Boards have taken place during the year, due chiefly to the retirement of representatives of the Chamber of Mines and Certificated Engine-drivers' Associations; but the numbers of Boards, viz., 19, and of individual members, viz., 53, remain the same as last reported, as also does the proportion of representation allotted to the Department, the Chamber of Mines, and the Engine-drivers' Association, viz., 22, 16, and 15 respectively. As pointed out in my Report for the previous year, these changes have a decidedly prejudicial effect upon the highly commendable work done in the direction of maintaining what has been generally regarded and accepted by steam-users and drivers as a good standard examination and a sufficient test of candidates' efficiency and fitness. In other words, it has been the aim of the Examining Boards to provide machinery owners with an engine-driver who, in addition to being capable of carefully handling (which is purely mechanical) any engine used for mining or other purposes placed in his charge, would have at least a fair knowledge of the various working parts and functions of his engine and boilers. It has also been sought to impress upon applicants for certificates the absolute necessity of being competent to maintain machinery which may be placed under their control in a state of efficiency so far as engine-driver's duties extend, and of showing evidence of being able to remedy, where necessary, ordinary defects relating thereto.

Abundant testimony in this connection has been furnished, and as the result of careful observation made whilst visiting the various mining centres, I feel confident that the efforts of the Boards in the direction indicated above, have been much appreciated, especially by the managers of the smaller mines and those in prospecting stages where economy and attention to duty are of the first importance.

Examinations have been held in all save six (6) centres where boards exist, *i.e.*, thirteen (13) Boards have held twenty-six (26) meetings, extending over a total of forty-nine (49) days, and have received and dealt with three hundred and thirty-four (334) applications for various classes of certificates.

Compared with the last year, there has been a decrease of seven (7) in the number of meetings held, and notwithstanding the fact that the number of applications considered during 1903 was only two greater than the total for the period under review, the work has been satisfactorily completed in sixteen days less than was required during the preceding twelve months.

Including 40 "interim" or "temporary" certificates, with a currency of not more than six (6) months, and twenty-eight (28) renewals of "lost" or "destroyed" certificates, a total of one hundred and ninety (190) engine-drivers (all classes) have been certificated, as shown in comparative Table "A" hereunder:—

TABLE A.

Class of Certificate.	1903.		1904.	
	No. of Applicants.	No. of Certificates issued.	No. of Applicants.	No. of Certificates issued.
1st Class Service	336	21	11	9
2nd „ „		9	9	9
1st „ Competency		40	58	20
2nd „ „		73	148	57
1st „ Interim		12	18	14
2nd „ „		26	35	26
Learners' Permits		48	27	27
Copies in lieu of Certificates lost or destroyed		18	28	28
Totals	336	247	334	190

In reference to Table "A" it will be noted that only a total of seventy-seven (77) certificates have been obtained by examination, whilst eighteen (18) have been granted upon the production of satisfactory evidence of experience gained prior to the statutes above referred to coming into operation, and which principally comprised certificates of similar grade to others obtained outside the State.

4. A notable feature in Table "B" hereunder, showing the percentage of passes in the examination for first-class competency certificates, is the decreased percentage between the results obtained by first-class candidates as compared with that shown for 1903, viz., 31·09 per cent. Undoubtedly the additional knowledge required for first-class candidates, and which is contingent upon the raising of the standard of examinations previously referred to, is in a measure responsible for the smaller percentage of passes; but it has also been demonstrated to the examiners that candidates do not give sufficient attention and thought to the rapid improvements which are constantly being made in modern machinery, nor do they avail themselves to any appreciable extent—certainly not as much as they should do—of the evening classes

established for their use at the Technical Schools and School of Mines in the State. When it is realised that in connection with the mining industry and a few other instances, many high-class and up-to-date engines and boilers are in use, and that the holder of a first-class certificate is entitled to take charge of any of these engines, the necessity therefore of possessing up-to-date knowledge will be readily apparent.

TABLE B.

Class of Certificate.	1903.	1904.
	per cent.	per cent.
First Competency	65·57	34·48
Second „	38·21	38·50

The receipts, comprising prescribed application and certificate fees, amounted to £324 2s., and the expenditure £258 14s. 7d., showing a credit balance of £67 7s. 5d. for the year's operations. In this connection special attention has been directed to the question of cost of these examinations, with the result that although there has been a much less amount received on account of certificate fees, the above satisfactory result remains.

Inquiries have been held during the year in connection with cases of over-winding. The first case dealt with was that which occurred at the Oroya-Brownhill mine on 11th April. The driver, who through serious losses and family troubles had been without sleep for several nights, overwound the cage. No damage was done as the rope detached itself at the head-gear. The Board recorded the opinion that the driver, who admitted his fault, should not have taken charge of his engine when he was not in a proper state of mind. A reprimand was considered sufficient under the circumstances.

The next case to come under notice was a similar one to that noted above. The driver was held to be guilty of negligence, and was required to pay £2 2s.—portion of the expenses of the inquiry.

On the 8th September another driver on the Oroya-Brownhill mine was required to forfeit one guinea as a penalty for carelessness on a charge of over-winding.

The fourth charge investigated was one preferred against a driver employed on the Golden Horse-shoe mine. In this instance the accident was shown to be mainly due to defective lighting on the brace. The Board decided that no blame was attachable to the driver and returned his certificate, and the matter of the absence of lights was brought under the notice of the proper authorities and dealt with.

Where necessary, particulars of the inquiries held and the action taken have been recorded against the engine-drivers concerned.

The question of reciprocity whereby engine-drivers' certificates would eventually be recognised over the whole of the Commonwealth has been a little further advanced since my last report. Communications dealing with this important matter have been forwarded to Tasmania, Queensland, Victoria, and New South Wales, and are, I believe, receiving the attention of the departments concerned. In view of the disabilities now existing this is a matter that should be taken in hand by the various States as early as possible to enable an uniform standard of examination to be established, whereby all certificates granted would be recognised throughout the Commonwealth. There are, however, many debatable matters before this can be finally accomplished. Pending a satisfactory arrangement which may result from the overtures already made, it is my intention to have the subject discussed by the Board of Examiners to be appointed under "The Inspection of Machinery Act, 1904," with a view of determining the relative values of engine-drivers' certificates throughout the Commonwealth and New Zealand, in order that a candidate holding a certificate granted outside the State and being desirous of obtaining a similar certificate in this State, will be in a position to know certain conditions that will enter into the consideration of his application.

I am pleased to be able to report that during the year under review "The Inspection of Machinery Act, 1904," which was thrown out by the Legislative Council during the previous year, was re-introduced by the Hon. the Minister for Mines, and was assented to on the 24th December last. This Act came into force on the 1st day of March last, and in consequence dispensed with the services of the old Boards, nineteen (19) in number, referred to in this report. Under the new system the collection, classification, and filing of all district officers' records (dating back to 1895) will in future be located in the Perth office, where they will receive attention. The preparation of various forms and certificates, registers, etc., and in addition the drafting of regulations governing examinations under the Act are now in hand, but this work can only be done out of regulation office hours. The whole of this additional work, which is not inconsiderable, will fall upon my present small staff, which will thus require augmenting to meet the additional duties under the new scheme.

It may not be inopportune to give herein a *précis* of the proposals, and *modus operandi* in conducting examinations under the new measure.

In the first place, the methods proposed to be adopted will be more economical than those obtaining under the old system, and are calculated to approach more closely an uniformity in examination than has been possible hitherto, inasmuch as the examination papers will in future be prepared by the one Board, who will sit in Perth, and such examination papers will be despatched to the approved centres under sealed cover. Subject to the approval of the Hon. the Minister, it is proposed to conduct examinations in the principal goldfields and coastal centres at regular intervals as near as possible on the same day. These examinations will be supervised by departmental officers, who will orally examine candidates, and report to the Central Board, to whom examination papers will also be forwarded by the supervisors to be dealt with. All certificates will be issued by the Central Board in Perth. A very important and new feature is the provision made in the Act for granting certificates to engine-drivers in

factories and other places where steam machinery is in use. Formerly, drivers of engines used for other than mining purposes were entirely outside of any legislation, a position which created much dissatisfaction. In the future, the engine-drivers of factory engines and river and harbour steamers will be subject to the provisions of the Act, and steam users may rely upon being able to obtain an engine-driver who has been tested by examination, besides having a ready means of punishment where damage to property has been occasioned by neglect or carelessness on the part of an engine-driver.

The work of the Board, which, I anticipate, will hold its preliminary meeting shortly, will be extremely heavy for the first twelve or eighteen months; but I anticipate being able to present a satisfactory report at the end of current year on the work performed, and feel sure that such report will show an absolute immunity from the disabilities which characterised some of the methods obtaining under the past system, which could not be avoided.

In conclusion, I desire to record my sincere thanks to the members of the various Examining Boards for their loyalty and assistance rendered since my appointment in December, 1900, as Chairman of the several Boards, many of whom have sat with me during the whole period.

I have, etc.,

C. J. MATHEWS,

16th May, 1905. Chairman Board of Examiners.

DIVISION V.

Ninth Annual Report of the Chief Inspector of Explosives and Government Analyst, for the Year 1904.

The Secretary for Mines, Perth.

SIR,

I have the honour to submit my ninth Annual Report dealing with the work done in my Branch during the year ending 31st December, 1904, for the information of the Hon. Minister for Mines.

My duties are of so varied a description that it is difficult to tabulate the work carried out, but for convenience I divide my report (as in past years) into two portions, dealing (1) with my duties as Inspector of Explosives and (2) with the analytical work under my supervision.

PART I.—EXPLOSIVES.

The following special matters have engaged considerable attention during the year:—

(1.) The regulations dealing with explosives have been completely revised.

(2.) Improved arrangements have been made with regard to the carriage of large quantities of explosives through the city of Kalgoorlie in connection with the mines on the Boulder Belt.

(3.) The large magazine depôt at Fremantle has been moved and thoroughly reorganised.

(4.) Arrangements are nearly completed for the removal of the depôts at Coolgardie and Menzies.

(5.) A travelling Inspector has been appointed, and will take up his duties with the new year.

(6.) The explosion of a magazine at Coolgardie and the subsequent attempt to explode another magazine at the same place caused considerable work and anxiety.

(7.) A large amount of time was occupied by my work as a member of the Royal Commission on the Ventilation and Sanitation of Mines.

These matters will all be dealt with at fuller length in their proper place.

IMPORTATION.

The importation of explosives into this State still continues on a large scale, as shown by the following table giving the quantities imported during the last 10 years.

Some difficulty exists in the way of furnishing correct returns.

The figures given are those kindly supplied by the Collector of Customs, Fremantle, but do not agree with the records kept in my office, and as these goods are free imports I am given to understand

8907

RESERVE FOR EXPLOSIVES

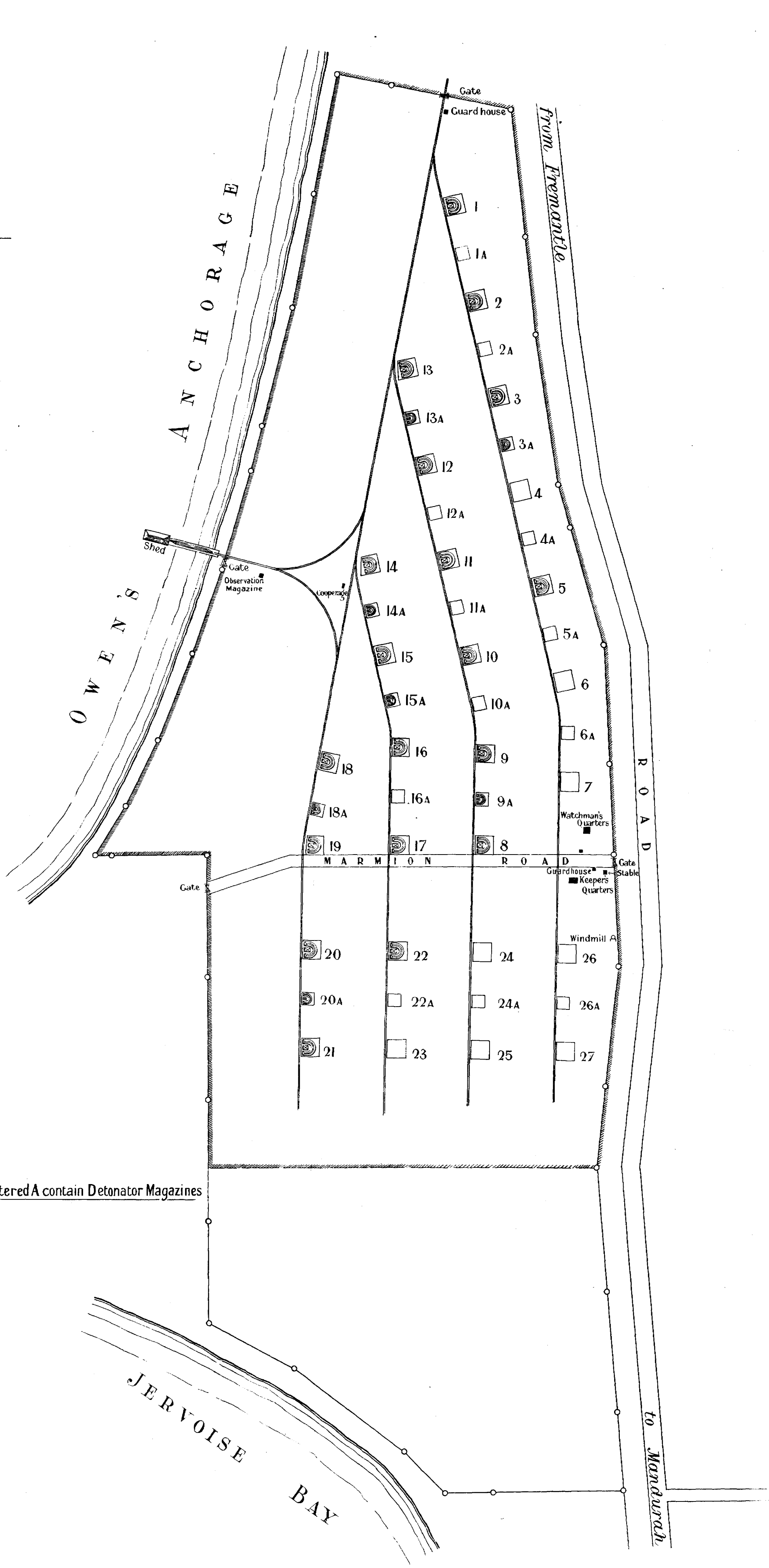
327 acres

Scale of Chains

0 2 4 8 12 16 20

DEPARTMENT OF MINES
WESTERN AUSTRALIA

Hon. R. Hastie M.L.A.
Minister for Mines.



Note-Sites lettered A contain Detonator Magazines

that the Customs figures may not be strictly accurate. As I am unable to say how far this is the case I publish the Customs figures without alteration.

The figures show that the importation of explosives were the highest on record.

TABLE.

Articles.	Weight or Quantity.	Value.
		£
Cartridges, Military	...	4,625
Caps, Percussion	...	21
Cartridges (N.E.I.)	...	10,123
Cartridge Cases (empty or capped)	...	12
Detonators	...	4,043
Dynamite, Gelatine Dynamite, Gelignite, and Blasting Gelatine	4,301,240 lbs.	160,817
Explosives (N.E.I.)	...	22
Fireworks	...	245
Fuse	649,281 coils	15,653
Powder, Blasting	136,610 lbs.	3,352
Powder, Sporting	6,100 lbs.	652
Total Value of Importations	...	199,565

The values of the importations, as declared on the Customs returns, have during the last five years been as follows:—

Table of Total Values for Five Years.

Year.	1900.	1901.	1902.	1903.	1904.
	£	£	£	£	£
Nitro-Glycerine Compounds	131,012	123,367	157,100	152,071	160,817
Blasting Powder	7,181	5,344	5,577	5,113	3,352
Sporting Powder	668	283	224	601	652
Fuse	9,193	11,687	13,439	10,433	15,653
Rackarock	802	...	115	...	...
Fireworks	167	150	341	...	245
Cartridges	3,793	5,973	8,593	...	14,781
Detonators	4,494	4,704	4,358	5,967	4,043
N.E.I.	6	779	...	4,651	22
	157,316	152,287	189,747	178,836	199,565

I regret that I am unable to give an analysis of the importations of nitro-glycerine compounds, owing to the fact that the various kinds are not distinguished by the Customs, and I am therefore unable, for the first time, to show what kinds of explosives are most in demand.

An interesting table, giving a comparison between the importations of explosives into this and the other States of Australia, is given in an appendix, and is compiled from returns kindly supplied by the Governments of the respective States, through the Hon. the Premier.

The routine inspection of the large shipments arriving in this State, combined with the periodical inspection of magazines, has entailed the examination of many samples of explosives, as shown by the following table, which does not include examinations as to physical condition only:—

EXPLOSIVES.

Kind.	No. of Samples tested.
Gelignite	989
Gelatine Dynamite	258
Blasting Gelatine	245
Dynamite	12
Pitite	8
Cheddite	5
Fuse	129
Sundry Analyses and Tests of Materials	20
Total	1,666

There are seven importation licenses in force at the close of the year.

STORAGE.

The removal of the Fremantle Magazine Depôt is at last an accomplished fact.

In the early part of the year the magazines were removed bodily from the old reserve at Robb's Jetty and re-erected on the site previously prepared for them at Woodman's Point. This site was also enclosed with a high fence and connected with a special landing stage and transit shed. The greater facilities afforded encouraged an increase of private magazines, and coincidently with the removal of the old magazines several new ones were erected. The depôt is now a very good one, and a full description here, perhaps, would not be out of place.

The reserve (which lies contiguous to the sea shore 5½ miles South of Fremantle) comprises 327 acres, of which about one-fifth has been reserved for future extensions. The remaining four-fifths have been enclosed by an 8ft. galvanised iron fence and is connected by railway with the main railway line and to the adjacent landing shed. This shed (about 90ft. long) is erected on a specially provided jetty where lighters can ride in safety, with an ample depth of water. On the platforms of the landing shed about 5,000 cases of explosives can be stacked and sorted, and as the landing shed is provided with ramps besides which the lighters lie, the entire operation of discharging and classifying a large cargo of explosives can be carried on with great safety and despatch.

Within the enclosure already referred to sites are laid out for 27 main magazines and 19 detonator magazines, while there is considerable room for extension.

Of these sites, 19 are occupied by main magazines (two of which belong to the Government) and seven by detonator magazines (including one Government building), having a total licensed capacity of 575 tons of explosives and 3,000,000 detonators respectively.

This large amount of accommodation is, however, still insufficient, and further extensions are expected shortly. All these sites are, by means of parallel railway lines traversing the reserve, connected with the main railway line and jetty.

In addition to these magazines, there is a building provided as an observation magazine, in which, if desired, suspected stocks may be kept under surveillance, with a capacity of 25 tons.

The establishment of this large reserve involved a large outlay, and the following account of the expenditure, as furnished by the Public Works Department, shows the various items. The construction of the connecting railway line from Robb's Jetty (Item 1) serves other purposes, and should not be strictly debited against the removal of the reserve :—

	£
(1.) Construction of connecting railway to Robb's Jetty	4,285
(2.) Construction of sidings, etc., inside reserve	5,368
(3.) Removal and re-erection of existing magazines	1,654
(4.) Construction of jetty and shed	2,886
(5.) Fencing	3,087
(6.) Mounding buildings removed	1,243
(7.) Erection of quarters, well-sinking, and telephone and alarm connections	1,133
Total	£19,656

The above only represents the expenditure by the Government, who undertook the removal and mounding of existing magazines on behalf of owners. In addition to this, several thousand pounds were spent by explosive merchants in erecting and mounding new buildings. The reserve, in spite of its large cost, makes a handsome return to the Government. I have been informed that the facilities are greater and the cost of handling less than in any other State of Australia. I have not, however, been able to verify this statement.

I attach to my report a plan showing the arrangements of this depôt, and a general photo. showing the character and arrangement of the buildings and mounds. There are several objections which could be raised even now to some of the arrangements on the reserve ; but it is not possible to get everything perfect, and I have considered that the circumstances have justified these being allowed to continue.

As during the previous year, I have to again report the fortunately rare occurrence of a magazine exploding.

At about 3·30 a.m. on the 19th May, 1904, the magazine belonging to the National Explosives Co., situated on the Coolgardie Reserve, was observed to be on fire, and almost immediately afterwards exploded, with complete destruction of the building and contents and of the adjacent detonator magazine belonging to the same owners.

The magazine, which was licensed for 20 tons, contained at the time a little over 17 tons of nitroglycerine compounds, made up as follows :—

289	cases of dynamite
124	cases of blasting gelatine
18	cases gelatine dynamite
251	cases gelignite
Total	682 cases.

The detonator magazine contained 113,200 detonators.

Fortunately, only slight personal injury resulted to one man, and the structural damage to neighbouring magazines and to buildings in the town of Coolgardie was not extensive. Full details were submitted in a special report of the explosion and need not be repeated here. As the outcome of my personal inquiries and the subsequent coronial inquiry held, I came to the conclusion that the most probable cause of the explosion was deliberate human agency, but no evidence could be obtained as to who was the person directly responsible for the outrage, though some light may be considered to have been thrown on the occurrence by the subsequent events.

On the 3rd November, a man named Miller reported to the police at Coolgardie that he had discovered and extinguished a fire burning at the door of the magazine occupied by the Nobel's Explosives Co., Hamburg, also situated on the Coolgardie Magazine Reserve, and being the nearest to the

site of the magazine which exploded in the previous May. A rather sensational turn was given to events when, after inquiry, the police arrested the informant, Miller, as himself the originator of the fire, and on subsequent trial at the Criminal Court, Kalgoorlie, he was convicted and sentenced to nine months' imprisonment.

Both these occurrences laid considerable emphasis on the requests which I had made to have the reserve properly fenced, and I am glad to say that during the year money provision has been made to provide a fence, and at the same time to remove the magazines to a more remote site, rendered desirable by the growth of the town since the reservation of the existing magazine area. Tenders for this work, and also for the removal of the magazines at Menzies (referred to in my last Annual Report), will be called for early in the new year.

During the year under review an important change was made with regard to the reserves for magazines in various parts of the State. These were formerly held by the Lands Department, from which all leases were issued. They have now been vested in the Minister for Mines, and leases will be issued from this office.

Owing to delays in arranging necessary legal preliminaries, the issue of these leases is at present in arrears, but I hope to have them brought up to date very shortly.

There are 67 buildings erected on explosives reserves, including Government buildings and exclusive of detonator buildings, representing a total capacity of 1,198 tons. Outside of reserves, 18 licenses for magazines have been granted (five of which are magazines on Government works), having a capacity of 45 tons.

Licensed Premises (Sale).

There is little to be said about these, except that I am looking forward to the work of the travelling inspector as likely to put them on a proper footing. Many of the premises have been looked after in a very lax manner, and the occupiers, in many instances, pay little or no heed to the terms of their licenses. I hope next year to be able to report that a great improvement has taken place.

The following table shows the licenses issued, revoked, and remaining in force during the last five years:—

Store Licenses.

Licensed Premises.

Year.	Applications received.	Licenses issued.	Licenses revoked.	Licenses remaining in force.
1900	46	42	16	100
1901	18	17	10	107
1902	31	32	14	125
1903	30	30	28	127
1904	7	7	31	103

This discloses a falling-off from last year, almost entirely due to the want of proper supervision, which the travelling inspector will in future supply. This falling off also means a slight loss in revenue.

Carriage.

Last year I referred to the carriage of explosives in and about Kalgoorlie, and a good deal of correspondence has taken place, and one or two conferences have been held with the explosives merchants and municipal authorities at Kalgoorlie, with a view to arriving at a more satisfactory arrangement.

The matter has, however, been surrounded with a good deal of difficulty.

The state of the roads in wet weather, and the arrangements by which consignees were compelled to take delivery of their explosives from the railway in the middle of the town, rendered almost impossible any other route of carriage than that generally followed.

As the result of negotiations with the Commissioner of Railways, however, a siding has been put in, by means of which all handling of explosives to and from the railway trucks will be conducted in the vicinity of the reserve and quite outside the municipal boundaries. This will also render available a better route to the mining areas along which the large supplies of explosives required can be carted without traversing populous districts.

Special permits governing this traffic will now be issued, and so the matter will be put on a better footing.

Inspection.

As far as possible, all magazines have been inspected at least once during the year, and these in the more accessible districts have been visited several times; but those in some remote districts (*e.g.* Esperance, Norseman, and Lawlers) it has been impossible to inspect, and, as regards licensed premises, only spasmodic and partial inspections have been possible.

The many duties which I have had to discharge and the increased necessity for my constant presence in Perth have rendered extended tours of inspection impossible.

I am, therefore, pleased to state that the Government have during the year approved of my recommendation for the appointment of a travelling inspector, and my senior assistant, Mr. Guest, has been promoted to the new post. He will commences his duties on the 1st January, and I confidently look forward to the result as amply justifying this new appointment.

In order to simplify the work of inspection and introduce a few reforms which past experience has shown to be necessary, the regulations have during the year been revised and added to, and issued in a more compact form; a more convenient form of licensing has been introduced, and the work of the office has been readjusted so as to place all licensing in the hands of the travelling inspector; also a complete record of the results of all inspections will in future be kept.

A very large amount of my time and energies have been spent during the year in connection with the Royal Commission on the Ventilation and Sanitation of Mines, to which I was appointed in May last. Special investigations were carried out to determine the gases arising from the use of explosives in our mines, and a large number of analyses of mine air were made, in addition to attending the sittings of the Commission and assisting in taking evidence. The report of this commission will be circulated shortly, and it is hoped that the work done will be found as useful as it was interesting.

The following is a list of the explosives condemned during the year in the course of inspection, and the methods in which they were dealt with :—

January 23rd.—Three cases of nitro-glycerine compounds were condemned at Kalgoorlie for exudation, and were destroyed. A sack of old cartridges, in more or less bad state, discovered in a mine magazine, were destroyed at the request of the Inspector of Mines.

March 2nd.—One case of gelignite was destroyed on account of damage by water.

August 10th.—Twenty-seven cases of gelignite and 20 cases of gelatine dynamite were destroyed on account of low heat test and physical deterioration.

November 10th.—Nine cases of various brands and kinds were destroyed at Kalgoorlie for physical deterioration.

In addition to above, one lot of 49 cases of gelignite and gelatine dynamite were ordered into immediate consumption on account of incipient deterioration.

Total amount destroyed:—60 cases, containing 3,000lbs.; and 49 cases, containing 2,450lbs., ordered into consumption.

Part II.—ANALYTICAL.

This part of my work has little or no connection with the general work of the Mines Department, and is not such as is capable of extended treatment here.

Nevertheless, from time to time results are obtained which it seems desirable should call for more notice and more detailed record than is possible in an annual report, and I propose, as time goes on, to issue occasional bulletins giving a full account of the work which is performed.

This will be specially desirable in connection with the work which is entrusted to me as chemist to the Agricultural Department, and which, with the growth and development of the agricultural industry of the State, is greatly on the increase.

The number of analyses carried out, and the departments for which they were made, are shown in the attached list:—

Explosives, as detailed on page 119	1,666
Agricultural Department	89
Central Board of Health	110
Crown Law Department	28
Public Works and Railway Departments	296
Stock Department	10
Customs (for Commonwealth Government)	1,154
Inspection of Liquors	142
Miscellaneous	24
	3,519

To meet the demands of this varied assortment of work, considerable extension of my staff has taken place during the year, and, with the present prospects, considerable enlargement will still be necessary in the near future.

Staff and Finances.

The staff under my control at present consist of the following:—

Travelling Inspector	1
Clerks	3
Analysts	6
Magazine Keepers	2
Watchmen	3
	15

And in addition there are eight honorary Sub-Inspectors of Explosives in the country districts, who combine a general oversight over matters connected with this branch with their duties as officers of other departments.

Explosives Reserve 8907.

FREMANTLE, W.A.

Though my branch, from the character of the work carried on, cannot in many ways be expected to be revenue producing, it is satisfactory to note that it more than pays its way, as shown by the following figures :—

	Revenue.	Expenditure.
	£	£
For financial year ending 30th June, 1904 ...	4,707 ...	3,052
Estimated for year ending 30th June, 1905 ...	4,150 ...	3,900

No allowance is made here for a sinking fund and interest on expenditure on magazine reserves, buildings, etc., which has been paid out of consolidated revenue.

As in past years, I have to record my appreciation of the assistance given to me by the officers under the Commissioner of Police and the Inspectors of Mines under the State Mining Engineer.

I also wish to express my appreciation of the energy, assiduity, and loyalty with which the officers under me have carried out their duties during the year.

I have, etc.,

E. A. MANN,

Chief Inspector of Explosives, Government Analyst, and Agricultural Chemist.

3rd December, 1904.

Return showing Importation of Explosives in the various States of the Commonwealth during 1904.

Note.—Owing to the nature of the returns received from the various States, some items have to be shown according to value while others are according to weight. Percussion caps and cartridges have been excluded and only industrial explosives enumerated.

—	Western Australia.	New South Wales.	Victoria.	Queensland.	South Australia.	Tasmania.	New Zealand.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Nitro-glycerine Compounds	4,301,240	1,147,150	1,424,650	1,012,075	812,100	292,550	625,075
Blasting Powder	136,610	1,024,306*	176,625	183,750	111,300	47,725	671,643
Sporting Powder	6,100	23,275	32,590	25,192	Not given		47,010
	4,443,950	2,194,731	1,633,865	1,221,017	923,400	340,275	1,343,728
	£	£	£	£	£	£	£
Fuse	15,653	Not given	Not given	7,264	3,858	Not given	5,251
Detonators	4,043	3,200†	6,973	3,040	1,591	1,378	1,802
Other Explosives	267	3,300†	3,481	4,893	158	262	260
Total	19,963	6,500	10,454	15,197	5,617	1,640	7,313
Total value of all Explosives enumerated above	£184,784	£92,500	£84,271	£70,271	£49,053	£23,492	£57,784

* Including "Blasting Cartridges." † Approximate (by calculation).

DIVISION VI.

School of Mines of Western Australia.

DIRECTOR'S REPORT.

Although actual work commenced in November, 1903, the School of Mines at Kalgoorlie was officially opened by the Premier on 25th March, 1904, and lectures and practical work have been regularly carried on throughout 1904.

The first year of the school's existence has been a successful one in the matters of attendance and results. The support accorded to the institution and the interest shown by the students in their work have been satisfactory; but students have been handicapped in their studies by the calls of their daily employment. I look forward, however, to more students presenting themselves who will be able to devote their whole time to the Associateship courses.

The courses are designed to give a student a sound training in the theory and practice of his work, such as will fit him to take up in the future a responsible position in connection with mining.

It seems, however, to be desirable that an alteration should be made in the school work, so as to extend the Associateship courses over four years instead of three as at present. This will enable each subject to be more thoroughly entered into by the students, and will allow of a more suitable arrangement of the work of each year.

At the beginning of the year Mr. H. E. Hill took up his duties as secretary and assistant lecturer in mathematics; in March Messrs. W. H. Baker, B.Sc., and A. S. Bowman, B.E., joined the staff, the former as assistant on the metallurgical side of the school, and the latter as lecturer in applied mechanics, drawing, etc.

So far, chiefly first year subjects have been taken in the lectures, and to meet the requirements of those working in the mines the class work has been duplicated, but in future second and third year work in different subjects will be necessary, and will require extra assistance, more especially in the metallurgical division of the school work.

The school has secured a good class of students, whose ages range from 17 to 35, the average being 25 years. Many of these students have shown great earnestness in their studies and have attended the school at considerable inconvenience to themselves.

Although the work done by the school cannot wholly be judged by examination results, but will become apparent in the future work of the students, still the students who sat for examination last November have acquitted themselves creditably—one of the School of Mines students secured the Senior Scholarship—and considering that the school has just completed its first year, the results have been very encouraging.

The details of the annual examinations for Diplomas, Certificates, and Scholarships are given below.

It is worthy of note that only a very small number of public school scholars entered for the Junior Scholarships, each of which has an annual value of £45, *e.g.*, there was only one candidate from the whole of the Kalgoorlie State schools, and altogether only 10 candidates for three Junior Scholarships. Only one of these scholarships was awarded, as the standard reached by the majority of the youths who entered was below that prescribed by the regulations. No doubt in future years there will be more candidates from the State schools for these valuable prizes, and the standard of proficiency reached by the candidates may be expected to increase.

The class examinations have shown the weakness of candidates in elementary mathematics, an important subject in every mining school course. There was a large number of candidates from Perth, Coolgardie, and Kalgoorlie for the Entrance Examination of the school, but, although the examination was not difficult, the majority failed to pass owing to their lack of knowledge of preparatory mathematics. Failure in this examination does not debar the student from attending classes at the school, but those students who pass through the Entrance Examination successfully are better qualified to take advantage of the lectures in the ordinary class subjects.

As the examinations in the subjects for the school courses entitle successful candidates to a class certificate, it is not intended to make the standard of examination a low one, for it must be recognised that a School of Mines certificate should not be granted in any subject except to those fully qualified in the class work.

During the year ending 31st December, 1904, a total of 303 free assays and determinations have been made at the School of Mines for prospectors, the majority of the assays being for gold. A number of determinations were also made for copper, asbestos, etc., and a large number of special tests were made on the auriferous arsenical pyrites found at Randells, the results of which I have embodied in a report to the Department.

The school has also from time to time been used for the taking of evidence by some six Royal Commissions, of two of which I was a member.

Practical Classes.

As far as possible prominence has been given to practical work in connection with the school classes. The laboratories for chemistry and assaying have been equipped with suitable apparatus and are well fitted up, so that students have an excellent opportunity of gaining practical experience in these subjects.

There is a good supply of apparatus for the different sections of physics—heat, sound, light, electricity, and mechanics—but it is intended to further increase the stocks in some directions, so as to enable further practical work to be accomplished, especially in electricity.

The drawing office is well equipped with drawing tables, presses, etc., and is available to students at all times during school hours. The ordinary survey instruments have been procured, and field practice is regularly carried on throughout the year.

For the geology and mineralogy classes, type collections of the chief rocks and minerals have been secured, besides a large number of local samples. The classes also indulge in periodical excursions into the field, and so gain a fuller understanding of the class work, as well as an intimate knowledge of the geology of the district.

The erection of the proposed mechanical workshop and museum will greatly enhance the value of the institution, and as the plans have now been prepared, it is hoped that the buildings will be an accomplished fact during the present year.

Attendance, 1904.

—	Total Enrolment.			Average Attendance.		
	First Term.	Second Term.	Third Term.	First Term.	Second Term.	Third Term.
Mathematics, Preparatory	65	49	32	44	30	20
Mathematics I.	17	9	10	11	8	7
Mechanical Drawing I.	20	10	7	11	8	5
Geology	19	16	11	13	12	7
Surveying I.	6	7	6	3	5	4
Applied Mechanics I.	6	2	2	4	2	2
Mineralogy	5	5	3	3	4	2
Mining I.	1	...	...	1	...	...
Chemistry I. (Lectures ... ...)	60	45	28	40	34	20
Chemistry I. (Laboratory ... ...)	60	45	28	35	33	19
Assaying I. (Lectures ... ...)	36	30	20	19	24	17
Assaying I. (Laboratory ... ...)	36	30	20	21	21	14
Assaying II. (Lectures ... ...)	1	1	1	1	1	1
Assaying II. (Laboratory ... ...)	1	1	1	1	1	1
Metallurgy I. (Lectures ... ...)	...	1	1	...	1	1
Metallurgy I. (Laboratory ... ...)	...	1	1	...	1	1
Physics I.	17	17	13	11	13	10
Engine Driving	35	43	43	25	22	9
Total Attendance	385	312	215	243	220	140
Individual Students ...	158	134	107	...	...	...

Examiners.

The following examiners were appointed to conduct the annual examinations in November, 1904:—

Mathematics, Preparatory	F. B. Allen, M.A., B.Sc.
Mathematics I.	J. Parr, B.Sc., and F. B. Allen, M.A., B.Sc
Chemistry	A. Montgomery, M.A., F.G.S., and A. Purdie, M.A.
Assaying	F. B. Allen, M.A., B.Sc., and G. C. Klug, A.S., A.S.M.
Metallurgy	G. C. Klug, A.S., A.S.M., and F. B. Allen, M.A., B.Sc.
Mineralogy	A. Purdie, M.A., and L. K. Ward, B.E.
Geology	F. B. Allen, M.A., B.Sc., and A. Montgomery, M.A., F.G.S.
Physics	W. J. Hancock, M.I.E.E., and J. B. Allen, B.Sc.
Drawing	A. S. Bowman, B.E., and J. Parr, B.Sc.
Applied Mechanics	J. Parr, B.Sc., and A. S. Bowman, B.E.
Surveying	T. Butement, M.E., and G. W. Ellis, Inspecting Surveyor.
Engine Driving	C. J. Mathews, A.M.I.C.E., and T. Butement, M.E.
Chemistry (Entrance Scholarship)... ...	W. H. Baker, B.Sc.
Physics (Entrance Scholarship)	W. H. Baker, B.Sc.
Arithmetic (Junior Scholarship)	F. B. Allen, M.A., B.Sc.
Geometry (Junior Scholarship)	F. B. Allen, M.A., B.Sc.
Algebra (Junior Scholarship)	F. B. Allen, M.A., B.Sc.
English (Junior Scholarship)	H. E. Hill.
Physiography (Junior Scholarship) ...	H. E. Hill.

Examination Results.

The following table shows the passes obtained by students of the school at the annual examinations held in November, 1904:—

Subject.	First Class.	Second Class.	Third Class.	Total.
Mathematics I.	1	1	2	4
Chemistry I.	2	1	...	3
Assaying I.	1	3	4	8
Assaying II.	...	...	1	1
Metallurgy I.	1	...	...	1
Physics I.	...	2	1	3
Mineralogy	...	1	...	1
Geology	...	...	5	5
Drawing I.	...	1	1	2
Applied Mechanics I.	...	2	...	2
Surveying	...	1	1	2
Engine Driving	...	...	3	3
Total	5	12	18	35

Scholarships.

The following candidates presented themselves for examination for the scholarships, which were offered last year for the first time. The names are arranged in order of merit:—

Junior Scholarships.

(1.) *South and Eucla Division.*

Hardwicke, A. (Perth).
Hanlin, P. (Perth).
Parkinson, T. (Albany).
Knox, A. H. (Albany).
Guy, C. H. (Perth).
Landells, R. B. (Perth).

Scholarship awarded to A. Hardwicke.

(2.) *North-West and Kimberley Division.*

Hughes, J. (Cue).

Scholarship not awarded.

(3.) *Eastern Division.*

Scouler, J. J. S. (Coolgardie).
Preston, L. H. (Coolgardie).
Monkhouse, R. (Kalgoorlie).

Scholarship not awarded.

Entrance Scholarships.

(1.) *Outside Eastern Division.*

Hutchinson, D. M. (Marble Bar).
Rowe, H. E. (Perth).

Scholarship awarded to D. M. Hutchinson.

(2.) *Eastern Division.*

No candidate.

Senior Scholarship.

Beech, S. J. (Kalgoorlie School of Mines).

Scholarship awarded to S. J. Beech.

F. B. ALLEN,
Director School of Mines.

DIVISION VII.

Report of the Engineer for Mines Water Supply.

To the Secretary for Mines.

SIR,

For the information of the Hon. the Minister for Mines, I herewith submit my Annual Report for 1904.

The work, as in previous years, has been of a varied and miscellaneous character, comprising the construction of reservoirs for conservation of water, boring for water, deep alluvial leads, sinking wells, improvements to soaks, lagoons, etc., clearing roads, examination of water rights under the Act, maintenance of existing water stations, collection of revenue from sale of water, investigating and reporting on requests and petitions from various municipalities and local authorities relating to water supply, etc.

The attached statements show particulars of principal works done, but to carry out many small works in all parts of the State at a reasonable cost necessitates care and considerable office work, which does not show in this report.

To keep his work up every officer on the staff has worked more than a fair amount of overtime during the year. I take this opportunity of thanking the staff, both on the fields and in this office, for the long hours worked and loyal support given during my absence on sick leave.

The revenue for the year amounts to £6,814, and the expenditure for maintenance and small works not charged to construction, £12,796. During the year several reductions were made in the price of water sold to the public. This in some cases increased the sales, but did not lead to a corresponding increase in revenue. These reductions were solely in the interests of the public and not made from a commercial point of view.

Boring.—The summary on page 128, on attached sheet, shows 120 holes and 13,934 feet at an average cost of 6s. per foot. The cost of this work on Eastern Fields runs out at about 5s. per foot; on Northern areas, Murchison, and Pilbarra, considerably more, owing to difficulty in transport, hotter climate, and less choice in selecting labour. It is satisfactory to know that boring on the Murchison has been reduced from about 20s. per foot to about 10s. per foot.

Allowing for transport and difference in wages, the Mines Water Supply boring compares very favourably indeed with similar work in other parts of Australia.

Statement attached (page 128) shows that boring operations, items 1 to 19, Eastern Fields, proved successful in each locality. On the Murchison, one out of two successful; on the Pilbarra, three out of four successful. The next year will show a further improvement on the Murchison.

One of the two horse-power boring plants imported from Victoria has been tried, and proved very expensive and cumbersome to move and also to work; the first by reason of faults in construction and great weight, the second on account of horse feed required in back country. I do not consider the class of drill is suitable for this country.

During the year seven hand boring plants were loaned to various parties on easy terms. An "H" class diamond drill, imported by the Department to assist the mining industry, etc., was engaged by a leaseholder at Peak Hill—the Department to bear half cost and leaseholder the other half. Result of boring operations will run into next year (1905).

Wells Sunk.—Well-sinking, which followed boring, was equally successful, and the cost per foot most satisfactory. Practically the whole of this work was done departmentally, and nearly every well is a great distance from a railway station. Allowing for travelling and high wages, etc., the cost is low.

The result of these wells is that about $\frac{1}{4}$-million gallons per day of fresh and about the same quantity of salt water is made available for the public and the mines.

Rainfall.—See schedule (page 132).

Inspections and Reports.—The more important reports, being on proposed works, etc., number about 30.

Water Stations leased.—During the year five reservoirs and 17 wells were leased. Caretakers and pumpers numbered 15.

The map attached shows locality and approximate cost of construction work done during the year.

A few photos accompany this report.

P. V. O'BRIEN, A.M.I.C.E.,
Engineer for Mines Water Supply.

26th July, 1905.

WATER SUPPLY BRANCH.

WORKS COMPLETED, UNDERTAKEN, AND INITIATED.

Boring.

Item.	Class of Work.	Locality.	General Description.	Remarks.
1	Boring for water	Davyhurst	Hand Plants, those in soft country cased. Feet bored 1903, 2,219 „ „ 1904, 1,405 Total to date 3,624	As described in special reports, the work obtained good results, a very fine supply of water being found
2	Do. fresh water ...	Wilson's Patch, Darlôt Road	4 bores — 520 feet ...	Bottomed on granite. Good supply, fair quality. Well sunk on No. 4
3	Do. alluvial gold ...	Kanowna North Lead ...	8 „ — 1,370 „ ...	*See* report S.M.E.
4	Do. battery water ...	Duketon Battery ...	3 „ — 315 „ ...	Good supply fresh water. Well sunk on No. 2A
5	Do. fresh water ...	Leonora-Lawlers Road, at Doyles	2 „ — 160 „ ...	For road supply. Good supply; fresh
6	Do. battery W.S. ...	Yarrie	4 „ — 410 „ ...	Fresh water; heavy supply found. Well sunk on No. 4
7	Do. do. ...	Randalls	13 „ — 650 „ ...	Heavy supply; salt water? Well sunk on No. 6
8	Do. prospectors W.S.	Fairyland, 9 miles S.E. of Lawlers	1 „ — 110 „ ...	Good supply; fresh. Well sunk
9	Do. Town Well ...	Duketon	3 „ — 230 „ ...	Heavy supply, fresh, in No. 3. Well sunk
10	Do. water	Duketon and Mount Maiden	9 „ — 630 „ ...	Heavy supply, fresh water, in No. 9. Cased and equipped as bore well
11	Do. prospectors ...	Pinjin	2 „ — 270 „ ...	Good supply, fresh, in No. 2. Well sunk
12	Do. road supply ...	Leonora-Lawlers Road, 28-Mile Post	1 „ — 101 „ ...	Good supply, fresh. Well sunk
13	Do. prospectors ...	Eucalyptus	11 „ — 655 „ ...	Good supply, fresh, in No. 11. Cased and equipped as bore well
14	Do. do. ...	Waite Kauri	2 „ — 202 „ ...	Good supply; fresh water. Well sunk on No. 2
15	Do. batteries ...	Mt. Monger	9 „ — 1,030 „ ...	This boring was to locate a supply of water to enable mines in the locality to be worked
16	Do. State battery ...	Waverley	5 „ — 500 „ ...	Good supply; salt. Well sunk to 106 feet
17	Do. battery supply	Between Jacoletti and Parker's Range	16 „ — 1,250 „ ...	Heavy supply in No. 13. This is in convenient position for leases which are said to be valuable though only now in the prospecting stage
18	Do. road supply ...	Kookynie-Edjudina Road	3 „ — 280 „ ...	Good supply; fresh. Well sunk on No. 3
19	Do. do. ...	Pinjin-Edjudina Road ...	3 „ — 163 „ ...	Good supply; fresh. No. 3 bore equipped as bore well
		Murchison District.		
20	Bores for water	Gabanintha	7 bores — 350 feet ...	No water.
21	Do. do.	Lake Austin	3 „ — 230 „ ...	Good supply; fresh. Equipped as bore well
		Pilbarra District.		
22	20-Mile Sandy, for battery supply	Sandy Creek	5 bores — 450 feet ...	Good supply; fresh
23	For prospectors	40-Mile Country ...	3 „ — 365 „ ...	No water
24	Do.	Lalla Rookh	1 bore — 33 „ ...	Fair supply
25	For road supply	Pippingarra-Tambourah Road	1 „ — 34 „ ...	do.

Summary.

No. of bores.	Total feet.	Average cost per foot.
120	13,934	6/-

DEPARTMENT OF MINES, WESTERN AUSTRALIA

Hon. H. Gregory M.L.A
Minister for Mines

MAP OF
WESTERN AUSTRALIA

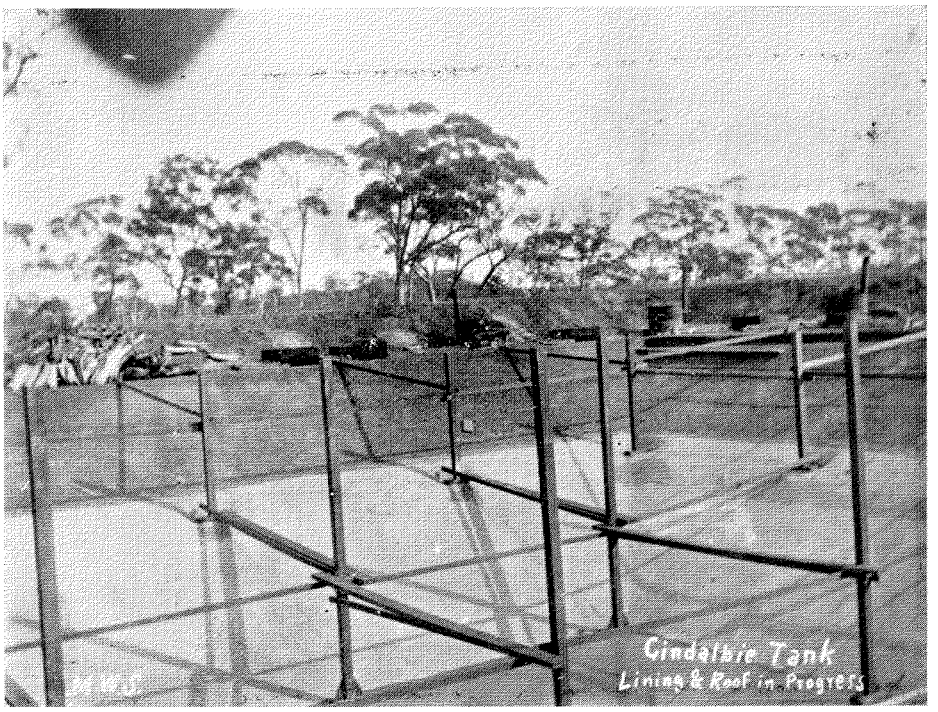
1905

Scale of English statute miles.

MINES DEPARTMENT
Water Supply Branch

Litho. Shewing Locality, also Graphically Cost of Works

H. J. Pether, Government Photolithographer. Perth. W. A.



Gindalbie Tank.

N.E. COOLGARDIE G.F.

Mulgabbie Tank.

N.E. COOLGARDIE G.F.

Well Sinking.

Item.	Name of Well.	Locality.	General Description.	Remarks.
		Eastern Goldfields.		
26	May Nulty	Leonora-Darlôt Road ...	Acquired and repaired 93 feet	Fair supply fresh water
27	Sullivan's Creek	„ „ „ ...	5 x 3 shaft, depth 38 feet	Very good supply; fresh
28	126-Mile	Rabbit Proof Fence ...	5 x 3 „ „ 88 „	„ „ „
29	Pennyweight Well ...	Pennyweight Point ...	5 x 3 „ „ 117 „	„ „ „
30	Teutonic Well	Leonora-Darlôt Road ...	5 x 3 „ „ 110 „	Good supply of water; slightly brackish
31	Leinster Town Well ...	Lawlers-Sir Samuel Road	6 x 4 „ „ 64 „	Fair supply; fresh
32	Harris Town Well	„ „ „	6 x 4 „ „ 108 „	Very good; supply fresh
33	Mulwarrie State Battery No. 2	Near Mulwarrie	6 x 4 „ „ 163 „	Fair supply; salt
34	Duketon State Battery ...	2½ miles West of Duketon townsite	6 x 4 „ „ 102 „	Good supply; fresh
35	25-Mile	Leonora-Lawlers Road ...	Drive 20 feet	Abandoned
36	Yarrie State Battery ...	Yarrie	6 x 4 shaft, depth 94 feet	Good supply; fresh
37	Randalls State Battery ...	About 4 miles South of Randalls townsite	6 x 4 „ „ 41 „	Very heavy supply, salt
38	Fairyland	At 9 miles South-East of Lawlers	5 x 3 „ „ 91 „	Good supply; fresh
39	No. 17 Well	Davyhurst	6 x 4 „ „ 170 „	Small supply; salt
40	No. 23 Well	„	6 x 4 „ „ 209 „ drive 41 „	Very heavy supply struck; salt
41	No. 29 Well...	„	6 x 4 „ depth 115 „	Good supply; nearly fresh
42	Duketon Well	Duketon	6 x 4 „ „ 53 „	Heavy supply; fresh
43	Eucalyptus Bore Well ...	Eucalyptus	„ „ 94 „	Good supply; equipped as bore well
44	Doyles	Leonora-Lawlers Road ...	5 x 3 „ „ 72 „	Heavy supply; fresh
45	28-Mile Well	„ „ „ ...	5 x 3 „ „ 98 „	„ „ „
46	Waite Kauri	7 miles E.S.E. from Mertondale	5 x 3 „ „ 81 „	Very heavy supply; fresh
47	Pinjin	Pinjin, ¾ mile West of 207 R	6 x 4 „ „ 136 „	Good „ „ „
48	Davyhurst No. 1	Davyhurst	6 x 4 shaft, deepening and driving 50 feet	Equipped with windmill, etc.
49	47-Mile Post Well	Kookynie-Edjudina Road	5 x 3 shaft, depth 110 feet	Good supply; fresh
50	15-Mile Well	Leonora-Lawlers Road ...	5 x 3 „ „ 72 „	Very good supply; fresh
		Murchison Goldfields.		
51	State Battery Well ...	Black Range	6 x 4 shaft, depth 95 feet	630 gals. per hour; brackish
52	71-Mile Well	Magnet-Black Range Road	5 x 3 „ „ 110 „	200 „ „ nearly fresh
53	Cue-Day Dawn W.S. ...	12 miles N.E. of Cue ...	6 x 4 „ „ 60 „	Heavy supply; fresh
54	Field's Find	¼ mile W. of townsite ...	5 x 3 „ „ 67 „	300 gals. per hour; fresh
55	Scotty's Well	Nannine-Wiluna Road ...	5 x 3 „ „ 66 „	Small supply, fresh
		Pilbarra Goldfields.		
56	Woomerina Well	On Yule River	5 x 3 shaft, depth 83 feet	Small supply; fresh
57	Shady Camp Well... ...	20 miles W. of Marble Bar	5 x 3 „ „ 27 „	300 gals. per hour
58	Little Shaw...	At Little Shaw Crossing	5 x 3 „ „ 23 „	1,000 „ „
59	Black Gin Point	5 miles N. of Pilbarra townsite	5 x 3 „ „ 53 „	175 „ „ fresh
60	Poondana	20 miles from Hedland on Marble Bar Road	5 x 3 „ „ 45 „	140 „ „ „
61	Soldier's Secret	(Gascoyne Field) ...	... ... 100 „	No record
62	Moolyella Well	Moolyella Tin Fields ...	5 x 3 „ „ 26 „	270 gals. per hour; fresh
63	20-Mile Sandy	Sandy Creek E.	6 x 4 „ „ 92 „	340 „ „ „ for Battery Supply
64	Frederick's Well	Hedland-Tambourah Road	5 x 3 „ „ 35 „	50 gals. per hour; fresh

Summary of Well-Sinking.

No. of Wells.	Total Depth.	Average Cost per foot.
39	3,292 feet ...	£3 18s. 6d. (including equipment)

Representing ¼ million gallons per day, fresh.
„ „ „ salt.

Improvements to Wells.

Item.	Name of Well.	Locality.	General Description.	Remarks.
65	Lawlers Town Well ...	On Town Lot 196 ...	Deepened 20ft.; drive, 10ft.	
66	Lawlers Stock Well ...	... ...	Deepened 6ft.	
67	Gwalia Bach Well ...	11 miles N. of Malcolm ...	Windmill and elevated tank erected	
68	Three Wells	Wiluna-Peak Hill Stock Route	Deepened 20ft.; timbered 50ft.	
69	State Battery	Mulline	Drive, 65ft.	
70	Well	Menzies-Mulline Road ...	Deepened 11ft.; drive, 13ft.	
71	Emu Well	Coolgardie-Norseman Road	Deepened 6ft.; drive, 6ft.	

Miscellaneous small Works.

Item.	Miscellaneous Works.	Locality.	General Description.	Remarks.
72	Survey and Trial Shafts ...	Gindalbie	Catchment, etc., surveyed	Tank site selected and plans prepared
73	Do. do. ...	Randalls	Catchment examined ...	Site selected
74	Do. do. ...	Kalpini	Do. do. ...	Report submitted
75	Do. do. ...	Norseman...	Catchment examined and surveyed	Special report *re* second tank near town
76	Do. do. ...	Menzies	Catchment examined and surveyed	From three suggested sites one was selected, as explained in special report
77	Survey and trial holes ...	Mulline	For tank for domestic Supply, close to town	A small but good catchment selected Proposed tank to be half million gallons, roofed and lined
78	Additions to Quarters ...	Marble Bar	Cost about £150 ...	Rent is charged for quarters

Works for Conservation of Water.

Item.	Class of Work.	Locality.	General Description.	Remarks.
79	Tank, 100,000 gallons ...	Dundas, on main road ...	Lined with asphalt composition and roofed with iron. Equipped with pump, etc., and fenced with netting	
80	Construction of Headworks	Davyhurst	By day labour, after contract, for excavation completed	
81	Tank, 200,000 gallons ...	Kanowna-Kurnalpi Road, Reedy's Lagoon	By day labour	Fenced and equipped with troughs and pump
82	Tank 100,000 gallons ...	Kanowna-Kurnalpi road, bullock holes	Bank across water-course	Fenced; and pump.

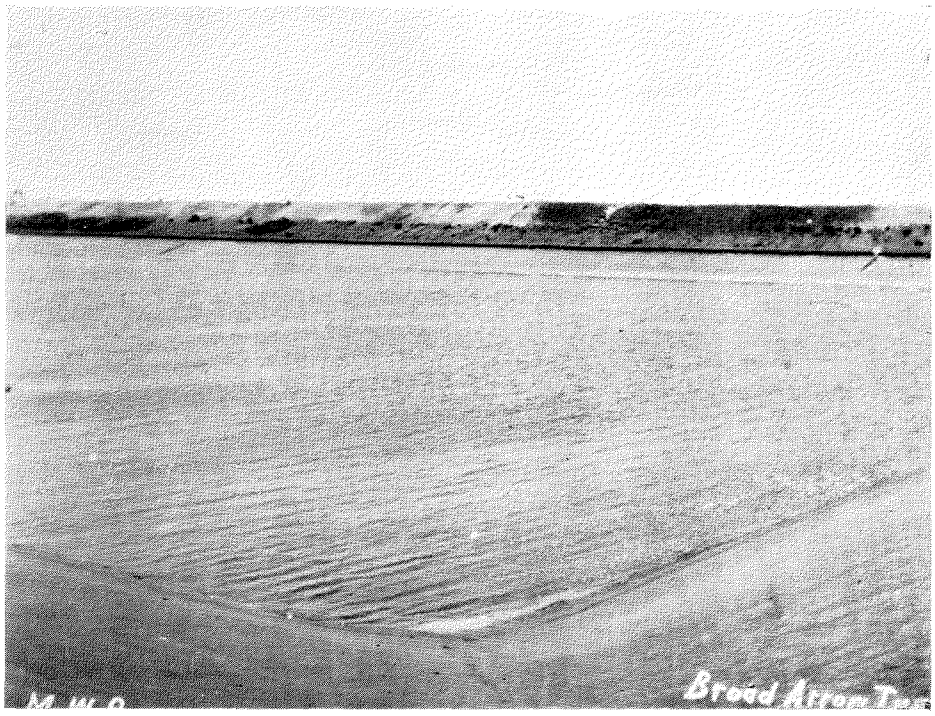
Roads—Surveys and Clearing.

83	Road clearing	Laverton-Erlistoun ...	Compass survey and road cleared 15ft., by contract, 45½ miles	Cost per mile, £6
84	Do.	Leonora-Darlôt	Cleared from Leonora to 6 miles north of Wilson's Patch, length 50 miles	Cost about £2 10s. per mile
85	Alteration of route and creek crossings made good	„ „	About 6 miles cleared ...	The water-course being deep, considerable work was required to make it fit for traffic
86	Road clearing	Erlistoun-Duketon-Mulga Queen	Theodolite survey made, road cleared 15ft. wide, length 39 miles	Cost per mile, £6
87	Do.	Morgans-Yundamindera	Survey and road cleared 15ft. wide, length 24 miles	Cost per mile, £4 10s.
88	Lake crossing	Lake Miranda, Lawlers-Samuel road	Length about 12chs. over a boggy lake, foundation of spauls, and covered with broken metal	
89	Road survey	Yelladine to Parker's Range	Theodolite survey made 24 miles	Not cleared

Summary.

Total length surveyed ... ... 133 miles
Do. cleared ... ... 158 „

Londonderry Tank.
COOLGARDIE G.F.



Broad Arrow Tank.
BROAD ARROW G.F.

WATER SUPPLY TO MINES AND TOWNS.

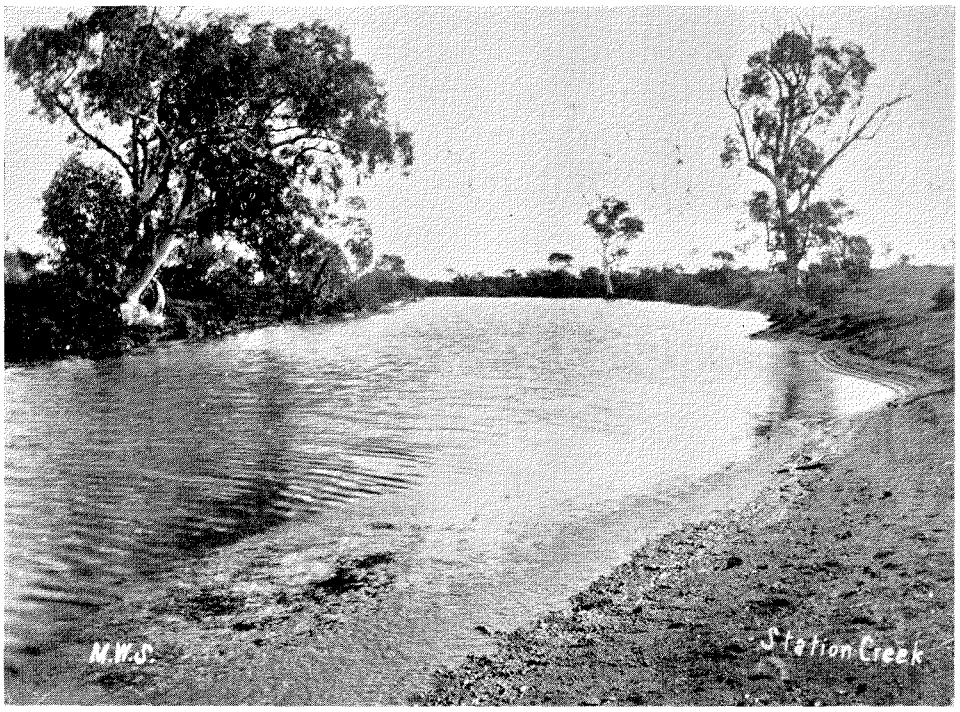
Item.	Class of Work.	Locality.	General Description.
90	Pumping	Davyhurst	Fresh water is conserved in 400,000 gallon excavated tank; salt water is obtained from No. 23 Well, distant from tank about 20 chains. The Pump Station is close to the reservoir and consists of Pearn's 3-throw pump, engine and dynamo; the latter drives an electric pump suspended in well A 3in. rising main, 1½ miles to 20,000-gallon service tank on small hill between mines and town, completes the equipment The mines obtain water by gravitation from service tank, and the quantity supplied to each mine is measured by meter and paid for on monthly accounts being rendered
91	Supply of Cue and Day Dawn with fresh water, and also some Mines	Cue and Day Dawn, Murchison	This work commenced April, 1904. and finished in December, 1904 Cost of work, as originally recommended and estimated on, £17,250 With extra reticulation, £20,800 The work consists of a group of wells about 12 miles north-east of Cue and near railway. Water is pumped from each well to 75,000-gallon collecting tanks at Pump Station. From there a 25 horse-power Pearn's engine and 3-throw pump drive the water through a 5in. Mannesman rising main for about 12 miles to service tanks on Trig. Hill, near Cue. The tanks have capacity of 120,000 gallons. A 4in. gravitation main runs through Cue and Day Dawn, and both towns are reticulated

MINES WATER SUPPLY.

Rainfall at various Stations.

Station.	Rainfall—100 Points=1 inch.												
	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
Malcolm	*a*	*a*	30	2	112	78	101	52	257	55	*Nil*	75	*a*
Niagara	17	*Nil*	34	7	82	39	88	56	214	25	„	51	613
27-mile Condenser	10	2	61	2	91	92	156	17	278	63	„	22	794
Menzies...	*Nil*	2	44	2	91	125	246	30	265	65	„	92	960
Mulline	„	2	57	5	137	127	245	12	302	53	„	31	969
Siberia	„	3	66	12	117	82	174	22	267	149	17	70	979
Black Flag	„	*Nil*	38	26	106	68	195	18	310	98	*Nil*	71	930
Kanowna	„	3	22	12	105	132	173	66	332	180	„	5	1,030
Kunanalling	„	*Nil*	50	35	132	80	178	4	274	144	7	36	940
Bulong	„	„	31	23	173	130	134	39	357	190	16	14	1,107
Coolgardie	„	„	64	62	107	122	106	103	236	161	56	98	1,115
Widgiemooltha	„	„	48	59	170	117	166	14	231	193	*Nil*	35	1,033
Wingarnie	„	„	*Nil*	142	219	186	200	66	190	176	6	*Nil*	1,185
15-mile Condenser	„	„	55	77	315	153	197	51	201	134	15	44	1,242
Norseman	8	„	62	138	269	180	221	20	161	290	25	*Nil*	1,374
Swan Lagoon	7	*a*	222	31	258	230	278	159	202	289	43	131	1,850
No. 1 Well, Yarri	*a*	*a*	28	...	80	58	103	28	356	138	*Nil*	52	*a*

a Incomplete.



Station Creek.

MT. MARGARET G.F.

Station Creek.

MT. MARGARET G.F.

MINES WATER SUPPLY.

Return showing Water Conserved, etc., in ten of the Principal Reservoirs, Eastern Fields.

Name of Tank or Reservoir.	Contents on 31st December, 1903.	Conserved during 1904.		Used and Lost during Year.			Total Loss.	Contents on 31st December, 1904.
		From Catchment.	From Rainfall on surface of water in Tank.	Sales and Issues.	Evaporation.	Absorption.		
	gallons.	gallons.	gallons.	gallons.	gallons.	gallons.	gallons.	gallons.
Niagara	2,494,166	301,918	16,116	1,224,280	1,225,790	362,130	2,812,200	*Nil*
Menzies	1,698,702	1,587,729	69,621	1,556,882	915,664	311,940	2,784,486	571,567
Mulline	151,008	107,059	6,760	33,448	77,772	141,676	252,896	11,931
Siberia	7,969	607,416	9,236	9,464	163,075	251,900	424,439	200,182
Black Flag	2,383,550	2,226,600	155,175	...	1,761,638	...	2,329,525	2,435,800
Davyhurst *	Empty	4,123,107	51,054	280,520	662,629	803,802	1,746,951	2,427,209
Kunanalling	477,708	671,913	13,932	226,499	435,217	126,179	787,895	375,658
Bulong	1,897,143	1,283,299	67,365	440,540	994,576	788,039	2,223,215	1,024,652
Woodgiemooltha	1,263,700	2,631,440	37,124	...	1,035,278	...	1,282,264	2,650,000
Norseman †	2,736,204	2,329,296	46,849	1,598,135	153,878	...	472,867	2,131,400

* Empty from 1st January, 1904, to 2nd August, 1904. † Evaporation and absorption together, as this tank is roofed.

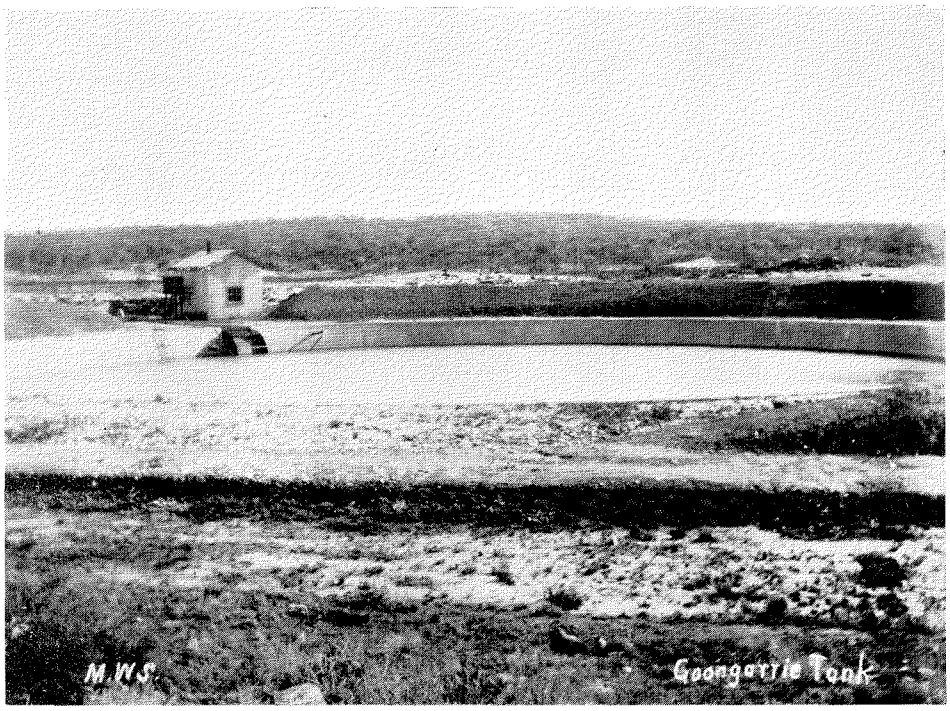
MINES WATER SUPPLY BRANCH.

Return of Revenue and Expenditure—12 months—January to December, 1904.

GENERAL SHEET.

Name of Watering Station.	Revenue.	Expenditure.
EASTERN GOLDFIELDS.	£ s. d.	£ s. d.
Swan Lagoon Condenser	...	55 11 0
Norseman Tank, Princess Royal W. S.	1,243 14 1	461 3 0
15-Mile Condenser	21 7 0	158 18 3
Widgiemooltha Tank	163 10 0	76 14 0
Siberia Tank	4 3 8	94 10 0
Kanowna Tank	1,062 9 7	103 2 9
Bulong Tank	468 15 2	302 3 4
Menzies Tank	908 18 6	335 5 5
27-Mile Condenser	...	88 19 11
Niagara Reservoir	639 15 4	165 0 5
No. 1 Well, Kookynie-Edjudina Road	...	81 2 3
No. 2 do. do. do. do.	...	0 6 3
Kunanalling Tank	204 13 5	160 1 8
Mulline Tank	247 9 9	171 18 8
45-Mile Well	6 15 0	3 0 0
Dingo Creek Well	1 0 0	0 3 0
Salmon Gum Condenser	...	51 0 1
42-Mile Tank	16 1 6	33 4 0
Gwalia Bach Well	...	5 17 4
Londonderry Tank	26 10 6	3 0 0
Hannans No. 2 Bore (dismantling)	...	12 14 5
Kalgoorlie Tank	...	4 16 9
Hawk's Nest Well	2 10 9	4 8 0
Pindinnie Well	...	2 18 8
30-Mile Condenser	...	78 8 9
Gibson's Soak	...	78 8 8
Yarri Well	3 3 0	70 19 9
Emu Lake Tank	1 14 10	39 0 0
Menzies Battery Well	729 12 8	340 17 9
Yowie Rocks Well	...	4 0 0
Jessup	...	1 5 0
Pennyweight	...	10 5 4
Jacolettee Well	17 10 0	0 12 0
9-Mile Soak	...	10 14 0
92-Mile Condenser	...	30 11 6 21 14 4
Fitzpatrick	...	8 0 0
Cork Tree Flat	...	6 0 0
Speakman's Tank	...	0 10 0
Goongarrie Tank	11 2 7	67 13 8
Edjudina Well	...	1 6 0
Davyhurst Tank	*Nil*	...
Diorite King Well	...	0 16 0
Mertondale Well	...	14 13 4
Mulgabbe Tank	...	3 6 8
65-Mile Well	0 12 0	...
Menzies (water hauled by railway and sold to public)	194 10 3	...
Granites Well	19 10 0	...
Wangine Well	15 0 0	...
Flat Rocks Well	54 0 0	...
Black Flag Tank	53 13 4	...
Wingarnie (50-Mile) Tank	117 6 0	...
French's Soak	7 0 0	...
Siberia	6 0 0	...
North Mount Weld Well	13 0 0	...
Davyhurst Well (£7 10s. deducted off Revenue, *see* Revenue Ledger)	15 0 0	
Davyhurst Tank	38 5 0	72 2 9
Emu Well	14 0 6	...
Tank on Reserve, Yilgarn	9 10 0	...
Rent House, New Zealand Gully Tank	5 12 6	...
Jourdie Hills Well	38 1 9	...
Donkey Rocks Well Soak	2 0 0	...
	£6,383 18 8	3,237 2 8
SUMMARY.		
Charged to C. F. Authorities but not allocated to any special watering station :—		
Wages of Caretakers, Yardmen, etc. Upkeep of Tanks, etc.	...	1,527 15 1
Plant for Maintenance	...	1,027 10 9
Office Expenses, etc.	...	75 6 10
Forage	...	669 3 4
	£6,383 18 8	6,536 18 8

Davyhurst Tank.
NORTH COOLGARDIE G.F.



Goongarrie Tank.
NORTH COOLGARDIE G.F.

Return of Revenue and Expenditure—continued.

Name of Watering Station.	Revenue.	Expenditure.
MURCHISON AND EAST MURCHISON GOLDFIELDS.		
	£ s. d.	£ s. d.
Day Dawn Well ...	126 8 8	52 8 4
Peak Hill Well ...	231 5 8	200 17 0
Granites ...	...	1 7 6
Mount Townsend	...	1 7 6
Walgagunyh ...	...	2 15 0
Fallon's ...	...	5 18 0
Nanadie ...	...	1 7 6
Ogilvie's ...	...	8 5 8
Peregrine ...	...	2 15 0
Kilalo ...	...	4 15 10
17-Mile Darlôt Road	...	2 13 4
Biearabiebba ...	...	4 0 0
Jack's ...	...	9 11 8
Minderoo ...	...	15 15 0
Tuckanarra ...	...	15 13 0
Occidental Well	...	10 1 2
Lloyd's ...	...	10 14 4
Nannine Town ...	...	2 15 0
Nannine Stock ...	...	7 15 0
Reedy's ...	...	4 8 9
Mistake ...	...	1 7 6
Gap ...	...	12 9 0
Red ...	...	8 5 0
Meekatharra ... (Town ... £4 2 6; Stock ... 5 10 0)	...	9 12 6
Daniels ...	...	4 2 6
Old Patch Well ...	...	8 8 9
Fisher's ...	...	5 10 0
Worthington ...	...	9 12 6
Mount Fraser ...	...	19 10 0
Murphy's ...	...	16 17 0
Millie ...	...	1 17 0
Abercrombie ...	...	3 18 8
Kathleen Valley No. 1 ...	...	2 19 0
Do. No. 2 ...	...	2 19 0
Carlamindra ...	...	3 0 0
Melville ...	...	5 0 0
Nannowtharra ...	...	12 14 6
Gum Creek ...	...	13 2 8
Black Range ...	...	11 14 11
Wargoo ...	...	1 17 6
Muletah ...	...	7 4 4
Ned's Well ...	...	10 18 8
Magnet ...	...	9 5 0
Do. Stock Well ...	...	8 2 6
Waddutharra ...	...	4 2 6
Murdabooka Well ...	...	2 7 6
Mickie's ...	...	1 17 6
Pindannerra ...	...	3 5 0 1 8 4
Gabanintha ...	...	7 17 6
Yarraquin ...	...	5 2 0
Yalgoo ...	...	7 10 0
Garden Granites	...	1 12 0
Field's Find ...	...	8 10 0
White Well ...	...	0 7 2
Simpson ...	...	6 10 0
Gullewa Town ...	...	4 2 6
No. 1 Well (Cue-Black Range route)	...	7 17 0
No. 2 do. do. do. do.	...	29 14 6
Stake do. ...	...	11 0 0
Gascard's ...	...	53 1 5
Scotty Well ...	...	52 2 6
Con's ...	...	1 7 6
Upper Ord Deep ...	...	290 1 6
Garden ...	...	1 7 6
Limestone ...	...	1 7 6
Star of the East ...	...	8 4 7
New Granites ...	...	1 7 6
Quin's Town Well ...	...	15 19 9
Do. Stock ...	...	8 12 6
Roads Board ...	...	1 7 6
Comearing ...	...	1 7 6
Boogardie Town ...	...	14 4 11
Do. Stock ...	...	6 5 9
Mummara ...	...	2 15 0
Carried forward ...	357 14 4	1,118 9 6

Return of Revenue and Expenditure—continued.

Name of Watering Station.	Revenue.	Expenditure.
MURCHISON AND EAST MURCHISON GOLDFIELDS—*continued.*		
	£ s. d.	£ s. d.
Brought forward	357 14 4	1,118 9 6
No. 1 Well (Lawlers-Magnet route)	...	1 7 6
No. 2 do. do. do.	...	1 7 6
No. 2 Bore Well, Nungarra	...	6 5 0
Stink Well	...	8 5 0
No. 4 Well (Lawlers-Magnet route)	...	3 12 0
No. 4A do. do. do.	...	2 15 0
No. 6 do. do. do.	...	5 0 0
No. 7 do. do. do.	...	5 11 10
Mainland Well	...	1 7 6
Munara Gully	...	3 9 6
No. 3 Black Range (called Contradiction Well)	...	11 5 10
Breakaway	...	2 17 4
Bulkabardoo	...	2 15 10
Muletah	*Nil*	...
Bulchina	...	9 2 6
Payne's Rush, Nungarra Well	...	2 15 0
Millee Station Well	...	1 7 6
Sir Samuel Town and Stock Well	*Nil*	...
	357 14 4	1,187 14 4
East Murchison Goldfields.		
Cork Tree Flat Well, No. 1	...	2 19 0
Do. do. No. 2	...	2 19 0
19-Mile Well	...	2 13 4 0 16 0
34-Mile	...	2 13 4
Lawlers Town	13 0 0 12 10 0	0 17 0
Lawlers Stock	...	10 2 8
25-Mile Well	...	38 11 4
23-Mile Well	...	13 2 0
Sir Samuel Town Well	16 5 0 16 5 0	5 3 4
Sir Samuel Stock Well	...	6 12 8
Darlôt Well	...	4 0 0
16-Mile Soak	...	2 13 4
Walby Nob Well	...	21 8 10
Millee	...	2 18 8 1 7 6
Yandit	...	7 6 8
Wiluna Town Well	...	1 19 4
Do. Stock do.	...	1 19 4
Jones' Well	...	3 18 8
Bore	...	2 18 8
Cody's	...	19 4 0
Diorite Well	...	7 1 2
Lake Way Stock	...	2 18 8
Do. Town	...	1 9 4
Mollie	...	2 18 8
No. 9 Well	...	6 13 4
No. 10 Well	...	4 0 0
McCaffrey Well	...	9 6 8
14-Mile Well (Leonora-Darlôt Road)	...	21 12 8
Wilson Creek Well	...	37 7 4
Kathleen Valley Well	5 0 0 2 0 0	...
Gum Creek Well	...	11 16 2
Sullivan Creek Well	...	2 16 0
28-Mile	...	1 8 6
Fairyland	...	0 16 0
Leinster	...	0 16 0
	424 14 4	1,454 19 6
SUMMARY.		
Charged to C. F. Authorities but not allocated to any special Watering Station:—		
Wages of Caretakers, etc. Maintenance of Well, etc.	...	844 17 4
Plant for Maintenance	...	1,470 5 9
Office Expenses, etc.	...	27 18 4
Forage	...	565 8 2
	£424 14 4	4,363 9 1

Return of Revenue and Expenditure—continued.

Name of Watering Station.	Revenue.	Expenditure.
PILBARRA AND WEST PILBARRA GOLDFIELDS.	£ s. d.	£ s. d.
No. 3 Mile Well ...	...	7 14 0
Marble Bar-Condon Road Well	...	6 10 0
Peterson's Well ...	...	23 19 6
Camel Creek	...	9 6 8
20-Mile Sandy	...	24 16 6
12-Mile (Trig. Hill)	...	4 14 0
Pippingarra Well	...	16 12 9
Strelly	...	17 11 0
Carlindie ...	...	5 12 0
Pindan Well	...	13 8 0
Coppin's Old Station	...	25 0 0
Granite Hills No. 2	...	2 0 0 5 10 0
Port Hedland 1 Mile	...	45 0 9
Port Hedland 4 Mile	...	14 10 10
Carbana ...	...	13 16 0
Spinaways	...	9 11 6
Eley's (Old Shaw)	...	1 5 0
Mount Mortimer Well ...	...	13 18 1
Mosquito, No. 2 Granites	...	2 10 0
Coppin's Old Station	...	25 0 0
Bangemall Well	...	3 16 0
Hong Kong Well	...	6 13 4
Friendly Creek ...	...	71 13 4
Marble Bar Town Well	5 10 0	2 5 0
No. 1 Well	...	2 5 0
Whim Creek	...	11 1 0
Balla Balla Well	...	17 3 4
Caporn's ...	...	10 6 0
Kangaroo	...	10 0 0
Toweranna	...	7 10 6
Sandy Creek	...	1 10 0
Little Shaw	...	5 7 9
Lalla Rookh	...	5 7 10
Big Schist	...	16 1 6
Shady Camp	...	5 7 9
Wyman's Well ...	...	1 10 0
Annie's Gap	...	14 0 0
Middle Creek No. 1	...	4 8 8
Do. No. 2	...	3 5 0
Butcher's Camp ...	...	2 5 0
Hale's Grave	...	1 10 0
Egina Well	...	13 0 0
Millendinna	...	14 0 0
Mallina ...	...	12 0 0
Top Camp	...	98 11 4
Granites Hills No. 1	...	3 2 6
Do. No. 2	*Nil*	...
Pilbarra ...	...	0 14 0
Gorge Creek	...	3 0 0
Lower Camp	...	22 11 6
Robinson's 5-Mile	...	3 0 0
Nullagine Well ...	...	6 10 0
Do. 4-Mile	...	1 10 0
Corunna Well	...	1 10 0
Granites, Well No. 2, at Mosquito Creek	...	4 10 0
No. 2 Marble Bar Well	...	17 15 0
	£5 10 0	693 7 11
SUMMARY.		
Charged to C.F. Authorities, but not allocated to any Special Watering Station :—		
Wages of Caretakers, etc. ...	...	327 14 3
Maintenance of Wells, etc.		
Plant for Maintenance	...	564 4 8
Forage ...	...	267 14 1
Office Expenses, etc. ...	...	43 5 6
	£5 10 0	1,896 6 5
GENERAL SUMMARY.		
Eastern Goldfields	6,383 18 8	6,536 18 8
Murchison and East, Goldfields	424 14 4	4,363 9 1
Pilbarra and West, Goldfields	5 10 0	1,896 6 5
GRAND TOTAL ...	£6,814 3 0	12,796 14 2

DIVISION VIII.

ANNUAL

PROGRESS REPORT

OF THE

GEOLOGICAL SURVEY

FOR THE YEAR 1904.

Annual Progress Report of the Geological Survey for the Year 1904.

TABLE OF CONTENTS.

Annual Progress Report of the Geological Survey for the Year 1904.

The Hon. the Minister for Mines, Perth.

Geological Survey Office, Beaufort Street,
Perth, 25th May, 1905.

SIR,

I have the honour to submit, for your information, the Progress Report of the Geological Survey for the Calendar Year 1904. During the period covered by the report, work proceeded practically on the lines of former years, field operations having been confined to those portions of the State of which it seemed necessary, in the public interest, to have surveys made.

Attached to this report is a skeleton map of the State, showing the districts which have been examined and reported on by the different members of the staff since the year 1896, when the Department was organised upon its present basis.

In addition to what may be called the ordinary work of the Department, during the year 52 special reports connected with the alienation of mineral lands in different portions of the State, 15 in connection with subsidies under the Mines Development Act, and eight upon matters referred to in certain clauses of the Mining Act of 1904 were made.

THE STAFF.

During the year 1904 the work of the Department was performed by 11 officers, other than camp assistants, etc. Owing to the necessity for making a slight adjustment of the work, consequent upon the lengthened absence of Mr. E. S. Simpson, the Mineralogist and Assayer, the strength of the field staff was reduced by one officer.

The only change in the *personnel* of the staff has been the resignation of the Senior Assistant Geologist, Mr. C. F. V. Jackson, to whose appointment reference was made in the report of the previous year. Mr. Jackson severed his connection with the Department on the 31st of October, having been appointed to the newly-created position of Chief Inspector of Mines to the Government of Queensland.

FIELD WORK.

The work of the year has, as usual, been distributed over various portions of the State so far as the exigencies of the Department permitted.

A. GIBB MAITLAND: The period between the 21st of June and the 2nd November found me in the Pilbara Goldfield, endeavouring to complete the work which had been commenced during the previous year. Nine days were devoted to matters connected with the alienation of mining lands at Kalgoorlie, shortly after my return from the North-West. During the year I was employed for 143 days in the field.

C. F. V. JACKSON: From the 14th of January to the 22nd of April this officer was engaged upon a geological survey of Mount Morgans, with the exception of seventeen days which were devoted to an examination of the telluride occurrences at Mulgabbie. Three days in the middle of July were spent at Coolgardie in connection with a report upon the occurrence of opal, and 10 days in August were spent in the Irwin River District, inquiring into an application with respect to certain coal lands under the provisions of the Mining Act. Mr. Jackson was employed for 112 days in the field.

W. D. CAMPBELL: The greater portion of the year this officer devoted almost exclusively to a detailed geological and topographical survey of Norseman, a piece of work which had been undertaken in consequence of a motion passed by the Legislature. Mr. Campbell was employed 263 days in the field, in addition to six days entailed in travelling to and from Perth.

C. G. GIBSON: The field work of Mr. Gibson covered 45 days, in consequence of his being deputed to take charge of the Laboratory during Mr. Simpson's absence. The 1st to the 15th of January found Mr. Gibson in Perth engaged in office work in connection with his late work on the Murchison Goldfield. Between the 15th and the 25th of the same month this officer was engaged in an examination of the country in the vicinity of Napier River, in connection with a proposal to bore for coal. An examination of the Southern Cross Goldfield engaged Mr. Gibson's attention from the 21st of March to the 25th of April.

H. W. B. TALBOT: This officer was employed for 222 days in the field, between the 24th of April and the 1st of December, in assisting me during a detailed examination of the Pilbara Goldfield.

LABORATORY WORK.

Up till the end of April, the work of the Laboratory was carried out as usual under the more immediate supervision of Mr. E. S. Simpson. On the 1st of May this officer left on extended leave, and, until the close of the year, Mr. C. G. Gibson, who had been appointed Acting Mineralogist and Assayer, became responsible for the work. During the period covered by his work in connection with the supervision of the laboratory staff, a considerable portion of Mr. Gibson's time was devoted to the preparation of his report upon Southern Cross, which forms Bulletin No. 17. A short time was also devoted to visiting and reporting on one or two outside districts where some new mineral finds had been reported; these latter visits consisted of a six days' trip to Cuballing in connection with a reputed tin find, and a short visit to Newcastle, with reference to the granting of a Reward Lease in that district.

The following table shows in detail the routine work of the laboratory during 1904, and although the total number of assays and other determinations made is somewhat smaller than that reported during the previous year, the total number of samples dealt with was greater, viz., 636 as against 541 :—

Table showing details of Assays, etc., made in the Geological Survey Laboratory during 1904.

Classification.	Public.		Official.		Totals.
	Pay.	Free.	Geological Survey.	Other Departments.	
Total Samples dealt with	138	234	73	191	636
Assays for—					
Gold	118	137	11	113	379
Silver	12	43	1	6	62
Copper	3	23	...	20	46
Lead	1	2	...	...	3
Tin	1	10	4	1	16
Iron	...	1	...	...	1
Tungsten	1	...	...	...	1
Platinum, Osmiridium	...	1	...	...	1
Analyses—					
Complete	5	1	32	4	42
Proximate	...	...	1	10	11
Partial	1	5	12	2	20
Determinations...	5	66	7	23	101
Miscellaneous	5	26	10	28	69
Total	152	315	78	207	752

GEOLOGICAL AND MINERAL COLLECTION.

New specimens to the number of 491 have been added to the Survey Collection during 1904, bringing the total number registered up to 5,856. The total number of microscopic slides registered amounts to 516 (many of these being in duplicate), whilst the number of negatives of geological and mining subjects taken by the staff during the year is 28, thus bringing the total number registered up to 233.

PUBLICATIONS.

The following is a list of the different publications prepared by the Geological Survey during the year under review:—

Annual Progress Report for the year 1903.

The Geology and Auriferous Deposits of Leonora, Mount Margaret Goldfield, by C. F. V. Jackson.

The Geology and Mineral Resources of a part of the Murchison Goldfield, by C. G. Gibson.

Preliminary Report on the Geological Features and Mineral Resources of the Pilbara Goldfield, by A. Gibb Maitland.

The Mineral Production of Western Australia up to the end of 1903, by A. Gibb Maitland and C. F. V. Jackson.

The Geology and Auriferous Deposits of Southern Cross, Yilgarn Goldfield, by C. G. Gibson.

Good progress has been made with the preparation of the general index to the various geological reports, alluded to last year, and it is hoped that the work will be finally completed during the current year.

PRINCIPAL RESULTS OF THE YEAR'S FIELD OPERATIONS.

Mineral Resources.

Pilbara Goldfield.—An examination of the mining centres of Nullagine, Warrawoona, and Marble Bar was made during the months of July, August, and September.

Nullagine.—The mining centre of Nullagine is situated about 90 miles above its junction with the Oakover River. Interest attaches to the district on account of the occurrence of gold in certain sedimentary rocks, which bear a close resemblance to the auriferous conglomerates of the Rand (South Africa). The geological formations occurring in the neighbourhood of Nullagine comprise, in addition to the recent superficial deposits and certain greenstone dykes, two distinct series of sedimentary rocks, viz., (*a.*) The Nullagine Series, a great thickness of quartzites, grits, conglomerates, and interbedded igneous rocks; and (*b.*) the Mosquito Creek Beds, made up of a series of sandstones, fine conglomerates, and shales. The two series are separated by a very violent unconformity.

The Nullagine Series, the base of which is rarely seen, makes a prominent feature in the landscape of the district, and plays an important part in the geology of the North-West, in addition to being of

some economic value by reason of the basal members of the series having proved to be auriferous in at least too widely separated localities. In addition to the sedimentary beds of the Nullagine Series, a great series of bedded lavas, ashes, and agglomerates form an integral and no small portion of the formation, as developed in different portions of the Pilbara Goldfield. They consist of acidic lavas, which form separate flows, each of no very great thickness; some of the finer grained, ashy beds, differ very little in general appearance from many of the banded lavas, but their distinctly fragmental character can readily be made out by the microscope, and in some cases with the aid of a pocket lens. So far no evidence has been obtained which would throw any light upon the sources from which the lavas emanated. The recognition of the geological age of the Nullagine beds is a point of considerable importance; the absence of fossils throughout the series, wherever it has yet been studied, renders correlation extremely difficult. They resemble very strongly the quartzites of the King Leopold Range, in Kimberley, and if this lithological resemblance should prove to possess greater significance than at present appears, the Cambrian Age of the Nullagine Series would seem to have very strong claims for consideration. The auriferous strata occur through a thickness of about 300 feet of grits, sandstones, and conglomerate, forming the lowest portion of the series. Those portions of the strata which have been proved to be gold-bearing, are those which are largely impregnated with the oxides and sulphides of iron, and which lie between a well marked fault and a greenstone dyke (possibly along a fault line also). The auriferous conglomerate is of sedimentary origin, and is made up of rounded and subangular fragments of the strata identical in character with that forming the underlying Mosquito Creek Series. It is noteworthy that the base of the formation has only proved auriferous in those places where it lies upon that portion of the underlying formation which carries auriferous quartz reefs. Mining operations have up to the present been confined exclusively to the outcrop of the conglomerates and to very limited and shallow depths; work, however, has been carried sufficiently far to enable some idea of the conditions governing the gold deposition being ascertained. It is only in the oxidised zone of the conglomerate that any mining has, up to the present, been carried on. The evidence, so far as it goes, respecting the origin of the gold in the Nullagine conglomerate, seems to indicate that it is a secondary and not an original constituent, and further that the primary source of the gold is the quartz reefs, which occur in the underlying formation. The gold contents of the conglomerate, so far as may be judged by the official statistics, are small, not amounting to more than 3,217·29ozs., derived from the milling of 5,167 tons of ore, or at the rate of ·62ozs. per ton.

Numerous dryblowers have been at work for a number of years over that portion of the conglomerate from which the crushings have been obtained, and have acquired a considerable quantity of gold, of which the published figures afford no clue. In all probability, one half of the "alluvial" gold from Nullagine may be legitimately claimed to have been derived from the escarpment of the conglomerate.

The known occurrence of such an extensive formation as the Nullagine Series has been proved by geological mapping to be, and the fact that it has been shown to contain considerable quantities of gold in localities where the requisite and qualifying conditions for gold deposition obtain, would seem to encourage efforts in the direction of carefully prospecting other parts of the basal members of the series.

The Mosquito Creek beds, which underlie the strata of the Nullagine series, comprise one of the oldest of the sedimentary formations as developed in Pilbara. The series consists of grits, shales, and fine conglomerates, an approximate estimate of the thickness of which cannot be determined, though it is possible that the apparent enormous thickness of the formation may in all probability be due to the repetition of the beds by folding. No trace of fossils have been met with anywhere in the series, so no definite data as to the age of the Mosquito Creek beds is available. Observations have shown that these strata lie with a violent unconformity beneath the Nullagine beds, and, as in certain portions of the district, the Mosquito Creek Series have been subjected to more or less intense dynamic metamorphism, a considerable period must have elapsed between the deposition of the two series. The Mosquito Creek beds are of economic importance by reason of the fact that they form the matrices of the numerous auriferous quartz reefs, which outcrop over a portion of the district, and have been more or less perfunctorily worked.

So far as any observations have been made, it seems that the productive area of the Mosquito Creek beds, as developed in the more immediate vicinity of Nullagine, consists of a broad belt of about a mile in width, with a general strike of north-east and south-west, which latter coincides with the general trend of the series.

The quartz of which the reefs of Nullagine are composed is generally of a whitish colour, contains little if any pyrites, and of such a character as render it readily amenable to battery amalgamation and cyanidation. So far as the official figures indicate, it appears that the gold contents of the reefs are high, having an average of nearly 3ozs. for every ton of stone mined and milled, though the actual quantity of ore raised has up to the present time been very small.

The following table gives in a succinct form the total gold yield of the various auriferous deposits of the more immediate vicinity of Nullagine up to the end of 1904 :—

Synoptical Table showing the Total Gold Production of Nullagine up to the end of 1904.

Nature of deposit.	Ore crushed.	Gold therefrom.	Rate per ton.
	tons.	ozs.	ozs.
Alluvium and Superficial	...	3,670·02	...
Quartz Reefs	1,237·95	3,497·30	2·82
Auriferous Conglomerates	5,167·00	3,217·29	·62
Total	**6,404·95**	***6,714·59**	**1·04**

* This total does not include that of the alluvial gold.

In addition to the above totals, 1,638·50ozs. of gold have been obtained from the cyaniding of 2,800 tons of tailings at Lambert's Treatment Works, M. A. 4L; thus bringing the total gold yield of Nullagine up to 12,023·11ozs. as recorded at the close of 1904.

WARRAWOONA.—The mining centre of Warrawoona lies about 15 miles from Marble Bar, and embraces the south-eastern extension of that belt of auriferous rocks which form the Marble Bar, Yandicoogina, and Mount Elsie zone. The geological formations of Warrawoona are represented by a series of sedimentary rocks, quartzites, and conglomerates, many of which have been converted into quartz schist, mica schist, etc., by dynamic agencies. Associated with these undoubted sedimentary strata are a series of igneous rocks which have likewise been foliated by the same causes. The exact relation these igneous rocks bear to the sedimentary series has not yet been definitely worked out. These beds are faulted against the large area of granite occurring on the southern portion of the field. Dykes and masses of felspar porphyry, which may have some intimate connection with the granite, occur in certain portions of the district. In addition to these rocks the field is traversed by a remarkably persistent series of north-west and south-east dykes, which traverse the centre of the auriferous portions of Warrawoona, approximately at right angles to the general trend of what may be called the auriferous zone.

Of the different rocks occurring in the Warrawoona area not much can be said in the present state of our knowledge of their relative ages nor of their position in the geological time scale.

The auriferous deposits of Warrawoona are quartz reefs which outcrop over a belt about six miles in length and about 20 chains in width. The quartz reefs exhibit, when viewed on the whole, a general parallelism to the trend of the main structural features of the district, and a careful examination of all the reefs, both on the surface and below ground, wherever such was possible, showed that they can be divided into two totally different types which are sharply differentiated from each other.

The first type may for convenience be called the Normal or Fissure Vein type, whilst the kidney-shaped lenticular quartz reefs of the second are locally spoken of as the "Leader." Both types have been more or less opened up and their relative importance as gold producers well established, as may be seen by a reference to the table below.

Synoptical Table showing the Gold Yield of the different types of Reefs at Warrawoona up to the end of 1904.

Nature of Deposit.	Ore crushed.	Gold therefrom.	Rate per ton.
	tons.	ozs.	ozs.
Normal quartz reefs	4,963·51	14,763·15	2·97
Leader type	549·50	1,627·31	2·94
Total	**5,513·01**	**16,390·46**	**2·97**

The reefs of the Leader type are in every respect identical with those described as forming the important ore deposits in the mining centre of Edjudina. At Warrawoona, the "Leader" which forms a continuous band of about 2½ miles in length, occurs along a line of rupture, which is forcibly shown by the powerful slickensided surfaces exhibited almost everywhere underground. The "reef" is represented by kidney or damper-shaped lenses of quartz which vary from a few inches in width to a foot or two in length along the vein. There seem very strong grounds for believing that the reefs of the "Leader" type are of later formation than those of the true fissure veins.

A feature of the normal or fissure vein reefs is the folding which they have undergone, and all the available evidence points to the fact that the folding of the reefs is the result of great lateral pressure acting upon the country rock after the formation of the reefs themselves. This lateral pressure has not only folded but has faulted many of the reefs. In addition to the numerous normal vertical faults, there are also reverse faults, which are either horizontal or are inclined at a very low angle to the horizon.

The reefs of both types are composed of hard, translucent crystalline quartz, which, in addition to the gold, contains in subordinate quantities pyrites, chalcopyrites, limonite, malachite, ferruginous wad, and a muscovite mica which is partly chromiferous.

Although the total gold yield of Warrawoona has been 17,294·18ozs. recovered from the milling of 5,700·01 tons of ore, thus giving an average value of 3·03ozs. per ton, and many of the reefs have been opened up; these, however, have only been worked to very shallow depths.

MARBLE BAR.—The mining centre of Marble Bar forms the westernmost extension of that auriferous zone referred to in the previous annual report as the Marble Bar, Yandicoogina, and Mount Elsie Group. Since the first discovery of the field Marble Bar has yielded 16,306·74ozs. of gold resulting from the milling of 8,407·20 tons of ore; these figures give an average of 1·93ozs. of gold per ton. In addition to these figures, there have been officially recorded 2,082ozs. from unknown tons and 82ozs. of specimens, thus bringing the total yield up to 18,470·74ozs.

The various formations represented consist of a series of schists and allied rocks, granites, greenstones, and certain volcanic rocks which may possibly represent the Nullagine Series, as referred to on an earlier page.

The auriferous reefs of the more immediate vicinity of Marble Bar are embraced within a comparatively narrow belt of greenstone schist running north and south, and which has a length of a little over three miles. The district has been subjected to a considerable amount of faulting, and wherever possible the exact position and extent has been ascertained and laid down upon the map.

Full particulars as to this district will be found in Bulletin No. 20, now in the press.

Notes on a Traverse from Marble Bar to Roebourne.—Having completed our work at Marble Bar, Mr. Talbot, the Field Assistant, was instructed to proceed with the horses and equipment to Roebourne, and on his return furnished the following report:—

"The localities mentioned throughout the following notes will be found on lithographs 16G, 15G, 12G, and 14G issued by the Lands Department.

"We left Marble Bar on 24th October, 1904, travelling *via* 'Boyer's Track.' Two miles from the town the road crosses a large jasper dyke which is a continuation of the 'Marble Bar.' The dyke strikes north-west and south-east, and, where it is crossed by the road, marks the junction between the amygdaloidal volcanic rocks of the Nullagine Beds and the much older series of schists, sandstones, etc., which form a continuation of that auriferous belt which includes Yandicoogina and Warrawoona. About four miles from where the jasper dyke is crossed, the volcanic rock is overlain by a long narrow ridge of conglomerate striking north and south, and dipping to the west at an angle of 30 degrees. After crossing the ridge, the volcanic rock reappears, and, except in a few places where it is overlain with grits and conglomerates, occupies the country passed over to a point about halfway between Shady Camp well and the Little Shaw well, where the lava gives place to greenstone (diabase?). The general strike of the grits and conglomerates overlying the volcanic rock is north-west and south-east, and the dip north-east. Just before Shady Camp well is reached the road descends into the valley of the Little Shaw River, which it follows to Cooke's Bluff.

"Four miles from Shady Camp well a large vertical quartz reef outcrops and trends across country for a considerable distance on a general bearing of 155 degrees. One mile from the quartz reef a bold greenstone dyke outcrops at a bearing of 200 degrees. Two miles from the Little Shaw well the road crosses a low range of greenstone schist. The schist continues nearly to Cooke's Bluff Hill, where several large ridges of laminated chert cut across the beds, causing a considerable faulting and folding.

"The country between Cooke's Bluff Hill and Strelley Pool has already been described in Bulletin No. 15, and therefore needs no repetition.

"After leaving the Strelley Pool, the road skirts the edge of the range. In most places the ground is covered with recent superficial deposits, but where the country rock outcrops it is granite. The greenstone continues for about eight miles, when a tongue of granite is crossed. This seems to be an offshoot from the main granite belt forming the plain that can be seen to the north of the road. From this point to Looke's Pool ('the Tank') the road winds about through numerous hills. Some of the hills are flat-topped, and are capped with laterite; others are in the form of high serrated ridges formed by laminated ferruginous quartz reefs. Most of the reefs strike north-west and south-east.

"Between Green's Well and Looke's Pool a bed of mica schist is crossed. The general strike of the outcrop of the schist is north-west and south-east, and the bed appears to be vertical.

"Looke's Pool, or 'the Tank,' is situated at the west side of a large laminated quartz reef through which the creek has cut its way. The reef runs on a bearing of 201 degrees. On the north side of the creek there is a low flat-topped range of laterite, about 10 chains wide, which follows an irregular course across country for a considerable distance. The laminated quartz reef runs under the laterite range, and reappears on the opposite side.

"Leaving Looke's Pool the road continues to skirt along the north side of the range for about three miles when the range swings round to the south. The road then traverses a large granite plain which extends as far as the eye can see to the south and south-west. To the north a bold black range can be seen towards the point of which the road trends. The road hits the range at the crossing of Eastern Creek. A quarter of a mile west of the crossing there is a cairn on a low hill. The hill is at the end of a high rough range which widens out in the shape of a fan to the east. The range is formed of greenstone [5822] and greenstone schist. The general strike of the outcrop of the schists is north-east, and the beds dip at a high angle to the north-west. In the creek and in the hollows of the range, granite can be seen and it appears to go under the schists. In the vicinity of the schists the granite is traversed by numerous veins of pegmatite, which contain large crystals of felspar and mica. Near the cairn there is a dolerite (?) [5823] dyke which runs across the country on a bearing of 308 degrees. The dyke cuts through the granite and schists, and also through a quartz reef which outcrops in the schists and strikes 215 degrees.

"The granite continues from Eastern Creek, across the Yale River to within a quarter of a mile of Pilbara, and then gives place to schists. The schists are very much weathered and in most places are covered with a layer of travertin. The schists strike north-east and south-west, and dip at a high angle to the north-west. Several quartz reefs, some of which are very ferruginous, outcrop in the schists, and the strike of the reefs coincides with that of the schists. Half a mile north of the Pilbara Hotel, a large laminated quartz reef outcrops. In places it is over 100 feet wide, and it strikes east-north-east and west-south-west. It is slightly faulted in many places along its course.

"For eight miles after leaving Pilbara, the road skirts along the west side of a high rough range. In most places the ground is covered with recent superficial deposits, but where any ridges are crossed

schists outcrop and strike in an east-north-east and west-north-west direction. At about eight miles from Pilbara the road swings round to the east, and after following a valley, covered with recent alluvium, for about a mile crosses numerous ridges of a dark volcanic rock which extends to Station Peak.

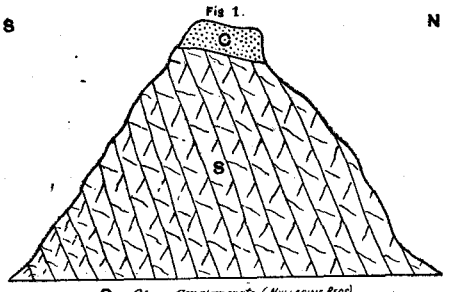
"In accordance with instructions, I spent some days at Station Peak preparing a topographical and mining map of that place, which will facilitate the work in connection with the preparation of the Geological Map to be undertaken later on.

"The Pilgrim's Rest mine at Station Peak is situated on a high rough ridge running in a west-north-west and east-south-east direction. The reefs, which follow the strike of the ridge, are very much faulted. In many places offshoots from a greenstone dyke, which runs along the range, cut across the reefs, and they disappear for distances varying from a few feet up to over 100 feet.

"To the south of Station Peak, rough ranges of a dark volcanic rock extend across country in an east and west direction but their width was not ascertained.

"To the north, sandstones, slates and quartzites [5838] outcrop. A good section of the latter can be seen in Youlingoorina Peak, where coarse conglomerate of the Nullagine Beds rests unconformably

Fig 1.



C – Coarse Conglomerate (Nullagine Beds).
S – Sandstones, Slates & Quartzites
SECTION ACROSS YOULINGOORINA PEAK (H.W.B. Talbot)
NOT DRAWN TO SCALE

upon the older sandstones, slates, and quartzites. The latter strike east and west and dip at a high angle to the north.

"At a hill at the end of a high range, two and a-half miles east of Station Peak, a very fine section is exposed. The top of the hill is formed of horizontal layers of sandstones [5839] of the Nullagine Beds, in which the bedding planes are distinctly marked. These rest uncomformably upon the upturned edges of a series of older sandstones. The latter are very much plicated and faulted, so much so, that it is almost impossible to determine the dip and strike of the beds.

"After leaving Station Peak, the road follows the valley of the Peewah River for about 14 miles. For the greater part of the way the ground is covered with recent superficial deposits, but in a few places sandstones and greenstones outcrop. Leaving the Peewah River, the road crosses a large open plain in the centre of which large granite boulders outcrop. Four miles from the crossing of Poverty Creek, the road enters a range of dark volcanic rock. In places the rock is similar to the amygdaloidal lava seen on the Coongan River, but for the most part it is darker in colour, coarser in texture and is not vesicular [5840]. The road winds through the range for about six miles without any change in the character of the rock being noticeable, when the Balla Balla River is crossed. From the crossing of the river to Whim Creek slates outcrop.

"From November 7th to 18th, I was engaged at Whim Creek preparing a map showing the mine workings, quartz reefs and principal water courses and tracks. The map will be used when the preparation of the geological map of the locality is undertaken later on.

"At Whim Creek a good deal of work has been done on the Copper leases owned by the Whim Well Company and the Balla Balla Copper Mines, Limited, but at present the leases are under exemption.

"At the Whim Well mine, the copper ores found are the red oxide (cuprite) and blue and green carbonates (azurite [5843] and malachite [5844]). The workings extend for about half a mile along the face of the north side of a low ridge formed of clay slates, which dip gently to the north. Numerous tunnels have been driven into the hill and a large amount of ore has been stripped from the lode which is exposed in many places along the face of the hill.

"The 'Mons Cupri' mine owned by the Balla Balla Copper Mines, Limited, is situated about three miles south-west from the Whim Well mine. The workings, consisting of tunnels, shafts, and open cuts, extend from the base to the summit of a high round hill formed of slates, which strike north-north-west and south-south-east. Several quartz reefs outcrop along the sides of the hill, and follow the general strike of the schists. Close to the south boundary of the lease, a narrow strip of volcanic breccia is exposed and it is intersected by a short dyke of felspar porphyry. Most of the ore raised at 'Mons Cupri' consists of cuprite, malachite [5846] and chrysocolla [5847].

"A small smelting plant has been erected on the property, but up to the present it does not appear to have been used.

"A quarter of a mile from 'Mons Cupri' there is an abandoned lease known as the 'Colorado,' on which a little desultory work has been done, and a few tons of lead ore consisting of cerussite [5852] and pyromorphite [5851] have been raised.

"Between Whim Creek and Roebourne, the road traverses a large open plain which in most places is covered with a rich red soil, but here and there along the track and on the banks of the rivers crossed between the former place and the Little Sherlock River granite and gneiss are exposed. On the West side of the Little Sherlock River, a belt of epidote rock [5856] is crossed. This belt extends for about four miles to near Mt. Fisher station when a wide greenstone dyke, running on an irregular course, is crossed. After crossing the George River near Mt. Fisher Homestead no rocks are exposed on the roadside until the Eastern Harding River is reached, but between that river and Roebourne several narrow belts of volcanic rocks are crossed."

State Aid for Boring, Peak Hill.—In consequence of a request from the owners of the Commodore, G.M.L. 118P, and the Admiral, G.M.L. 245P, for assistance towards boring, Mr. Gibson, the Assistant Geologist, who happened to be engaged on the Murchison, was instructed to visit the locality and report as to the advisability or otherwise of assistance being granted. Mr. Gibson issued the following report:—

"I have examined the leases 118 (Commodore) and 245 (Admiral) at Peak Hill in connection with the proposed Government aid to boring. The object of the bore is to try and cut the 'Peak Hill' lode which is at present, dipping towards the above leases. I enclose a plan (Plate II.) showing the positions of the 'Peak Hill' reef and of all shafts on the Commodore and Admiral leases, with their depths; from only one of these has any driving been done, viz., from that marked (X) on the Admiral lease, from which about 40 feet of driving has been done east and west; a quartz reef about two feet wide and dipping at a flat angle to the westward was cut in this shaft at a vertical depth of 60 feet; this reef however carried no gold. A small quartz reef was also struck in sinking the shaft on the Admiral South; this also carried no gold, or at most a trace. Nothing was met with in any of the other shafts. The last shaft worked is situated in the extreme northern corner of the Commodore lease; this was started with the intention of trying to cut the Peak Hill lode but was abandoned at 265 feet; it is a 6 feet by 4½ feet shaft, and is in hard country all the way. Several other shafts have been put down on the leases to depths of about 200 feet; these are shown—with their vertical depths—on the accompanying plan.

"Accompanying this report is also a rough cross-section showing the dip of the lode and the approximate depth at which it may be expected to enter the Admiral lease along the line of section. The figures are only approximate, being given to me from memory by the underground boss; if necessary the exact data could be obtained from the company's plans.

"Speaking roughly, from these figures, the lode may be expected to enter the Admiral lease at a depth of from 600 to 700 feet, say 700 feet.

"In the bottom levels of the Peak Hill mine the lode is some 15 feet wide and running very true with every appearance of living to a considerable depth. I have marked on the accompanying plan (Plate I.) a suitable bore site; a vertical bore at this spot would probably cut the reef at about 700 feet. I would recommend this in preference to boring on the Commodore lease as the reef has not been proved beyond the approximate limits shown on the plan; it, however, probably does continue beyond them.

"In the event of this bore proving successful a second bore could be put down on the Commodore lease and if put near the eastern boundary would naturally cut the lode at a much shallower depth.

"I would recommend the Government to assist the owners of these properties in their boring operations."

Boring was eventually carried out at sites 1 and 2, selected by Mr. Gibson, and the results given in the tables below, and the plan and section, Plate II.

Summarising the results of the operations on the completion of bores 1 and 2, Mr. Gibson reports as follows:—

"Since my original report *re* boring at Peak Hill was prepared the underground plans of the Peak Hill G.M. have been obtained and the accompanying section prepared from the information available therefrom.

"Assuming the lode to continue in depth at a dip ranging between that shown in the upper and lower levels, then No. 1 bore should cut it between the depths of 850 and 930 feet, and No. 2 between 840 and 900 feet, assuming that is that the surface level of the mouth of the main shaft and the bores is the same.

"It will be seen from the accompanying tables that No. 1 bore has passed through auriferous lode matter at a depth of from 818 to 840 feet whilst No. 2 passed through similar material from 840 to 885 feet, the most consistent assay values being obtained between 875 and 885 feet. This auriferous material is in all respects similar to that forming the 'Peak Hill' lode, and consists of a highly foliated and altered chlorite schist, carrying a fair percentage of pyrites, and with which is associated a varying amount of quartz. In the bore cores it is practically impossible, from the examination of hand specimens, to say exactly what thickness of this lode matter has been passed through, as there is no hard-and-fast boundary between it and the country rock, this being also the case in the lower levels of the Peak Hill G.M., where the exact lateral extent of the lode matter is defined solely by the decrease in assay values. It seems, however, in view of the accompanying tables, beyond all doubt that the 'Peak Hill' lode has been cut in both bores; in No. 1 at a depth of 830ft. and in No. 2 at 880ft., this latter depth being almost exactly the calculated position of the lode; while the depth in No. 1—830ft. in the bore as against 900ft. calculated—can easily be accounted for by a slight change in the dip, or strike of the lode, or difference of surface level of the bores."

The following tables give the record of the strata pierced, together with the results of the sampling carried out under the direct supervision of Mr. Simpson:—

RECORD OF STRATA AND ASSAYS IN No. 1 BORE, PEAK HILL.

Depth in feet.	Nature of Strata.	Assays by Mr. E. S. Simpson.
0 — 130	No core (probably mica schist)	
130 — 153	Mica schist	
153 — 153½	White quartz	
153½ — 272	Mica schist, passing into chlorite schist	
272 — 285	Chlorite schist	
285 — 289½	Calcite	
289½ — 345	Chlorite schist, passing in places into mica schist	
345 — 371	Massive chlorite rock	
371 — 382	Slightly foliated chlorite rock	
382 — 382¾	White quartz	
382¾ — 413	Foliated chlorite rock, with veins of calcite	
413 — 414	Highly foliated chlorite rock, with small veins of quartz	
414 — 450	Slightly foliated chlorite rock	
450 — 452	Calcite	
452 — 465	Slightly foliated chlorite rock	
465 — 482	Massive chlorite rock	
482 — 502	Foliated chlorite rock with small veins of quartz ...	484ft., schist; gold, *nil* 484½ft., quartz; gold, *nil* 485-492ft., schist; gold, *nil*
502 — 520	Massive chlorite rock	
520 — 590	Foliated chlorite rock, with small veins of quartz at about 588ft.	
590 — 614	Mica schist, passing into chlorite schist	
614 — 633	Chlorite schist	625-630ft.; gold, trace
633 — 638½	Pyriteous chlorite schist	
638½ — 645	Slightly foliated hornblende rock	
645 — 701	Chlorite schist, with small quartz veins	650-654ft.; gold, trace
701 — 807	Fine-grained massive (?) chlorite rock	
807 — 818	Chlorite schist	812ft.; gold, trace 813ft.; gold, trace 814ft.; gold, small trace 815ft.; gold, 20grs. 816ft.; gold, 1dwt. 15grs.
818 — 823	Highly altered chlorite schist (pyriteous)	818ft.; gold, trace 822ft.; gold, *nil*
823 — 842	Chlorite schist	825ft.; gold, *nil* 829ft.; gold, 3dwts. 6grs. 830-832ft.; gold, 1dwt. 15grs.
842 — 852	Massive (?) chlorite rock	
852 — 897	Chlorite schist	
897 — 900	Highly altered and slightly graphitic schist	
900 — 920	Chlorite schist	919ft.; gold, *nil*
920 — 930	Graphitic schist, carrying a considerable amount of pyrites	921ft.; gold, *nil* 925ft.; gold, *nil*
930 — 965	Chlorite schist, gradually passing into mica schist at about 950ft.	930ft.; gold, *nil*

RECORD OF STRATA AND ASSAYS IN No. 2 BORE, PEAK HILL.

Depth in feet.	Nature of Strata.	Assays by Mr. E. S. Simpson.
0 — 110	No core	
110 — 166½	Mica schist	
166½ — 169	Granite, partly foliated	
169 — 231	Mica schist and mica chlorite schist, with small veins of quartz and calcite	
231 — 237	Foliated mica chlorite rock	
237 — 449	Chlorite rock and amphibolite, passing in places into mica chlorite schist	
449 — 477	Mica-chlorite schist and less foliated chlorite rock	
477 — 478	Graphitic schist with pyrites	
478 — 481	Chlorite rock and amphibolite with quartz veins	
481 — 489½	Mica chlorite schist with quartz veins	
489½ — 567	Chlorite rock, slightly foliated at times, and passing into amphibolite; 5in. quartz vein at 537ft.	
567 — 587	Mica schist, with quartz veins	
587 — 651	Mica schist and chlorite rock, more or less foliated	
651 — 675	Amphibolite, with quartz veins	
675 — 743½	Chlorite rock and schist, with quartz veins	
743½ — 744	Graphitic schist	Quartz and schist, with graphite and pyrites; gold, 10grs.
744 — 746	Chlorite rock	
746 — 749	Graphitic schist	Schist with graphite and pyrites; gold, 10grs.
749 — 754	Quartz and mica chlorite schist, with pyrites and graphite in places	750-754ft., quartz and schist, with pyrites; gold, 15grs.

RECORD OF STRATA AND ASSAYS IN NO. 2 BORE, PEAK HILL—*continued.*

Depth in feet.	Nature of Strata.	Assays by Mr. E. S. Simpson.
754 — 762½	Mica chlorite schist, with pyrites in places	756½-759ft., schist, with pyrites and quartz; gold, trace 760-762½ft., schist, with pyrites and quartz; gold, trace
762½— 763	Graphitic schist, with pyrites	Schist, with pyrites and graphite; gold, 2dwts. 1gr.
763 — 774	Mica chlorite schist	
774 — 783	Amphibolite, more or less foliated	
783 — 806	Mica chlorite schist, with a little graphite at 799ft. ...	799½ft., schist, with pyrites and graphite; gold, 1dwt. 11grs.
806 — 808	Graphitic schist, with pyrites	Schist, with pyrites and graphite; gold, 10grs.
808 — 809	Quartz and calcite	Quartz, with calcite and pyrites; gold, trace
809 — 812	Schist, with pyrites and quartz	Schist, with quartz and pyrites; gold, 1dwt. 1gr.
812 — 870	Mica chlorite schist, with pyrites, quartz, and calcite in places	841-844ft., quartz, with calcite and pyrites; gold, 4dwts. 17grs. 852½-855½ft., schist, with calcite and pyrites; gold, trace 855½-858½ft., schist, with calcite and pyrites; gold, 2dwts. 11grs. 858½-861½ft., quartz and schist, with pyrites; gold, trace 861½-866ft., quartz and schist, with pyrites; gold, 10grs.
870 — 884	Graphitic schist, with pyrites and small quartz veins ...	870-872ft., schist, with graphite and pyrites; gold, 20grs. 872-874ft., schist, with graphite and pyrites; gold, 15grs. 874-876ft., schist, with graphite and pyrites; gold, 10grs. 876-878ft., schist, with graphite and pyrites; gold, 2dwts. 1gr. 878-880ft., schist, with graphite and pyrites; gold, 15grs. 880-882ft., schist, with graphite and pyrites; gold, 4dwts. 12grs. 882-884ft., schist, with graphite and pyrites; gold, 4dwts. 7grs.
884 — 888	Mica schist	
888 — 889	Quartz, with a little pyrites	Gold, 2dwts. 1gr.
889 — 891	Mica schist, with quartz veins	Gold, 1dwt. 6gr.
891 — 918	Mica schist and mica chlorite schist, with quartz veins	894-896ft., schist, with quartz veins; gold, 1dwt. 15grs. 896-898ft., schist with quartz veins; gold, 1dwt. 15grs.
918 — 923	Quartz, with a few bands of schist	918-920¼ft., quartz with a little schist; gold, 1dwt. 15grs. 920¼-923ft., quartz; gold, 1dwt. 6grs.
923 — 926	Mica schist	
926 — 930½	Quartz, with bands of schist	926-928ft., quartz with schist; gold, trace 928-930½ft., quartz with schist and pyrites; gold, trace.
930½— 936	Mica schist	
936 — 952	Mica chloride schist	940ft., quartz vein with pyrites; gold, trace.
952 — 956½	Calcite (marble?)	
956½— 962	Calcareous schist	
962 — 969	Mica schist with quartz veins	
969 — 979½	Mica chlorite schist with pyrites and quartz veins ...	969-972ft., schist with pyrites; gold trace. 977-978ft., schist and quartz with pyrites; gold, trace.
979½— 982	Micaceous quartz schist	

Mount Morgans.—An examination of this field was undertaken by Mr. Jackson, and from his report the following *résumé* has been prepared:—

"*Topography.*—The main feature of this district is a rough broken ridge, immediately behind the townsite, extending north-westerly and south-easterly for about five miles. The remainder of the country consists of level sandy flats, broken only here and there by small isolated greenstone hills. The area mapped and examined comprises about 30 square miles, and it appears more than likely that this is part of the north-western extension of that belt of auriferous rocks which includes Edjudina and Yundamindera, and which has already been described in a former Bulletin, No. 11.

"*General Geology.*—The staple formation of Mount Morgans comprises a complex of basic and acidic rocks of the geological age of which the district affords no direct evidence, though in all probability it forms part of the same series as that so largely developed in other portions of the Eastern Goldfields, and invariably assumed to be Archæan. The ubiquitous cover of superficial deposits renders geological mapping somewhat difficult, but as far as possible the different rock masses and associated ore deposits have been followed and delineated upon the plan with which the report is accompanied.

"The basic rocks, the greenstones, are essentially hornblendic, and although they present many varieties, have all been distinguished on the map by one single colour and symbol. They chiefly occupy

the western portion of the area examined, but are also found in more or less isolated patches in the granitic area to the east. Some of the greenstones have been converted into schists, these, as might be expected, being most prominent along the main junction of the greenstones with the granitic rocks. The acidic rocks, which principally occupy the eastern portion of the area examined, consist chiefly of quartz and felspar porphyries, and from the evidence obtainable appear to be intrusive into the greenstones; like the latter, they have been subject to local mechanical deformation, and have been converted into what may for convenience be best described as granitic schists.

"*Economic Geology.*—The ore deposits of the Mount Morgans district are separable into two main divisions:—

"(*a.*) Lodes which are genetically similar to the banded and hematite-bearing quartz lodes which form such conspicuous features in the Murchison and Mount Margaret goldfields.

"(*b.*) Gold-bearing quartz reefs of the ordinary type.

"The banded quartz lodes form a series of bold outcrops on the summit of the main Mount Morgans ridge, and have been traced across country for about four miles, occurring along the main junction line between the greenstones and the porphyry. These banded quartz veins vary much in size and are very irregular, and therefore difficult to work. Their chief characteristic is that of a solid body or pipe of lens section, the main axis of which trends or dips to the south at an average angle of about 45 degrees. The ore chutes also have a marked trend to the southward.

"The second division, the normal quartz reefs, are found occurring almost entirely within the smaller areas of greenstone to the eastward of the main dividing ridge.

"The following table shows the gold yield from the Mount Morgans district from 1897 to the end of 1903:—

Year.	Ore treated.	Gold therefrom.	Rate per ton.
	tons.	ozs.	ozs.
1897	·4·00	6·00	1·50
1898	1,796·00	2,175·28	1·21
1899	5,562·00	13,710·60	2·46
1900	25,003·00	32,044·41	1·28
1901	36,012·00	42,697·64	1·18
1902	56,367·50	56,432·50	1·00
1903	93,526·75	69,081·52	·73
Total	**218,271·25**	**216,147·95**	**·99**

"This district as a whole is well watered, the supply pumped from two wells for the Westralia Mount Morgans and Guests mines being sufficiently large to supply the town.

"Full details with reference to the district will be found in Bulletin No. 18.§

The Occurrence of Telluride Ore at Mulgabbie.—While engaged at Mount Morgans, Mr. Jackson was instructed to visit Mulgabbie to report upon the discovery of telluride ores at that centre. It would seem that, from this officer's observations, "the formation of chief importance in this district consists of a system of basic rocks appearing in the form of schists and weathered greenstones outcrops; there are also several areas occupied by an intrusive porphyry. The latter are of small extent, but the former rocks cover a very large area which, however, is concealed in many places by a considerable development of ironstone gravels.

"The output of gold from the district has been derived from two sources—

"(*a.*) Alluvial flats;

"(*b.*) Small rich veins or leaders.

"From the latter the total production to the end of 1902 is as follows:—

Year.	From Specimens.	From Ore.	Total.
	ozs.	ozs.	ozs.
1898	44·60	...	44·60
1899	...	...	...
1900	897·42	*147·80	1,045·22
1901	620·65	†123·76	744·41
1902	6·60	‡190·04	196·64
Total	**1,569·27**	**461·60**	**2,030·87**

* From 7 tons ore. † From 8 tons ore. ‡ From 53·25 tons ore.

"With regard to the quantity of alluvial gold obtained, there is no information which will enable the amount to be stated, since the production from this source is included in the returns from the Kurnalpi district generally.

§ The Geological Features and Auriferous Deposits of Mount Morgans, and Notes on the Geology and Ore Deposits of Mulgabbie, by C. F. V. Jackson. Bulletin 18. Perth: By Authority, 1904.

"Most of the mining has been confined to a small area about half-a-mile to the north-east of Mulgabbie Trig. Station, where a series of small highly-inclined veins or leaders have been worked. These leaders are usually only a few inches in width, and a considerable portion of the gold has been obtained by dollying the richer portions; they trend about north-west and dip at an average angle of about 75 degrees to the south and west, and in very few cases have been worked below about 80 feet. In addition to the quartz leaders, several lines of jointing 'indicators' cross the country in the same direction but dipping at a much steeper angle; at the intersection of the quartz leaders with these indicators rich bunches of ore are usually found, and it was at one of these intersections, at a depth of about 90 feet, that the recent discovery of telluride was made; so far, this telluride, petzite, has only been found in small quantities, but its discovery would seem to warrant more thorough investigation than has so far been given to the district."

Full particulars, illustrated by maps and sections, will be found in Bulletin 18.||

Southern Cross.—Mr. Gibson was entrusted with an examination of the Southern Cross field, and his report makes a further instalment of the series designed to treat of the different mining centres of the State. The report is accompanied by a geological map, which shows, *inter alia*, the position of all existing leases, shafts, and surface workings, together with the strike and dip of all reefs and ore bodies. From the statistics of output given in the report, the auriferous deposits of Southern Cross are of low grade. At my request, Mr. Gibson has prepared a short summary of his report, which is included in this place.

"Approaching Southern Cross from either the east or west, the country is uniformly flat and uninteresting, with the exception of a few low greenstone ridges trending away in a general southerly direction behind the townsite. Northwards of the railway line, and intermediate between Southern Cross and Hope's Hill, is the large salt marsh known as Lake Koorkoordine, running in a north-easterly and south-westerly direction for a number of miles.

"*General Geology.*—Broadly speaking, the formations of Southern Cross, apart from the extensive cover of recent superficial deposits, can be divided into two divisions, the granites and the greenstones, these latter being again subdivisible into two classes, the schists and the massive and foliated variety. These greenstones are of by far the greatest economic importance, as it is solely within them that the auriferous ore bodies occur. Quartz reefs also occur in the granite, but these, for the most part, carry at best only a trace of gold. The greenstone belt runs in a general north-westerly and south-easterly direction, being bounded on the north-eastern side by an extensive area of apparently intrusive granite; its exact extent is not known, but it has a width of from fifteen to twenty miles, and is probably the same belt in which Golden Valley to the northward and Parker's Range to the south are situated, though it is much broken by granite intrusions towards this southern end. At their junction with the granite, the greenstones are altered into schists over a width of from one to two miles, and it is within these schists that the larger and better defined quartz reefs are found. Several parallel lines of hematite-bearing quartzites, similar to those found on the Murchison and other goldfields, are also found in these schists, running parallel to the lines of foliation and occurring for the most part in the form of low bare ridges.

"*Economic Geology.*—The auriferous reefs of Southern Cross consist for the most part of white quartz, and carry considerable quantities of pyrites below water level. Those occurring within the schists are, generally speaking, large and well defined, one having been followed for a distance of about a mile and a-half; those in the massive greenstone are usually more irregular, and though they are sometimes of large size, they cannot be followed for any great distance. Most of the reefs in the district are somewhat lenticular in form, some possessing this characteristic to a very marked degree. The quartzites are for the most part non-auriferous, but one or two bands with which are associated considerable quantities of quartz have been worked for their gold contents, the gold for the most part being found in the quartz bunches. Up to the end of 1903 the yield from the area examined and mapped is shown by the following table:—

Year.	Ore treated.	Gold therefrom.	Rate per ton.
	tons.	ozs.	ozs.
Previous to 1897	173,311·00	92,251·26	·52
1897	35,519·00	16,703·77	·47
1898	26,517·35	11,601·55	·43
1899	29,087·18	12,302·11	·42
1900	51,134·10	*27,110·46	·52
1901	26,081·00	†25,280·28	·96
1902	39,533·00	‡21,899·01	·55
1903	49,639·50	§21,698·66	·43
Total	**430,822·13**	**228,847·10**	**·53**

* Includes 818·40ozs. by cyanide from unknown tons. † Includes 3,350·90ozs. by cyanide from unknown tons. ‡ Includes 1,258·00ozs. by cyanide from unknown tons. § Includes 7,317·05ozs. by cyanide from unknown tons.

"The water met with in the mines throughout the district is salt, and is generally very abundant, especially in those mines situated near the edge of the salt lake, where the water level is only a few feet below the surface. It is in most cases used for battery purposes, but is unsuitable for cyaniding or for boiler use.

"Timber of good size and quality is plentiful throughout the district.

|| *Loc. Cit.*

"PARKER'S RANGE.—In addition to Southern Cross, a short visit was made to Parker's Range. The characteristic features here are very similar to those at Southern Cross, the country consisting for the most part of massive and foliated greenstones, considerably broken by instrusive masses and dykes of granite and traversed by several very persistent bands of hematite-bearing quartzites. Very little work has been done in this district below water-level, and most of the mines are at present abandoned. The reefs are of fair size, but are for the most part very irregular and broken in the upper workings.

"Water (salt) and timber are both plentiful throughout the district."

Full details will be found in Bulletin No. 17.*

Norseman.—Towards the close of 1903, in consequence of a motion in Parliament, instructions were issued to the Department to prepare a topographical map of Norseman. This work was entrusted to Mr. W. D. Campbell.

Progress had not been carried very far when I issued instructions to combine both geology and topography, as it seemed that what was actually required in the public interest was rather a plan, illustrated by cross-sections, showing the trend, extent, and structural relations of the ore deposits and the enclosing rock masses, than mere surface features, such as the Parliamentary motion implied.

This work, which contains, in addition to geological and mining information, all the prominent landmarks, such as hills, shafts, batteries, etc., has now been completed and is in course of preparation for reproduction.

The mining plans and sections, of which there are five, together with twelve cross and longitudinal sections, mark a great advance on the official mining plans yet issued of any of the goldfields of the State, in that their most prominent features are the lodes (which are shown in their relative dimensions), the faults traversing them, and the dykes by which certain of the workings are riddled, rather than the levels, winzes, etc. This data, coupled with the descriptions and statistics, will form a permanent "Record of the Mines of Norseman" up to date, and should prove of use not only to the local mining community, but to the public at large.

As there is only one draftsman attached to the department, some little time must of necessity elapse before the maps and report can be made available to the public.

Mr. Campbell, the officer entrusted with the work, has prepared the following synopsis of his labours:—

"I have to report that during the year 1904 my work was exclusively on the Norseman Topographical and Geological Survey, and occupied 263 days in the field, besides six days entailed in travelling to and from Perth.

"On completion of the survey early in December, I returned to Perth, and the remainder of the year was occupied in office work, preparing the statistics and completing the geological colouring.

"The contouring has been done by tacheometer and aneroid barometer. The contours are 10 feet apart in altitude, and the scale of the field map is 10 chains to an inch. The map extends over an area of 11 miles in a north and south direction, and six and a-half miles east and west, having an area of 46 square miles of country lying between the southern end of Lake Cowan and the northern portion of the chain of Dundas Lakes. The map, when published, will consist of two sheets, on a scale of 15 chains to an inch, which is the smallest admitting of minute details being inserted, and will be accompanied by five plans and 12 sections of mines, on the scale of 100 feet per inch.

"*Topography.*—The area mapped is composed chiefly of hilly ranges, trending slightly east of north; the principal exception occurs to the southward of the Princess Royal township, where there is a due east and west range. The height of the bed of Lake Cowan is 865 feet, and that of the hills from 1,000 to 1,500 feet above sea level. Dundas Lake, eastward of the Norseman Government tank, is about 20 feet lower than Lake Cowan. The wooded hills and extensive lake flats give a very varied appearance to the landscape. The western shores of the lakes are mostly steep and rugged, while the eastern are mostly gently-sloping ground.

"*General Geology.*—The surface covering, excepting the hill tops where the rock is bare, is concretionary ironstone gravel, resulting from the decomposition of the amphibolite rock, while in the neighbourhood of the ironstones decomposition has resulted in the formation of laterite, or concretionary ironstone. The predominating rock is massive amphibolite, having joint planes that dip about 75 degrees to the west. The strike of these is usually north and south. The coarse and fine-grained varieties of the rock are intimately associated, evidently all parts of the same molten mass. The finer-grained portion is sometimes intrusive in the other, having apparently welled up into cracks and fissures in the slower cooled portions. Where quartz veins or quartz porphyry dykes occur, a schistose character is sometimes developed in their immediate vicinity. Near the west side of Lake Dundas there is a change in the character of the country, where several north and south lines of banded quartz and ironstone occur, intercalated with bands of actinolite rock and sericite schists. Some of the latter show evidence in places of having been originally of sedimentary orgin, conglomerates and sandstones, but have undergone varying degrees of silicification and metamorphism, ranging up to green sericite schist. These have a westerly underlay varying from 35 degrees to nearly perpendicular. Another line of banded quartz and ironstone and schists occurs at Mt. Rugged, on the west side of Lake Kirk, having a direction west of north.

"Quartz porphyry dykes form a series of intrusions in the amphibolite rocks, and vary mostly from 10 to 150 feet in width, trending in a line about 25 degrees east of north from the western foot of Woolyeenyer Hill, through Mt. Benson and Norseman Hill towards the Trig. Hill near Princess Royal. They underlay from 50 degrees to 80 degrees to the west, and are in places pyriteous and also slightly auriferous, and occasionally alter into porphyry. They vary in colour from white to black, but all exhibit the characteristic beads of glassy quartz.

* Geology and Auriferous Deposits of Southern Cross, Yilgarn Goldfield, by Chas. G. Gibson, B.E. Bulletin 17. Perth: By Authority, 1904.

"A remarkable band of intrusive norite rock forms an east and west range, varying from one mile to half a mile wide, and forms the Trig. Hill near Princess Royal township. This belt extends in an interrupted line to Mount Norcote, about 12 miles to the eastward and farther beyond that, while to the westward it passes to the other side of Lake Cowan. The line of banded quartz and ironstone tapers off near the south boundary of the norite, but a few miles to the eastward there are other bands of banded quartz and ironstone on the north side of the norite. No intrusive rock occurs in the norite rock, which would appear to be newer than any of the others. Dolomite occurs at Lake Cowan, on its south-east margin, and has been opalised in places into a flinty mass, and by this means a most interesting remnant of an ancient beach of later tertiary age has been preserved there, 40 feet above the present lake bed, containing specimens of *Turritella, Pecten, Cardium,* or *Cardita,* and numerous fragments of other shells and polyzoa; and I would suggest that the locality be made a public reserve, owing to the lamentable destruction of the best portions of the deposit for purposes of road construction in the past. Silicified specimens also of true eucalypti wood occur on the valley flat of the Mary Cater Gully and on the laterite flat on the north side of Windlass Gully adjacent, north of the Israelite Bay track, near Lake Dundas.

"*Economic Geology.*—The district has proved a good mining field, the auriferous massive quartz reefs being scattered over a large extent of country, comprising most of the area in which the quartz porphyry dykes and the banded quartz and ironstone occur, enabling a large number of leases to be worked by parties of miners. Some auriferous quartz and ironstone lodes also occur in the latter formation, and have yielded some extraordinarily rich results, but comparatively little work has been done on them as yet, on account of their not having been understood in the past. The reefs are mostly north and south and underlay easterly about 45 degrees; those bearing east and west underlay south about 60 to 70 degrees; exceptions occur in the banded formations as at the Admiral Togo, where the massive quartz reef coincides with westerly inclination of that formation. At the Lily and adjacent ground in this amphibolite area, some of the reefs are almost horizontal. The reefs also vary exceedingly in occurrence, some having well-defined walls, as at the Cumberland and Northern Star, while others have scarcely any or no walls at all, and are greatly contorted, as if following the foldings of a plastic condition of the amphibolite rock, as at the Valkyrie. With the exception of the Norseman G.M. line of reef, which is over two miles long, the reefs are mostly short.

"The alluvial gold workings are of small extent, and are mostly confined to some of the gullies crossing the banded formations. A deep lead was found at a depth of about 100 feet at Princess Royal township below kaolinised material. The wash is of a concretionary character, and probably the gold has segregated into its nuggety character, though derived originally from the adjacent Princess Royal reefs. The deep lead in the Lady Mary Gully is under a rather more ferruginous kaolin about 90 feet in depth, and is probably also largely a secondary gold deposit. In neither locality is any work in progress at the present time on the leads.

"Inclusive of the year 1903, the total yield of the whole Dundas Goldfield from quartz mining has been 255,495·36 gross ounces of gold from 249,674·88 tons of ore, or 1·023 gross ounces per ton, while the alluvial gold is 1,871·76 gross ounces in addition. The figures for the year 1903 alone show a yield of 1·52 gross ounces per ton from the quartz mining. The production for the year 1904, recorded in fine gold, is 31,711·77 fine ounces from 33,431½ tons, a yield of ·948 fine ounces per ton, besides 118·5 fine ounces of alluvial gold.

"The compilation of the statistics of gold yield have proved unusually troublesome, owing to the number of short-lived leases and quartz claims, the majority being held by small parties of miners, and the difficulty of identifying the localities from which the various small parcels of ore have come, in consequence of insufficient descriptions."

Reported Tin Find at Cuballing.—On the 13th of August, Mr. Gibson furnished the following report upon a short visit he paid to Cuballing, to inquire into the authenticity of the discovery of tin:—

"In accordance with your instructions, I have visited Cuballing and examined the locality of the supposed tin find, which is situated in granite country, about seven miles east-north-east of Birdwhistle Rock, and some 24 miles east-south-east of Cuballing townsite. The supposed tin-bearing body consists of a belt of banded quartz and hematite (often magnetite) of considerable width, apparently marking an old line of faulting or jointing, and can be followed across country in a north and south direction in the form of a low ridge for a distance of over a mile. The strongest outcrop of this body is situated on the ground applied for as a reward lease by the original prospectors, Messrs. Reynolds and party. Here the quartz and hematite (magnetite) are in well-defined, roughly parallel, alternating layers, those of the hematite being from about one-sixteenth to one quarter of an inch in thickness. It is this latter mineral, which on the surface has a somewhat granular appearance, that has been mistaken by the prospectors for tin. About 20 samples were taken over a considerable length of the outcrop, some by myself and some by the prospectors, and these were, on my return to Perth, carefully tested by myself in the departmental Laboratory, and in no single one of them was I able to discover even the faintest trace of tin. In view of this fact, further remarks are, I think, unnecessary."

Reward Lease at Newcastle, Toodyay District.—On the 7th September, Mr. Gibson reported as follows, in connection with the granting of a reward lease at Newcastle:—

"In accordance with your instructions, I visited Newcastle and examined the area applied for by Mr. C. J. Cook as a reward lease. The block is situated in a paddock which is at present under cultivation, and as the greater part is covered with a varying depth of recent detrital accumulations, it is impossible to see much on the surface. The country rock is granite, and a fair-sized diorite dyke runs through the lease in a general north-easterly direction, with a dip of about 60 degrees to the south-east. On the hanging-wall side of this dyke are about four feet of crushed and foliated granite, with stringers and veins of quartz running through it, and it was from one of these quartz stringers that the original

specimens were obtained. This particular stringer was about an inch in width and only extended about a foot both longitudinally and vertically. The only work done consists of a couple of pot holes put down on the "lode," the deepest about eight feet, on the spot where the gold was found. This hole was about half full of water, so I was unable to obtain samples from the bottom of it. I obtained, however, three sets of samples from about four feet from the surface—one across the whole width of the formation, one across about two feet on the hanging-wall side where most of the quartz was, and one of the crushed granite. Of these, the first two gave only small traces of gold, while the third gave not even a trace. Although sufficient work has not been done to enable a definite opinion to be given, still, in view of the above assay results and what I was able to see, I am of opinion that payable gold will not be found on this lease.

"I was shown several specimens which were said to have been taken from the original stringer, and though small, they showed course gold freely. Although there is a likelihood of other small rich stringers being found, they are not likely to be of sufficient size or number to render the proposition a payable one."

Boring for Coal, Napier River.—Towards the close of 1903, an application was made for the loan of a boring plant to test the country between the Porongorup and Stirling Ranges, and the following report was prepared:—"The site of the bore put down by Mr. Sundberg is between the Porongorup and Stirling Ranges, on the east side of the Kalgan River, 22 miles due east of Mt. Barker Railway Station. No less than 16 bores have been put down in this district in search of coal, all of them without success, as described in the Annual Report of this department for 1900. Only one of these was in the valley between the Porongorup Range and the Stirling Range, viz., No. 14, which was 18 miles west of Mr. Sundberg's bore. This No. 14 bore, after passing through five feet of soil and soft sandstone, reached the crystalline bedrock, granite. The materials from Sundberg's bore show that this hole passed for 212 feet through clay, sometimes more or less sandy, without striking any coal or carbonaceous shale which might lead one to infer that coal was met in close proximity. At 212 feet a hard rock was met with, which chippings prove to be diorite, that is, bed rock.

"It is evident that as bed rock has been reached in this bore, it would be inadvisable to assist Mr. Sundberg to sink it any further. From the information available with regard to this part of the country, I do not anticipate any good would result from further boring in the immediate vicinity. There is a greater possibility of boring being successful in the neighbourhood of Napier Creek, to the west of Reserve 647A, and I consider that the Government would be justified in assisting Mr. Sundberg by the loan of a plant to bore thereabouts. The area referred to is shown on the accompanying map.*"

On the 27th of January, Mr. Gibson reported as follows in connection with the boring for coal at the Napier River, in the Plantagenet District:—"In accordance with your instructions, I visited Albany for the purpose of reporting on the possibility of finding coal by boring in the vicinity of Napier River, about sixteen miles to the north of Albany. Reports on this district and on the boring already done there appear in the Annual Progress Reports of the Geological Survey for the years 1898 and 1900.

"The country between Albany and the Napier Bridge, near which it was proposed to bore, consists of sandy plains covering tertiary (?) deposits, through which rise occasional outcrops of granite. In addition to the area of granite round Albany, there are outcrops on the King River and on the Napier near its junction with the Kalgan. The outcrop at the King is at the point where the road crosses it half a-mile or so in width, and runs about east and west, following the course of the river; that at the Napier is of very limited extent, being only about a quarter of a mile wide and half to a mile in length, and is in the form of a low ridge trending about east and west; the outcrop is on the south side of the river, between two and three miles to the east of Reserve 647A.

"The granite is undoubtedly continuous between these outcrops and the main bodies lying to the north and west, and will most probably be found underlying the tertiary (?) deposits at a comparatively shallow depth. With regard to any surface indications as to the likelihood of coal being found in this neighbourhood, there is absolutely nothing to be seen. The whole country, with the exception of the granite outcrops, is covered with deposits of loose sand and ironstone gravel, and no outcrops of the sedimentary beds are visible.

"Taking into consideration the results of the boring that has already been done in this district, and the fact that the granite was found outcropping in several places near the centre of what was thought to be the sedimentary area, I am of opinion that any boring done in this vicinity would simply be a waste of money on the part of those concerned in it.

"Mr. Sundberg's syndicate are anxious to put down a bore in the neighbourhood of Kalgan Bridge on the Albany-Phillips River Road. I did not examine this locality, but as you have yourself been over it, you can doubtless give a report as to their possible chances of success."

Mr. Assistant Geologist Gibson's report merely confirms what has been written during the last few years on the question of the occurrence of coal near Albany.

It appears from the report that the syndicate, of which Mr. Sundberg is a member, are anxious to bore on the Kalgan where it is crossed by the Phillips River Road. It is not quite clear to me whether the site alluded to is on Reserve 1973 or Reserve 800, which lies some miles to the north of Woodburn.

In September, 1898, I examined this locality, travelling from Woodburn to Moingup in the Stirling Range, and reported as follows:—"Some distance after leaving Woodburn, a change in the physical features and the character of the soil indicates a difference in the nature of the underlying rocks. From Mitchell Spring northwards the road has been carried over an open sand plain, strewn in places with boulders of sandstone.

---

* Not reproduced.

"At the crossing of the Kalgan River, at Reserve 800, which is 200 feet below the level of Millinup, the river has cut through the overlying sandy beds, and exposes the ancient crystalline rocks of two varieties, a heavy basic rock and an acidic porphyry; of the relations of the two there is no evidence.

"The section between Woodburn and the Kalgan showed that the thickness of the soft sandstones could not be very great. From the Kalgan to Moingup Spring, in the gap by which the Stirling Range is breached, the staple formation is evidently soft sandstones of the type on the south side of the river.

"Approaching Moingup from the south, quartzites and quasi-vitreous sandstones emerge from beneath the horizontal sandy beds, and form the comparatively low ground at the foot of the Stirling Range."

This condition of affairs is pictorially represented in the sketch section* herewith, and from which it appears that to bore in this locality is absolutely waste of money.

Below this point (Reserve 800) granite is known to outcrop in several places in the bed and on the banks of the river; it is also known to rise to the surface in the vicinity of the crossing of the King and the Kalgan Rivers. These facts, coupled with a reasonably intimate acquaintance with the district lying between Albany and Cheynes Bay, warrant the deduction that boring in the search for coal is unlikely to be successful.

Reputed Petroliferous Deposits of the Warren and the Donnelly Rivers.—Since the date of the last report†, despite the many causes which stood in the way of boring, operations were continued from a depth of 722 feet to 1,719 feet. As work proceeded, a series of samples from the borehole were submitted, and the following is a description thereof:—

Nature of Strata.	Thickness.	Depth.
	feet.	feet.
No core	7	722
Fine angular sand of quartz felspar and mica, with a little carbonaceous shale	7	729
Do. do. do.	25	736
No core	129	761
Coarse angular quartz sand, with a little felspar and a few pale garnets	10	890
Very coarse angular sand of quartz and felspar	5	900
Do. do. do.	5	905
Fine angular sand of quartz and felspar, with a little mica and a few pale garnets	25	910
Fine angular sand of quartz felspar and mica	17	935
Coarse angular sand of quartz and felspar	168	952
Coarse angular sand of quartz and felspar, with a little mica	10	1,120
Coarse angular sand of quartz and felspar, with a little mica and a few pale garnets	8	1,130
Coarse angular sand of quartz and felspar	22	1,138
Fine micaceous and somewhat sandy shale...	3	1,160
Coarse angular quartz felspar, sand and gravel	142	1,163
Fine white quartz sand	35	1,305
Coarse angular quartz felspar, sand and gravel	150	1,340
Coarse sand of quartz and felspar, with a few small pale garnets ...	70	1,490
Fine quartz sand	40	1,560
Coarse angular quartz felspar sand	70	1,600
Fine quartz sand	40	1,670
Coarse quartz sand, with a little felspar	9	1,710

Opal at Coolgardie.—In consequence of an application for assistance under the terms of the Mines Development Act towards the exploitation of an opal-bearing deposit, about three miles from Coolgardie, Mr. Jackson, whose experience on the Queensland opal fields fitted him for the task, was instructed to visit the locality and report upon the question.

On his return Mr. Jackson submitted the following report:—

"The occurrence of precious opal at Coolgardie has been demonstrated by the specimens submitted to the department on the 6th of July, and also by a further series collected during an inspection made in pursuance of the instructions of the Hon. the Minister for Mines.

"The locality of the deposit, which has been prospected by Mr. J. S. Moore, is shown on the attached sketch plan, close to the Union Jack mine, which is about three miles north-east of the Coolgardie Railway Station.

"The mineral occurs in one of the belts of dark compact rock, which resemble slate, and which are not uncommon on the field, their origin having been ascribed to processes of metamorphism affecting the schists and amphibole rocks, which are the staple formation in the vicinity. This belt or zone of altered rock has a width of about 26 feet, and trends in a west-north-west direction.

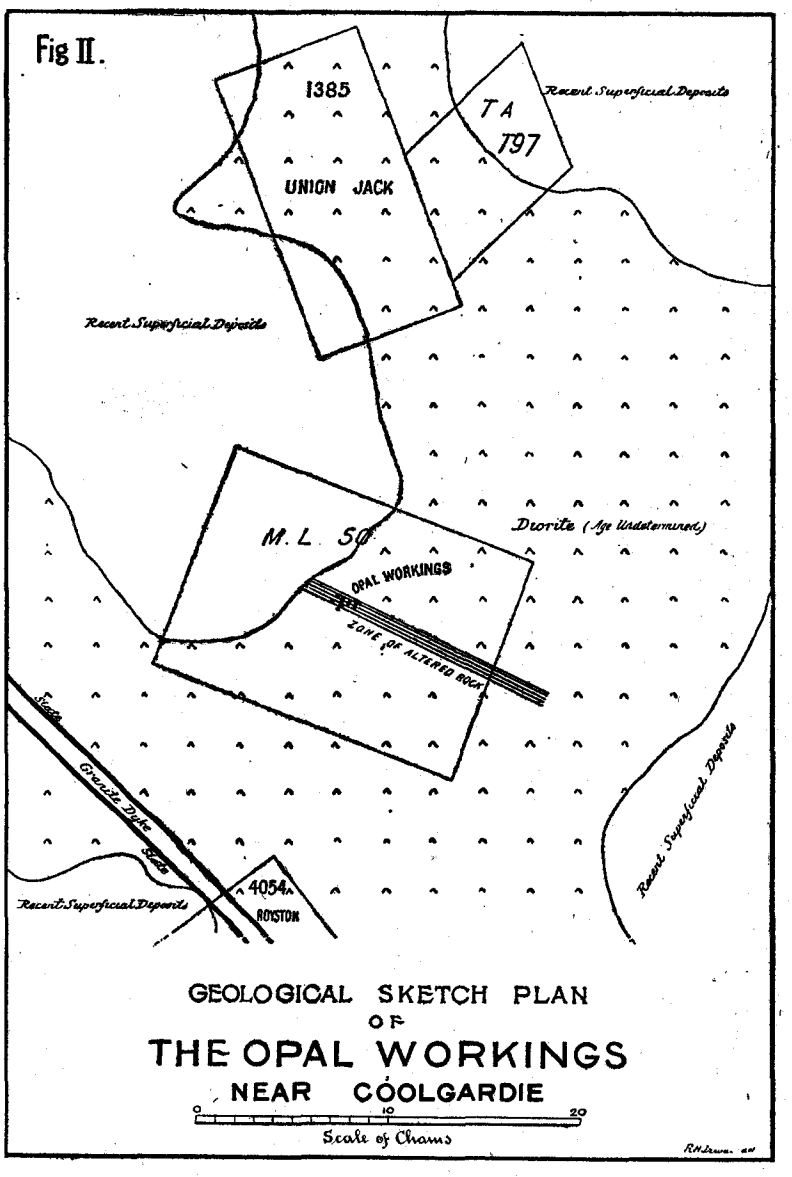
"The rock is very fine in texture, being banded or foliated, and in places considerably contorted; the foliation planes being almost vertical, or dipping at a very high angle to the south. The outcrop is not well marked, on account of the cover of superficial deposits; but the formation can be traced for some distance.

"The rock is traversed by innumerable joints and partings, and the infiltration of solutions and subsequent deposition has given rise to deposits of silica in the form of extremely minute veins, or filling small cavities; both the crystalline form, quartz, and the amorphous form, opal, occurring in association.

* Not reproduced. † Annual Progress Report of the Geological Survey for the year 1902. Perth: By Authority; 1903, p. 15.

"The opal is, in great part of the variety, known as common opal, but in places in the minute veins it has assumed the precious or noble variety, and shows considerable brilliancy. Silicification has also taken place to a slight extent on either side of the main formation in the less metamorphosed rock, which is now much decomposed.

"The nature of the deposit is such as would not be more likely to yield results from deep workings than from shallow workings, and the extent of the opening up so far is small, there being some seven or eight holes and trenches of an average depth of eight feet; hence the operations proposed by Mr. Moore would be one of the forms of mining anticipated in Part III. of the Mining Development Act."



"The question as to whether there is reasonable probability of such mining operations proving to be of a remunerative character would depend on the fulfilment of the following conditions:—

"(*a.*) That they should result in the discovery of a supply of precious opals suitable for cutting into gemstones.

"(*b.*) That they should result in the discovery of the opal occurring in sufficient abundance to pay for mining in hard rock.

"With respect to (*a*), though some of the specimens have shown great brilliancy, and in one or two instances might, with difficulty, have been shaped into very small gems, the opal obtained so far, on account of its extreme thinness and irregularity, would not be classed as 'saleable.' There is, however, in one part of the formation, a perfect reticulation system of the minute veins and joints, in which opal has been deposited; and in places where it has assumed the noble variety a product has been formed similar to that known to gem dealers as 'matrix.' This in sufficient quantity would be of some commercial value for shaping into pendants and for decorative purposes, some specimens exhibiting good colouring.

"With regard to (*b*), though depositions of hydrous silica in the form of common opal is abundant, the conditions which give rise to the assumption of the previous variety (slight difference of physical structure) appear to be generally more favourable in small cavities; and pieces of precious opal of uniform quality, much larger than those generally employed by jewellers, are extremely rare. Moreover it is reasonable to suppose that the opal would have assumed the noble variety under generally similar conditions in the same deposit—*i.e.*, minute veinlets.

"The occurrence is, in some ways, analogous to that of opal and hyalite in hard vecicular basalt, and such deposits have not been worked commercially; the formation from which the supplies of the gems are derived in other countries being sandstone or soft decomposed rock.

"It appears, therefore, that while it is not altogether unlikely that further work at Coolgardie might result in the finding of a small quantity of saleable opal, possibly of the variety which has been referred to above as 'matrix,' the deposit is such as would not be likely to yield a consistent supply; further, the use of explosives is practically inadmissible on account of their shattering effect, and the intrinsic value of gem opal (a few shillings to £1 10s. per carat) is not sufficient to pay for mining in hard rock unless under conditions which would be very exceptional.

"In conclusion, with regard to results of general value which might be attained by more extensive prospecting of the deposit, there are only grounds for hoping that it might lead to a little saleable opal being found occasionally in other such deposits; the result of secondary silicification, which has been observed elsewhere in the rocks of the Eastern Goldfields."

Miscellaneous Mineral Notes.

During the year the following notes were prepared by Mr. Gibson upon some interesting specimens which passed through the laboratory, and are placed in record in this place:—

Manganotantalite, G.S.L. 293.—Specimens of this mineral in its massive form were received during the year from the Wadgina Tinfield, Pilbara District. A rough analysis made in the laboratory shows the composition of this mineral to be as follows:—

Tantalic and niobic oxides	79·26	(mostly tantalic oxide)
Tin dioxide	1·10	
Manganese protoxide	16·67	
Iron protoxide	3·01	
Lime	·52	
Moisture	trace	
	100·56	
Specific gravity	7·15	

Guano.—Several samples of guano of excellent quality were received from the islands of the Recherché Archipelago, partial analyses of these gave results as follow:—

G. S. L. 405 ...	Sand ·50 per cent. ...	Phosphorous Pentoxide 37·04 per cent., equivalent to Calcium Phosphate 80·80 per cent.
G. S. L. 406 ...	Sand ·64 per cent. ...	Phosphorous Pentoxide 31·55 per cent., equivalent to Calcium Phosphate 68·86 per cent.
G. S. L. 407 ...	Sand ·10 per cent. ...	Phosphorous Pentoxide 36·08 per cent., equivalent to Calcium Phosphate 78·78 per cent.
G. S. L. 408 ...	Sand ·12 per cent. ...	Phosphorous Pentoxide 39·14 per cent., equivalent to Calcium Phosphate 85·44 per cent.

Precious Opal.—Several specimens of precious opal were sent to the Laboratory from Coolgardie. Some of these were of very good quality, but were too small to be of much value. The deposit was reported on by the then Acting Government Geologist, Mr. Jackson.

Scheelite.—This mineral has already been reported from several localities within the State. Several fair-sized pieces were sent down during the year from the Ard Patrick G.M., Nullagine District, where it is found on the walls of the quartz reef.

An assay of a sample made in the Laboratory gave Tungstic Acid 50·93 per cent. The sample was considerably contaminated by the admixture of quartz with the scheelite.

Cobaltiferous Asbolite.—An assay of a sample of asbolite from Greenbushes showed it to contain nickel and cobalt as follows:—

Nickel	·15 per cent.
Cobalt	1·04 per cent.

These percentages are too low to render it of any commercial value as an ore of cobalt.

I have, etc.,

A. GIBB MAITLAND,

Government Geologist.

INDEX TO NAMES OF PLACES, MINES, REEFS, ETC.

INDEX TO NAMES OF PLACES, MINES, REEFS, ETC.—*continued.*

INDEX TO NAMES OF PLACES, MINES, REEFS, ETC.—*continued.*

213P
MARGARETTING No1 NORTH
Sc

245P
ADMIRAL

13P
87N
POLAR STAR
Sc

4P
39N
Sc
PACIFIC

Govt Well
59.93
Water Reserve

15P
106N
MARGARETTING

152P
115P
PEAK HILL BOULDER

1P
2N
NORTH STAR

V.D. 220'
25°
No1 Bore
V.D. 965'

16P
107N
MARGARETTING SOUTH
Sc

5P
49N

29P
567
ATLANTIC

82P

A
No2 Bore
V.D. 952'
Section line

9P
75N
No1 NORTH

54P
INDEPENDENT
Sc

EVENING STAR

28P
566
COMMERCIAL

263P
ADMIRAL SOUTH

118P
COMMODORE

146P
92P
GEM OF PEAK HILL

43P
108N
GRAND DUCHESS

6P
60N
BOBBY DAZZLER

0 5 10 15
SCALE OF CHAINS

ADMIRAL 245P — No1 Bore — A — No2 Bore — PEAK HILL BOULDER 152P — MARGARETTING STh 16P — Main Shaft — No1 NORTH 5P — EVENING STAR 9P — B

128'L
234'L
340'L
450'L.

V.D. 965'
V.D. 952'

CROSS SECTION OF PEAK HILL LODE AT MAIN SHAFT

0 240' 480'
SCALE OF FEET.

Alfred Gaitland
Government Geologist

PLAN & SECTION
SHEWING THE RESULT OF BORING FOR REEFS
PEAK HILL G. F.

TO ACCOMPANY ANNUAL PROGRESS REPORT OF THE GEOLOGICAL SURVEY FOR 1904.

The Hon. W. D. Johnson M.L.A.
Minister for Mines

EXPLANATION

RECENT SUPERFICIAL DEPOSITS
QUARTZ MASSES — Q
SCHISTOSE ROCKS (Age undetermined) — Sc
LODE — PROVED — PROBABLE CONTINUATION
IMPREGNATIONS
GEOLOLOGICAL BOUNDARIES — UNCERTAIN
BORES
WELLS
SHAFTS
UNDERGROUND WORKINGS — 450'L
MINING LEASES — Name of: MARGARETTING; Registered No of: 15P; Post No of: 106N; Boundaries of:

R H. Irwin del 30/6/05

H. J. Pether, Government Photolithographer, Perth, W. A.

The Hon. W.D. Johnson M.L.A.
Minister for Mines
1905

MAP OF WESTERN AUSTRALIA

SHEWING THE GEOLOGICAL MAPS ISSUED SINCE 1896

To accompany Annual Progress Report of the Geological Survey for 1904.

Scale of English statute miles.
50 40 30 20 10 0 50 100 150 200

REFERENCE

- Towns ..... shown thus ..... ◉ EUCLA
- Railways ..... ,, ... ,,
- Land District Boundaries ..... ,, ... ,,
- Land Division ..... ,, ... ,,
- Goldfields ..... ,, ... ,,
- Telegraph Lines & Stations ..... ,, ... ,,
- Agricultural Areas ..... ,, ... ,,
- Stock Routes ..... ,, ... ,,
- Heights in feet ..... ,, ... (1265)
- Steamer Routes ..... ,, ... ,,

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16 NORTH LEAD KANOWNA
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21 MT MAGNET & BOOGARDIE
23 EDJUDINA & YARRI
24 MULLINE
25 MULWARRIE & DAVYHURST
26 LEONORA
27 THE ISLAND
28 THE MAINLAND
29 TUCKANARRA
30 QUINNS
31 GABANINTHA & STAR OF THE EAST
32 NANNINE
33 MEEKATHARRA
35 LALLA ROOKH
36 BAMBOO
37 YANDICOOGINA
38 MOSQUITO CREEK
39 MOOLYELLA
41 SOUTHERN CROSS
42 MT MORGANS
43 MULGABBIE
44 IRWIN COAL FIELD
45 WANNEROO
46 CANNING RIVER VALLEY
47 HELENA RIVER VALLEY
48 ARRINO
49 CUE PEAK HILL & MENZIES

A Gibb Maitland
Government Geologist

Longitude 121° East of Greenwich.

H. J. Pether, Government Photolithographer, Perth, W.A.

Western Australia.

MINING STATISTICS TO 31ST DECEMBER, 1904.

LETTER OF TRANSMITTAL.

Department of Mines,
Statist's Office,
Perth, 30th June, 1905.

The Secretary for Mines.

SIR,

I have the honour to transmit, herewith, the Mining Statistics of 1904.

From the beginning of the year all returns of bullion have been made in ounces of fine gold, and, when known, of fine silver. The tonnage, as is the established practice in the other States of the Commonwealth, is recorded in standard tons of 2,240lbs.

In order to bring the returns giving the details of the production of each mine, from 1897 to 1903, into harmony with those subsequently published, it will be necessary to recast the figures relating to the output, substituting "fine gold" content for "gross weight." This work has been undertaken but is not yet complete. It is anticipated, however, that the amended table will be ready for embodiment in next year's report.

All other tables for the year are complete.

I have the honour to be,
Sir,
Your obedient servant,

JAMES WALLACE,
Statist.

MINING STATISTICS

TO 31ST DECEMBER, 1904.

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PART II.—MINERALS OTHER THAN GOLD.

PART III.—ALL MINES.

APPENDIX.

EXPLANATIONS OF SIGNS AND ABBREVIATIONS.

Gf.	Goldfield.	R.C.	Reward Claim.
Mf.	Mineral Field.	M.A.	Machinery Area.
D.	District.	P.A.	Prospecting Area.
P.P.L.	Private Property Lease.	T.A.	Tailings Area.
Loc.	Location.	W.R.	Water Right.
Q.C.	Quartz Claim.		

SUMMARY OF MINERAL PRODUCTS.

GOLD and OTHER MINERALS produced during 1904, and the estimated Value thereof, together with a comparison for previous years, and the Total Production to date.

Description of Mineral.	1904.		1903.		1902.		1901.		1900.		Previous to 1900.		Total to date.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
		£		£		£		£		£		£		£
Antimony ... ... (Exported) statute tons	...	...	22	230	...	...	...	...	...	...	...	...	22	230
Gold (Exported and [1]†Minted) fine ounces	1,983,230	8,424,226	2,064,801	8,770,719	1,871,037	7,947,662	1,703,417	7,235,653	1,414,311	6,007,611	3,879,575	16,479,386	12,916,371	54,865,257
Black Tin .. ... (Raised) statute tons	855	58,817	817	55,890	620	39,783	734	40,000	823	56,702	2,001	95,797	5,850	346,989
Copper Ore ... ... (Raised) do	3,969	25,180	20,526	56,541	2,262	8,090	9,960	69,900	6,183	43,673	9,982	91,208	52,883	294,592
Ironstone ... ... (Raised) do	1,442	577	220	88	4,800	2,040	20,569	13,246	12,251	9,258	12,952	9,239	52,234	34,448
Lead — Ore ... ... (Exported) do	...	...	...	...	...	...	...	...	27	242	33,617	364,514	33,644	364,756
Lead — Silver-Lead Ore (Raised) do	...	...	...	...	36	277	21	152	...	...	...	...	57	429
Lead — Pig ... ... (Exported) do	...	...	...	...	...	...	...	...	...	...	684	13,306	684	13,306
Silver ... ... (Exported) fine ounces	399,190	45,912	168,113	19,153	83,293	9,190	60,869	7,609	28,749	3,594	...	...	740,214	85,458
Asbestos ... ... (Exported) statute tons	...	...	[4]†	10	...	...	...	...	...	...	[2]†	1	...	11
Coal ... ... (Raised) do	138,550	67,174	133,427	69,128	140,884	86,188	117,836	68,561	118,410	54,835	57,844	27,712	706,951	373,598
Cobalt Ore ... (Exported) do	...	...	...	...	2	41	...	...	...	...	...	...	2	41
Limestone ... (Raised) do	13,397	1,699	1,280	178	5,080	1,340	18,210	4,348	15,927	3,594	17,953	2,838	71,487	13,997
Mica ... ... (Exported) do	...	...	...	...	...	...	...	...	[2]†	3	[2]†	291	...	294
Plumbago Ore ... (Exported) do	[5]†	2	...	...	1	6	...	...	...	...	...	...	1	8
Precious Stones (Exported) carats	...	...	...	...	...	...	...	...	[3]†	24	...	...	...	24
Total Values	...	£8,623,587	...	£8,971,937	...	£8,094,617	...	£7,439,469	...	£6,179,536	...	£17,084,292	...	£56,393,438

[1]† Since May, 1899. [2]† Weight not stated. [3]† 25 Small diamonds raised, weight not stated. [4]† 4cwts. [5]† 1cwt.

AUSTRALASIAN MINERAL PRODUCTION.

COMPARATIVE TABLE showing the Output of all Mineral Products from the several States of Australia and the Colony of New Zealand during 1904.

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.
		£		£		£		£		£		£		£
Gold ... ... fine ounces	1,983,230	8,424,22	269,817	1,146,109	639,149	2,714,934	765,596	3,252,045	65,921	280,015	29,110	123,648	467,897	1,987,501
Copper ... ... statute tons	...	...	6,549	376,325	4,370	257,896	...	...	[5]†8,583	596,956	6,278	382,356	...	...
Copper Ore ... ... do	3,969	25,180	2,358	44,062	...	...	...	...	104	1,640	3,051	24,597	...	...
Lead ... ... do	...	...	5,883	65,964	2,046	24,560	...	...	...	...	...	...	...	...
Manganese ... ... do	...	...	...	...	830	3,540	...	...	...	...	...	...	...	...
Platinum ... ... fine ounces	...	...	535	1,070	...	...	...	...	...	...	...	...	...	...
Silver ... ... do	399,190	45,912	1,121,402	123,256	654,929	71,858	28,653	3,390	...	...	...	...	1,094,461	112,875
Silver Ore ... ... statute tons	...	...	367,483	1,376,211	...	...	...	...	...	...	...	...	...	...
Silver-Lead Ore ... do	...	...	29,737	566,073	...	...	...	...	51,138	203,702	...	...	...	...
Tin ... ... do	...	...	1,068	136,960	3,923	270,276	...	...	2,072	255,228	...	...	...	...
Black Tin ... ... do	855	58,817	...	...			...	...	...	...	...	...	...	...
Tin Ore ... ... do	...	...	577	47,825	...	...	71	5,190	245	10,893	...	...	...	...
Wolfram... ... ... do	...	...	89	8,432	1,539	161,635	...	...	16	1,147	...	...	...	...
Zinc Spelter ... ... do	...	...	57,603	117,978	...	...	...	...	...	...	...	...	128	1,103
Antimony ... ... do	...	...	[1]†109	503	...	...	[4]†20	160	...	...	...	...	...	...
Bismuth ... ... do	...	...	40	12,329	21	3,581	...	...	[6]†	15	...	...	...	...
Alunite ... ... do	...	...	370	925	...	...	...	...	...	...	...	...	...	...
Coal ... ... do	138,550	67,174	6,019,809	1,994,952	566,831	166,557	121,741	70,208	61,109	51,942	...	...	1,537,838	768,919
Coke ... ... do	...	...	171,006	110,692	§	§	...	...	...	...	...	...	...	...
Shale (Oil) ... ... do	...	...	37,871	26,770	...	...	...	...	...	...	...	...	...	...
Cobalt Ore ... ... do	...	...	545	60	...	...	...	...	...	...	...	...	...	...
Gypsum ... ... do	...	...	...	...	...	...	3,620	1,905	...	...	§	§	...	...
Iron ... ... do	...	...	6,303	80,504	...	...	...	...	...	...	...	...	...	...
Iron Oxide ... ... do	...	...	415	239	...	...	...	...	...	...	...	...	...	...
Ironstone ... ... do	1,442	577	8,661	6,628	4,424	1,659	...	...	6,840	2,975	46,687	27,091	100	59
Lime ... ... do	...	...	23,173	13,250	18,773	10,820	§	§	...	...	...	...	...	59
Limestone ... ... do	13,397	1,699	24,975	14,434	...	...	§	§	...	...	43,440	26,059	...	...
Molybdenite ... ... do	...	...	25	2,726	21	2,673	...	...	...	...	...	...	...	...
Plumbago Ore ... ... do	[9]†	2	...	...	...	...	...	...	...	...	...	...	...	...
Precious Stones ... carats	...	...	14,296	11,620	...	[3]†14,125	...	...	...	...	...	...	...	...
			[2]†...	57,000										
Unenumerated	...	...	...	59,661	...	148	§	§	[7]†	6,679	[8]†	12,000	...	14,258
Total Values	...	8,623,587	...	6,402,558	...	3,704,262	...	3,332,898	...	1,411,192	...	595,751	...	2,884,774

* Including Northern Territory. [1]† Ore and Metal. [2]† Opal. [3]† Includes Opal, valued at £3,550. [4]† Antimony Ore. [5]† Includes Blister Copper, 8,371 tons, valued at £582,540.
[6]† 6cwts. [7]† Includes 1,931 tons Zinc Ore, valued at £1,982, and 9,869 tons Flux, valued at £4,697. [8]† Salt. [9]† 1cwt. § Particulars not obtainable.

PART I.—GOLD.

TABLE I.

MONTHLY GOLD PRODUCTION.

Return of Gold, in Fine Ounces, reported Monthly to the Mines Department from the respective Goldfields and Districts during 1904.

Goldfield.	District.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Total.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley	...	13·07	8·71	8·71	8·71	6·97	10·45	10·45	8·71	8·71	95·22	8·71	17·42	205·84
Pilbarra	Marble Bar	177·69	186·22	...	104·34	...	...	607·24	22·78	354·20	709·49	650·96	316·45	3,129·37
Do	Nullagine...	179·39	233·40	485·52	351·54	631·44	237·80	231·99	416·68	599·68	462·68	481·03	589·13	4,900·28
West Pilbarra... ...	...	650·01	60·96	584·81	41·46	369·86	591·15	7·65	...	22·33	890·81	196·87	11·80	3,427·71
Ashburton	...	...	84·74	84·74	...	...	...	...	...	239·56	39·90	33·90	27·12	509·96
Gascoyne	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Peak Hill	...	1,229·80	2,134·17	1,937·40	1,705·80	1,118·42	938·30	852·33	773·45	655·01	754·90	938·15	1,075·84	14,113·57
East Murchison ...	Lawlers ...	5,438·49	5,702·84	5,624·75	6,662·78	7,018·59	5,314·85	8,428·02	8,490·84	7,712·21	7,896·17	7,206·71	6,908·28	82,404·53
Do	Black Range	...	1,233·72	178·16	744·58	1,457·83	718·71	1,108·73	830·17	955·91	774·07	1,986·34	1,198·17	11,186·39
Murchison	Cue ...	1,316·52	925·80	1,542·77	947·85	1,032·54	1,121·35	1,212·32	1,629·24	950·30	1,387·14	1,531·50	1,689·38	15,286·71
Do	Nannine ...	1,671·39	1,496·33	1,101·86	1,968·62	1,277·83	1,434·56	1,121·73	1,214·69	1,439·03	2,386·69	810·21	2,745·37	18,668·31
Do	Day Dawn	12,064·22	11,334·43	13,123·11	14,407·16	12,266·04	13,977·18	13,256·75	13,940·20	14,058·55	14,567·73	13,875·98	14,292·16	161,163·51
Do	Mt. Magnet	1,644·59	1,420·64	2,292·48	2,087·64	3,150·25	1,640·72	1,743·53	1,264·56	1,149·79	1,176·95	1,056·23	657·22	19,284·60
Yalgoo	...	189·40	430·96	162·60	317·86	429·58	103·15	177·64	2·51	216·82	33·23	152·67	136·99	2,353·41
Mt. Margaret	Mt. Morgans	4,796·81	4,029·37	4,252·01	4,071·34	4,079·00	2,642·37	4,180·29	3,383·47	2,835·13	3,135·35	5,781·12	2,044·07	45,230·33
Do	Mt. Malcolm	6,719·63	6,207·30	8,268·18	6,717·39	7,715·47	7,222·03	7,758·56	8,694·77	9,225·02	8,323·87	8,240·62	9,207·43	94,300·27
Do	Mt. Margaret	2,185·49	4,929·59	3,313·14	3,756·68	3,861·38	3,208·36	3,340·36	3,416·11	3,577·02	3,641·76	3,867·54	4,895·22	43,992·65
North Coolgardie ...	Menzies ...	2,258·06	1,982·21	3,092·88	3,179·66	2,742·10	4,406·81	2,583·47	3,304·34	3,456·24	3,404·00	3,420·91	3,270·05	37,100·73
Do	Ularring ...	557·82	593·15	920·39	763·26	1,437·97	1,283·33	1,602·90	2,669·76	3,079·75	2,795·95	2,389·43	3,675·70	21,769·41
Do	Niagara ...	6,381·63	6,691·82	6,063·21	6,190·05	6,116·45	6,018·75	4,994·28	4,893·12	4,800·01	5,484·28	4,418·50	5,178·23	67,230·33
Do	Yerilla ...	1,142·36	1,975·09	1,194·64	2,074·82	1,614·66	1,741·52	1,363·55	1,851·36	1,228·83	1,292·07	1,508·08	1,977·16	18,964·14
Broad Arrow	...	1,450·63	2,064·80	2,367·09	1,666·61	888·28	1,442·08	1,905·18	2,665·75	2,023·90	1,971·48	1,677·83	2,056·56	22,180·19
North-East Coolgardie	Kanowna ...	2,579·58	2,993·80	2,387·51	3,591·47	2,489·94	2,870·78	2,955·59	2,826·87	3,962·81	3,948·84	3,871·42	4,169·95	38,648·56
Do	Bulong ...	637·22	1,099·44	1,404·92	574·03	1,038·75	687·10	821·46	1,018·64	652·96	1,637·40	791·71	791·75	11,155·38
Do	Kurnalpi ...	15·75	16·22	203·69	...	35·94	133·78	58·00	115·34	28·40	176·67	38·17	329·11	1,151·07
East Coolgardie ...	...	84,738·72	89,546·88	99,410·38	88,586·35	89,247·97	85,382·07	86,005·78	80,911·07	86,421·24	86,383·52	83,558·45	90,730·46	1,050,922·89
Coolgardie	Coolgardie	3,653·02	2,912·73	4,226·20	3,146·31	4,274·97	4,031·57	4,159·51	5,134·24	4,129·00	5,013·52	6,005·26	6,818·68	53,505·01
Do	Kunanalling	732·72	1,534·32	1,122·84	852·82	616·82	643·29	728·17	627·18	419·64	782·67	687·98	946·30	9,694·75
Yilgarn	...	1,691·53	2,114·53	3,198·35	2,288·39	2,484·58	2,695·72	1,897·91	2,062·82	2,216·84	1,879·31	1,801·24	1,177·42	25,508·64
Dundas	...	1,433·79	3,260·85	2,918·41	2,242·20	2,212·33	3,738·65	3,029·53	2,576·97	2,582·32	2,479·58	2,531·78	2,823·86	31,830·27
Phillips River... ...	...	271·58	401·52	547·59	329·86	482·04	...	608·60	294·55	202·20	156·95	538·59	183·15	4,016·63
Donnybrook	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Goldfields generally	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**145,820·91**	**157,606·54**	**172,018·34**	**159,379·58**	**160,098·00**	**154,236·43**	**156,751·52**	**155,040·19**	**159,203·41**	**163,682·20**	**160,057·89**	**169,940·43**	**1,913,835·44**

TABLE II.

YEARLY GOLD PRODUCTION.

Return of Gold, in Fine Ounces, reported Annually to the Mines Department from the respective Goldfields and Districts, to the 31st December, 1904.

Goldfield.	District.	1904.		1903.		1902.		1901.		1900.	
		District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley		...	205·84	...	644·54	...	301·71	...	262·25	...	504·21
Pilbarra	Marble Bar	3,129·37	8,029·65	4,787·33	9,570·04	4,501·02	10,602·12	3,636·77	9,072·45	10,168·33	14,507·02
Do.	Nullagine	4,900·28		4,782·71		6,101·10		5,435·68		4,338·69	
West Pilbarra		...	3,427·71	...	5,100·48	...	1,910·42	...	198·73	...	779·48
Ashburton		...	509·96	...	903·94	...	926·66	...	938·04	...	1,493·56
Gascoyne		...	...	...	...	...	...	...	85·10	...	64·86
Peak Hill		...	14,113·57	...	31,750·17	...	35,297·81	...	18,607·23	...	25,175·67
East Murchison	Lawlers	82,404·53	93,590·92	86,565·13	87,278·05	76,134·74	76,326·88	65,533·58	65,547·42	56,440·60	56,532·25
Do.	Black Range	11,186·39		712·92		192·14		13·84		91·65	
Murchison	Cue	15,286·71	214,403·13	20,688·78	204,181·85	21,016·82	172,914·32	18,755·54	123,865·85	18,383·98	93,833·87
Do.	Nannine	18,668·31		19,947·48		19,329·49		17,690·99		25,913·18	
Do.	Day Dawn	161,163·51		136,768·68		102,030·80		57,867·95		12,413·87	
Do.	Mt. Magnet	19,284·60		26,776·91		30,537·21		29,551·37		37,122·84	
Yalgoo		...	2,353·41	...	3,138·35	...	5,198·89	...	8,351·30	...	8,794·00
Mt. Margaret	Mt. Morgans	45,230·33	183,523·25	59,517·40	182,763·92	51,092·42	186,818·98	41,607·09	165,243·01	31,819·52	126,855·11
Do.	Mt. Malcolm	94,300·27		83,529·04		78,171·96		84,278·40		77,235·19	
Do.	Mt. Margaret	43,992·65		39,717·48		57,554·60		39,357·52		17,800·40	
North Coolgardie	Menzies	37,100·73	145,064·61	52,870·58	162,139·18	50,168·26	154,238·37	51,568·02	121,974·00	47,103·26	91,388·29
Do.	Ularring	21,769·41		19,142·55		25,766·96		17,821·18		11,641·47	
Do.	Niagara	67,230·33		77,013·02		69,877·50		42,146·08		25,013·63	
Do.	Yerilla	18,964·14		13,113·03		8,425·65		10,438·72		7,629·93	
Broad Arrow		...	22,180·19	...	26,021·17	...	17,092·95	...	29,885·18	...	43,438·91
N.E. Coolgardie	Kanowna	38,648·56	50,955·01	40,554·03	54,459·08	39,497·86	57,627·45	35,318·30	55,583·21	38,127·32	58,484·12
Do.	Bulong	11,155·38		13,180·06		16,849·50		17,445·04		17,129·11	
Do.	Kurnalpi	1,151·07		724·99		1,280·09		2,819·87		3,227·69	
East Coolgardie		...	1,050,922·89	...	1,062,898·06	...	941,436·40	...	856,748·86	...	657,863·87
Coolgardie	Coolgardie	53,505·01	63,199·76	58,692·50	71,285·59	65,002·37	74,502·96	59,973·11	73,083·48	70,702·09	90,009·59
Do.	Kunanalling	9,694·75		12,593·09		9,500·59		13,110·37		19,307·50	
Yilgarn		...	25,508·64	...	19,276·71	...	20,066·81	...	21,925·95	...	24,353·94
Dundas		...	31,830·27	...	33,845·76	...	28,579·34	...	29,843·03	...	34,036·83
Phillips River		...	4,016·63	...	7,050·73	...	7,441·30	...	665·83	...	36·72
Donnybrook		...	...	...	53·21	...	61·36	...	3·54	...	339·95
Goldfields generally		...	...	...	...	...	...	...	108·93	...	128·46
TOTAL	**Fine Ounces**	...	1,913,835·44	...	1,962,360·83	...	1,791,344·73	...	1,581,993·39	...	1,328,620·71
	Sterling Value	**£8,129,456**		**£8,335,579**		**£7,609,149**		**£6,719,881**		**£5,643,622**	

TABLE II.—*Return of Gold, in Fine Ounces, reported Annually, etc.*—continued.

GOLDFIELD.	DISTRICT.	1899.		1898.		1897.		Previous to 1897.		Total to 31st December, 1904.	
		District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.	District.	Goldfield.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Kimberley	... ...	...	804·06	...	402·44	...	209·32	...	11,686·66	...	15,021·03
Pilbarra	Marble Bar	11,856·46	17,357·03	9,339·65	12,746·05	4,804·81	5,615·46	21,207·61	22,478·47	73,431·35	109,978·29
Do.	Nullagine	5,500·57		3,406·40		810·65		1,270·86		36,546·94	
West Pilbarra	... ...	...	1,689·63	...	296·37	...	753·47	...	301·10	...	14,457·39
Ashburton	... ...	...	1,572·00	...	474·35	...	277·03	...	...	...	7,095·54
Gascoyne	... ...	...	330·63	...	12·29	...	12·39	...	...	...	505·27
Peak Hill	... ...	...	30,582·24	...	14,319·60	...	10,372·18	...	10,554·30	...	190,772·77
East Murchison	Lawlers	39,558·51	39,620·88	31,896·53	31,909·95	19,063·44	19,063·44	2,327·16	2,327·16	459,924·22	472,196·95
Do.	Black Range	62·37		13·42		...		...		12,272·73	
Murchison	Cue	21,869·47		22,037·29		20,527·54		20,827·00		179,393·13	
Do.	Nannine	16,301·86	71,209·25	19,344·18	70,306·71	8,928·19	55,692·73	18,154·20	125,186·63	164,277·88	1,131,594·34
Do.	Day Dawn	11,331·86		12,249·64		15,168·26		53,143·53		562,138·10	
Do.	Mt. Magnet	21,706·06		16,675·60		11,068·74		33,061·90		225,785·23	
Yalgoo	... ...	...	10,572·38	...	2,938·03	...	3,121·21	..	6,301·58	...	50,769·15
Mt. Margaret	Mt. Morgans	14,652·97		8,641·76		3,376·34		294·06		256,231·89	
Do.	Mt. Malcolm	46,399·13	70,254·54	29,638·28	42,121·24	15,051·71	19,123·93	3,887·01	4,448·39	512,490·99	981,152·37
Do.	Mt. Margaret	9,202·44		3,841·20		695·88		267·32		212,429·49	
North Coolgardie	Menzies	58,536·52		46,758·96		48,457·33		18,479·79		411,043·45	
Do.	Ularring	10,199·16	100,631·51	3,709·08	62,692·53	608·25	51,544·41	57·21	23,011·16	110,715·27	912,684·06
Do.	Niagara	22,703·15		8,112·48		504·03		189·13		312,789·35	
Do.	Yerilla	9,192·68		4,112·01		1,974·80		4,285·03		78,135·99	
Broad Arrow	... ...	...	40,615·81	...	25,005·93	...	12,541·93	...	8,333·96	...	225,116·03
N.E. Coolgardie	Kanowna	63,881·85		136,717·64		27,514·76		7,460·24		427,720·56	
Do.	Bulong	27,367·87	94,744·72	14,191·28	152,690·22	8,692·91	36,542·47	509·13	8,058·48	126,520·28	569,144·76
Do.	Kurnalpi	3,495·00		1,781·30		334·80		89·11		14,903·92	
East Coolgardie	... ...	...	799,464·46	...	400,457·41	...	284,297·70	...	137,975·92	...	6,192,065·57
Coolgardie	Coolgardie	89,081·78	110,359·36	68,722·90	89,613·88	40,420·91	57,196·18	60,781·58	67,138·88	556,882·25	696,389·68
Do.	Kunanalling	21,277·58		20,890·98		16,775·27		6,357·30		129,507·43	
Yilgarn	... ...	...	14,151·16	...	10,094·40	...	14,200·73	...	75,645·28	...	225,223·62
Dundas	... ...	...	37,839·28	...	32,469·59	...	17,115·64	...	3,663·25	...	249,222·99
Phillips River	... ...	...	...	...	...	...	...	...	...	...	19,211·21
Donnybrook	... ...	...	370·27	...	13·43	...	...	...	...	...	841·76
Goldfields generally		...	1,151·91	...	...	...	...	...	...	...	1,389·30
TOTAL	**Fine Ounces**	...	**1,443,321·12**	...	**948,564·42**	...	**587,680·22**	...	**507,111·22**	...	**12,064,832·08**
	Sterling Value	**£6,130,838**		**£4,029,246**		**£2,496,307**		**£2,154,071**		**£51,248,149**	

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, 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 1904.

Goldfield.	District.	Warden's Office.	Date of Proclamation of Goldfield.				Area in Square Miles.		Leases in Force.		Particulars of Plant.				Average Number of Men employed.	
			Proclamation gazetted.	To take effect from	Latest Amendment of Boundaries gazetted.	To take effect from	Goldfield.	District.	No.	Area in Acres.	Milling. Stamps.	Milling. Other Mills.	Cyaniding. Leaching Vats.	Cyaniding. Filter Presses.	Above Ground.	Under Ground.
Kimberley	...	Hall's Creek	20-5-86	20-5-86	31-10-02	1-11-02	33,000	...	2	13	25	...	...	...	2	3
Pilbarra	Marble Bar	Marble Bar	1-10-88	1-10-88	20-9-95	1-11-95	34,880	25,205	20	204	45	1	17	...	38	21
	Nullagine							9,675	24	286	40	...	5	...	20	98
West Pilbarra	...	Roebourne	20-9-95	1-11-95	...	...	9,480	...	5	78	20	1	4	...	...	11
Ashburton	...	Onslow	11-12-90	11-12-90	18-10-01	14-10-01	14,252	...	...	...	...	...	...	...	...	...
Gascoyne	...	Carnarvon	25-6-97	15-4-97	...	...	5,061	...	5	66	...	...	...	...	...	..
Peak Hill	...	Peak Hill	19-3-97	1-4-97	...	...	12,194	...	62	719	50	1	12	9	147	104
East Murchison	Lawlers	Lawlers	28-6-95	28-6-95	28-3-02	2-4-02	25,420	20,000	164	2,392	245	2	77	3	493	501
	Black Range							5,420	89	1,017	15	2	4	...	169	137
Murchison	Cue	Cue	24-9-91	24-9-91	8-2-95	23-1-95	20,513	7,981	113	1,007	90	...	32	...	107	124
	Nannine							7,716	98	1,187	204	2	47	...	92	112
	Day Dawn							728	98	1,058	175	...	40	6	396	319
	Mt. Magnet							4,088	77	656	120	1	40	...	210	189
Yalgoo	...	Yalgoo	8-2-95	23-1-95	...	...	18,921	...	27	284	75	2	13	...	33	33
Mt. Margaret	Mt. Morgans	Mt. Morgans	12-3-97	1-4-97	28-3-02	2-4-02	44,976	1,473	55	933	90	...	51	3	219	257
	Mt. Malcolm							3,708	143	2,384	266	2	61	1	329	451
	Mt. Margaret							39,795	159	2,454	150	2	72	2	327	378
North Coolgardie	Menzies	Menzies	28-6-95	28-6-95	12-3-97	1-4-97	30,609	10,342	135	1,649	180	2	62	5	249	326
	Ularring							5,182	77	909	80	...	27	1	112	161
	Niagara							779	111	1,297	120	3	55	3	256	325
	Yerilla							14,306	81	1,232	55	1	26	...	125	182
Broad Arrow	...	Broad Arrow	17-11-96	20-11-96	...	...	590	...	88	1,144	220	5	60	3	133	172
North-East Coolgardie	Kanowna	Kanowna	20-3-96	15-4-96	13-11-96	20-11-96	21,542	1,099	82	1,073	195	12	67	...	171	315
	Bulong							991	74	1,084	40	2	3	...	58	126
	Kurnalpi							19,452	27	612	5	1	...	...	4	8
East Coolgardie	...	Kalgoorlie	21-9-94	1-10-94	20-3-96	15-4-96	632	...	246	3,579	655	108	230	120	3,006	3,249
Coolgardie	Coolgardie	Coolgardie	6-4-94	6-4-94	20-3-96	15-4-96	11,974	9,221	167	2,104	359	1	141	6	476	654
	Kananalling							2,753	72	882	140	5	48	1	145	184
Yilgarn	...	Southern Cross	1-10-88	1-10-88	20-3-96	15-4-96	15,593	...	62	861	170	3	63	...	214	180
Dundas	...	Norseman	31-8-93	31-8-93	22-8-02	1-9-02	11,500	...	88	913	120	4	46	3	198	262
Phillips River	...	Ravensthorpe	21-9-00	14-9-00	22-8-02	1-9-02	3,850	...	15	229	45	1	5	...	34	40
Donnybrook	Crown Land	Greenbushes	17-11-99	27-11-99	...	...	102	...	5	56	5	...	...	...	...	...
	Private Property								13	132						
Goldfields generally (Newcastle)	...	...	...	...	...	...	...	...	4	36	...	4	...	...	163	...
		Total	...	...	...	...	315,089	...	2,488	32,530	3,999	168	1,308	166	7,926	8,922

TABLE III.—*Return showing, for the respective Goldfields and Districts, etc.*—continued.

GOLDFIELD.	DISTRICT.	Alluvial.	Dollied and Specimen.	Ore Treated.	Gold therefrom.	Silver therefrom.	Total Gold.
		fine ozs.	fine ozs.	tons (2,240 lbs.)	fine ozs.	fine ozs.	fine ozs.
Kimberley	... ...	119·33	...	300·00	86·51	...	205·84
Pilbarra	Marble Bar	351·72	307·08	737·60	2,470·57	253·57	3,129·37
	Nullagine	378·06	23·75	2,986·85	4,498·47	...	4,900·28
West Pilbarra	... ...	289·87	...	3,552·00	3,137·84	...	3,427·71
Ashburton	... ...	509·96	...	...	...	...	509·96
Gascoyne	... ...	...	...	...	...	...	...
Peak Hill	... ...	...	...	46,795·25	14,113·57	528·19	14,113·57
East Murchison	Lawlers	186·47	383·56	187,714·70	81,834·50	3,942·95	82,404·53
	Black Range	135·70	61·61	7,183·16	10,989·08	5·60	11,186·39
Murchison	Cue	31·32	46·98	18,912·50	15,208·41	...	15,286·71
	Nannine	583·96	1·07	15,599·90	18,083·28	589·96	18,668·31
	Day Dawn	665·94	186·29	146,477·00	160,311·28	35,330·14	161,163·51
	Mt. Magnet	206·66	234·26	25,201·90	18,843·68	631·22	19,284·60
Yalgoo	... ...	...	...	5,462·70	2,353·41	...	2,353·41
Mt. Margaret	Mt. Morgans	50·89	217·77	91,725·50	44,961·67	4,540·47	45,230·33
	Mt. Malcolm	...	331·58	134,770·50	93,968·69	2,892·93	94,300·27
	Mt. Margaret	371·72	143·52	68,630·78	43,477·41	814·23	43,992·65
North Coolgardie	Menzies	82·92	349·49	47,182·83	36,668·32	900·64	37,100·73
	Ularring	...	47·84	19,371·10	21,721·57	85·20	21,769·41
	Niagara	220·73	189·47	140,040·00	66,820·13	867·15	67,230·33
	Yerilla	6·30	259·94	23,917·00	18,697·90	9·54	18,964·14
Broad Arrow	... ...	1,340·55	161·87	26,363·11	20,677·77	133·05	22,180·19
North-East Coolgardie	Kanowna ... ... quartz	113·12	277·61	56,495·44	35,257·96	737·10	35,648·69
	Kanowna ... ... cement	1,025·91	...	5,173·00	1,973·96	...	2,999·87
	Bulong	718·12	2,378·42	7,892·00	8,058·84	...	11,155·38
	Kurnalpi	241·89	41·64	676·00	867·54	...	1,151·07
East Coolgardie	... ...	126·01	2,534·89	1,147,270·15	1,048,261·99	123,779·89	1,050,922·89
Coolgardie	Coolgardie	20·90	297·99	83,301·27	53,186·12	·17	53,505·01
	Kunanalling	22·41	745·02	12,686·23	8,927·32	7·88	9,694·75
Yilgarn	... ...	23·61	23·82	66,051·70	25,461·21	1,302·23	25,508·64
Dundas	... ...	118·50	1,127·68	33,431·50	30,584·09	3,162·88	31,830·27
Phillips River	... ...	21·19	68·82	6,269·60	3,926·62	1,110·14	4,016·63
Donnybrook	... ...	...	...	...	...	...	...
Goldfields generally	... ...	...	...	...	...	...	...
	Total	**7,963·76**	**10,441·97**	**2,432,171·27**	**1,895,429·71**	**181,625·13**	**1,913,835·44**

TABLE IV.

MILLING and CYANIDING PLANTS erected in the respective Goldfields and Districts, on the 31st December, 1904.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	Kimberley Goldfield.																	
M.A. 8 ...	Mt. Bradley Tunnelling claim	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 9 ...	Ruby Queen	15	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**25**	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...
	Pilbarra Goldfield.																		
	Marble Bar District.																		
R.C. 112 ...	Lallarookh—British Exploration of Australasia, Ltd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	5	...
615	British Exploration of Australasia, Ltd. ...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
161	Bulletin	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	..
625	Elsie Abandoned	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
M.A. 18 ...	Klondyke Battery	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 26 ...	Lady Adelaide Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
M.A. 19 ...	Salgash Public Crushing Co.	15	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**45**	...	...	...	...	...	...	**1**	...	...	...	...	...	...	**17**	...	**7**	...
	Nullagine District.																		
T.A. 4L ...	Barton	10	...	...	..	...	...	...	...	...	...	...	...	...	...	5	...	3	...
M.A. 9L ...	British Exploration of Australasia, Ltd. ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
95L, etc. ...	Parnell leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 6L ...	Royer's Public Crushing Syndicate	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**40**	...	...	...	...	...	...	...	...	...	...	...	...	...	**5**	...	**3**	...
	West Pilbarra Goldfield.																		
106	Ninety-nine leases	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
117, etc. ...	Pilgrim's Rest	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
129	Yellow Aster	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
	Total ...	**20**	...	...	...	...	...	...	**1**	...	...	...	...	...	...	**4**	...	...	...
	Peak Hill Goldfield.																		
M.A. 4P ...	Peak Hill Goldfield, Ltd.	40	...	...	...	...	...	...	1	...	...	...	...	...	...	8	3	9	9
	Ravelstone State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...
	Total ...	**50**	...	...	...	...	...	...	**1**	...	...	...	...	...	...	**12**	**3**	**10**	**9**
	East Murchison Goldfield.																		
	Lawlers District.																		
24, etc. ...	Bellevue Proprietary, Ltd.	40	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
532	Brilliant leases	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
714	British-American Alliance	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 9 ...	British King Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	1	...
645	Cinderella	5	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 17 ...	Condor Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	2	...
	Darlôt State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
1	East Murchison United Mines, Ltd. ...	40	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...
557	Enterprise	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
140, etc. ...	Golden Age Consolidated, Ltd.	20	...	...	...	...	...	...	1	...	...	...	...	...	...	5	...	3	...
542, etc. ...	Gwalia Consolidated, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	9	1	5	3
837	Lady Wiluna	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	1	2	...
	Carried forward ...	140	...	...	...	...	...	...	1	...	...	...	...	...	...	41	2	13	3

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	East Murchison Goldfield—*continued.*																	
	***Lawlers District*—continued.**																	
	Brought forward ...	140	...	...	...	...	...	...	1	...	...	...	...	...	...	41	2	13	3
161, etc. ...	Lake Way Goldfield (1899), Ltd.	30	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	6	...
M.A. 11 ...	Lawlers Public Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
15	Leinster	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	3	...
137	Monarch of the East G.M. Co., N.L. ...	10	...	...	...	...	...	...	1	...	...	...	...	...	...	3	...	2	...
113	Nil Desperandum	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
339	Vanguard	5	...	...	...	...	...	...	..	...	...	...	...	...	...	5	...	2	...
521, etc. ...	Vivien G.M. Co., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	..	3	...
	Wiluna State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
382	Yellow Aster	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	3	...
	Total ...	**245**	...	...	...	...	...	...	**2**	...	...	...	...	...	...	**77**	**2**	**36**	**3**
	Black Range District.																		
5B	Black Range	10	...	...	...	..	...	...	...	...	...	...	...	...	..	...	...	...	...
	Black Range State Battery	5	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...
M.A. 1B ...	Earlsville	...	...	...	...	...	...	..	1	...	1	...	...	...	...	4	...	...	...
	Total ...	**15**	...	...	...	...	...	...	**1**	...	**1**	...	...	...	...	**4**	...	...	...
	Murchison Goldfield.																		
	Cue District.																		
42	Anchor Consolidated G.Ms., W.A., Ltd. ...	10	..	...	...	.	...	...	...	...	...	...	...	...	...	3	...	2	...
R.C. 64 ...	Boyd's Reward	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	...
203, etc. ...	Cue One—Cue Public Battery	20	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	...
1174	Cue Victory	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
M.A. 19 ...	Gem of Cue Extended	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
	Tuckanarra State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
595, etc. ...	Victory United G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	1	...
M.A. 17 ...	Weld Hercules G.M., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**90**	...	...	...	...	...	...	...	...	...	...	...	...	...	**32**	...	**6**	...
	Nannine District.																		
	After Many Years Battery	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
238N	Alliance	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
M.A. 6N ...	Champion Reef (Nannine, W.A.) G.M. Co., Ltd.	30	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	...
475N	Cornstalk	4	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Garden Gully Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
455N	Jillawarra	5	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
361N	Margueritta	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
	Meekatharra State Battery	10	.	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
379N	Mountain View	5	...	..	...	...	...	...	...	...	...	...	.	...	...	...	...	...	...
25N, etc. ...	Mt. Hall, Royalist Consolidated, and Nannine leases	10	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
171N	Mt. Vranizan	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
7N, etc. ...	Mt. Yagahong G.M. and Exploration Co., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
32N, etc. ...	Nannine Goldfields, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
408N	New Alliance	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
179N, etc. ...	New Murchison King	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
478N	Princess Dagmar	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
174N	Star of the East, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...
453N	Two Jacks	5	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
415N	Wanganui	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	..	2	...
	Total ...	**204**	...	...	...	**1**	...	...	**1**	...	...	...	...	...	...	**47**	...	**6**	...

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	MURCHISON GOLDFIELD—*continued.*																	
	Day Dawn District.																	
M.A. 6D ...	Day Dawn Public Battery	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
26D, etc. ...	East Fingall G.Ms., Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15D, etc. ...	Emperor G.Ms., Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 13D ...	Golconda Mines, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1D, etc. ...	Great Fingall Consolidated, Ltd.	100	...	...	...	...	...	...	...	...	...	...	...	...	...	20	4	5	6
5D, etc. ...	Island Eureka G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
179D	Kinsella	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
355D, etc. ...	Mainland Consols	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
320D	Mt. Fingall	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14D, etc. ...	Murchison Associated G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	2	...	...
227D	Trenton	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
	Total ...	**175**	...	...	...	...	...	...	...	...	...	...	...	...	...	**40**	**6**	**7**	**6**
	Mt. Magnet District.																		
	Boogardie State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
327M, etc. ...	Burra Burra leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
465M, etc. ...	Empress leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
	Lennonville State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	4	...
30M, etc. ...	(Long Reef G.M. Co., Ltd.)	20	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...	...
314M, etc. ...	Morning Star Quartz Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	3	...
(313M) ...	(Chums Consolidated, Ltd.)	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
57M	Welcome	...	...	...	...	...	...	...	...	...	1	...	...	...	...	3	...	...	...
103M	Wheel of Fortune North	20	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	6	...
(340M) ...	(Windsor Consolidated (W.A.) G.Ms., Ltd.)	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**120**	...	...	...	...	...	...	...	...	**1**	...	...	...	...	**40**	...	**17**	...
	YALGOO GOLDFIELD.																		
P.A. 119 ...	(Purchase, C.)	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
508	Emerald	5	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
414, etc. ...	Field's Reward G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
392	Golden Eagle	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
174	Monarch leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
34, etc. ...	Phœnix G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...
M.A. 8 ..	Royal Standard leases	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
192, etc. ...	Woodley's G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
	Total ...	**75**	...	...	...	**1**	...	...	**1**	...	...	...	...	...	...	**13**	...	**2**	...
	MT. MARGARET GOLDFIELD.																		
	Mt. Morgans District.																		
M.A. 3F ...	Hamblin's Battery	5	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
8F	Millionaire, Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
5F, etc. ...	Westralia Mt. Morgans G.Ms. Co., Ltd. ...	60	...	...	...	...	...	...	...	...	...	...	...	...	...	36	7	3	3
7F	Guest's Battery—Westralia Mt. Morgans G.Ms. Co., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	3	...
	Total ..	**90**	...	...	...	...	...	...	...	...	...	...	...	...	...	**51**	**7**	**8**	**3**
	Mt. Malcolm District.																		
987C	Anglo-Saxon	5	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
781C	Golden Crown and Midas United G.M. Co., Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1120C... ...	Great Western	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
W.R. 84C ...	(Hill and party)	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
195C, etc. ...	Leonora Gold Blocks	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
210C, etc. ...	Leonora Main Reefs, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Leonora State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	4	...
11C, etc. ...	Malcolm Mines, Ltd.	30	...	...	...	...	...	...	...	...	...	...	...	...	...	6	2	3	...
	Carried forward ...	80	...	...	...	...	...	...	...	...	1	...	...	...	...	18	2	7	...

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	Mt. Margaret Goldfield—*continued.*																	
	***Mt. Malcolm District*—continued.**																	
	Brought forward ...	80	...	...	...	...	...	...	...	...	1	...	...	...	...	18	2	7	...
638c, etc. ...	Merton's Reward G.M. Co., Ltd.	30	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	2	...
M.A. 18c ...	Mt. Clifford Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
851c	Perseverance	16	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	3	...
M.A. 4c ...	Perseverance G.Ms., Ltd.	15	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	6	...
	Pig Well State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
618c, etc. ...	(Pride of Leonora G.M. Co., N.L.)	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
959c	Princess Alix	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...
978c	Randwick	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
991c	Richmond Gem	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
190c, etc. ...	Sons of Gwalia, Ltd.	50	...	...	...	...	...	...	...	...	...	...	...	...	...	16	3	3	1
263c	Trump	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(956c) ...	(Windsor)	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
1040c... ...	Workman	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**266**	...	...	...	...	...	...	...	...	**2**	...	...	...	...	**61**	**5**	**23**	**1**
	Mt. Margaret District.																		
1041T, etc. ...	Away from Home	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
725T	Baneygo leases	5	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	1	...
M.A. 11T ...	Burtville Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
	Burtville State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	9	...
1322T ...	Caledonia leases	...	...	...	...	...	...	...	1	...	...	...	...	...	...	4	...	2	...
761T, etc. ...	Childe Harold G.M. Co., Ltd....	20	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
592T, etc. ...	Craiggiemore Proprietary, Ltd.	20	...	...	...	...	...	...	1	...	...	...	...	...	...	6	...	2	...
1398T ...	Golden Orbit	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1046T ...	Golden Spinnifex	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
329T	Ida H. G.M. Co., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	2	2	...
M.A. 7T ...	Lancefield G.M. Co., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	15	4	2	2
	Laverton State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
771T	Little Doris	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1414T ...	Mistake	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
1517T ...	Mulga Queen leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
781T	Sailor Prince leases	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
1134T	Sons of Westralia	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	...
1435T) ...	Sunrise	8	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**150**	...	...	...	...	...	...	**2**	...	...	...	...	...	...	**72**	**6**	**24**	**2**
	North Coolgardie Goldfield.																		
	Menzies District.																		
2728z, etc. ...	Boddington leases	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2823z, etc. ...	Crusoe Gold Claims, Ltd.	30	...	...	...	...	...	...	...	...	...	...	...	...	...	6	1	...	2
2821z ...	Florence	10	...	...	...	...	...	...	...	...	..	...	...	...	...	3	...	2	...
4855z ...	Goodenough	...	...	...	...	...	...	...	1	...	...	...	...	...	...	2	...	...	...
2820z, etc. ...	Lady Shenton G.M., Ltd.	30	...	...	...	...	...	...	1	...	...	...	...	...	...	10	3	3	2
5197z, etc. ...	Main Reef North	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	1	...
3277z, etc. ...	Maranoa leases	5	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
4931z, etc. ...	Menzies Consolidated, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	16	...	3	...
2832z, etc. ...	Menzies Mining and Exploration Corporation, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	3	8	1
	Menzies State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
5148z ...	Milparinka	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4525z, etc. ...	Mt. Ida Consols, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...
	Mt. Ida Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
	Mt. Ida State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...
2836z, etc. ...	Queensland Menzies G.M. Co., N.L.	15	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
	Total ...	**180**	...	...	...	...	...	...	**2**	...	...	...	...	...	...	**62**	**7**	**26**	**5**

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	NORTH COOLGARDIE GOLDFIELD—*continued.*																	
	Ularring District.																	
4580U ...	Eileen leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
459U, etc. ...	Golden Pole G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	8	2	2	...
	Mulline State Battery	20	...	...	...	...	...	...	...	...	...	...	...	...	...	5	2	11	1
	Mulwarrie State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
M.A. 1U ...	Riverina G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	3	...
438U	Westralia Waihi G.Ms., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
	Total ...	**80**	...	...	...	...	...	...	...	...	...	...	...	...	...	**27**	**4**	**20**	**1**
	Niagara District.																		
W.R. 72G ...	Brittannia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	1	...
M.A. 13G ...	Champion	10	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	2	...
20G, etc. ...	Cumberland Niagara G.M., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	13	...	2	...
518G, etc. ...	Eaglehawk Heather Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
26G, etc. ...	Englishman: Cosmopolitan Proprietary, Ltd.	50	...	...	...	...	...	...	...	...	...	...	...	...	2	14	4	10	3
M.A. 4G ...	Mignonette Battery and Cyanide Works ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
	Niagara State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	3	...
628G	Puzzle	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
505G	W. E. G.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
	Total ...	**120**	...	...	...	...	...	...	...	...	**1**	...	...	...	**2**	**55**	**4**	**20**	**3**
	Yerilla District.																		
502R, etc. ...	London and Coolgardie Explorers, Ltd. ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
682R	Melba Consols G.M. Co., N.L.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
401R, etc. ...	Neta	5	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
M.A. 3R ...	Pauley and McCoy's Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
450R, etc. ...	Potosi Consolidated, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	12	...	...	...
539R	Senate	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Yundamindera State Battery	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**55**	...	...	...	**1**	...	...	...	...	...	...	...	...	...	**26**	...	**6**	...
	BROAD ARROW GOLDFIELD.																		
43W, etc. ...	Black Flag Proprietary Co., Ltd.	50	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	3	...
75W	Broad Arrow Consols G.M. Co., N.L. ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
1209W ...	Dixie	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1186W ...	Excelsior leases	5	...	...	...	...	...	...	1	...	...	...	...	1	...	2	...	1	...
3W, etc. ...	Golden Arrow Mine, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
M.A. 1W ...	Half-Mile Reef Mines, Ltd	20	...	...	...	...	...	...	1	...	...	...	...	...	...	5	...	2	...
48W	Lady Bountiful G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2	...
1250W ...	Lady Charlotte G.M. Syndicate	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 19W ...	Milne's Battery...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
45W	Mt. Corlic	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 14W ...	New Arrow Proprietary Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2W, etc. ...	New Austral Co., Ltd.	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	3	...	...
2W, etc. ...	New Austral Co., Ltd. (Hill End Cyanide Works)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	2	...
959W, etc. ...	New Slug Hill G.M. Co., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
53W, etc. ...	New Standard Exploration Co., Ltd. ...	40	...	...	...	...	...	...	...	...	...	...	...	...	1	10	8	7	3
T.A. 13W ...	Paddington Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	2	...
36W	Zoroastrian, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
	Total ...	**220**	...	...	...	...	**1**	...	**2**	...	...	...	...	**1**	**1**	**60**	**11**	**23**	**3**
	NORTH-EAST COOLGARDIE GOLDFIELD.																		
	Kanowna District.																		
M.A. 37X ...	Atlas G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
1112X ...	Bonnie Jean	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
Q.C. 61X ...	Campbell's Works	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
M.A. 45X ...	Donnon's Works	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
	Carried forward ...	10	...	...	...	1	...	...	1	..	...	...	...	...	1	6	...	2	

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	North-East Coolgardie Goldfield—*continued.*																	
	Kanowna District—continued.																	
	Brought forward ...	10	...	...	...	1	...	...	1	...	...	...	...	...	1	6	...	2	...
1079x ...	Federal	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
1123x ...	Gindalbie	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
W.R. 60x ...	Golden Puzzle	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
367x, etc. ...	Golden Valley leases	10	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
153x, etc. ...	Kanowna Acquisition Syndicate, Ltd. ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
M.A. 42x ...	Koh-i-noor Works	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
52x, etc. ...	Lake View South G.M. (W.A.), Ltd. ...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
187x, etc. ...	London and Coolgardie Explorers, Ltd. ...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 43x ...	Monmouth Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
M.A. 39x ...	Mudlark Works	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
M.A. 46x ...	Mulgarrie Cyanide Works	...	...	...	...	..	...	...	...	...	...	...	...	...	...	3	...	...	...
(918x) ...	(North Cross Reef)...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
3x, etc. ...	North White Feather G.M., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	3	...
Q.C. 57x ...	Norton's Works	10	...	...	...	...	...	...	1	...	...	...	...	...	...	6	...	...	...
M.A. 19x ...	Old Cement Works	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
392x	Queen Margaret G.M. Co., Ltd.	15	...	...	...	...	...	...	...	...	...	...	...	...	...	10	...	...	...
... ...	(Rollo, J.)	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
1083x ...	Scotia	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	4	...
M.A. 15x ...	Sims & Son's Works	...	...	...	...	...	...	...	1	...	...	...	...	...	2	...	...	...	...
891x	Sirdar	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12x, etc. ...	White Feather Main Reef, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	3	...
9x, etc. ...	White Feather Reward, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	11	...	2	...
	Total ...	**195**	...	...	...	**2**	...	...	**5**	...	...	...	...	...	**5**	**67**	**1**	**14**	...
	Bulong District.																		
W.R. 24y ...	Berry's Public Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
835y	Green Harp leases	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 64y ...	Hodder's Public Mill	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(849y) ...	Mt. Monger G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
9y, etc. ...	Queen Margaret G.M. Co., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
	Total ...	**40**	...	...	**1**	**1**	...	...	...	...	...	...	...	...	...	**3**	...	...	...
	Kurnalpi District.																		
280k	Billy Billy	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.A. 3k ...	Glover's Works	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
	Total	**5**	...	...	...	...	...	...	**1**	...	...	...	...	...	...	...	...	...	...
	East Coolgardie Goldfield.																		
71e, etc. ...	Associated G.Ms. of W.A., Ltd.	20	...	...	...	1	12	...	..	...	...	...	4	...	...	13	15	4	7
49e	Associated Northern Blocks (W.A.), Ltd. ...	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	6	6	3
1101e, etc. ...	A.W.A. United leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	...	...
552e, etc. ...	Brown Hill Consols leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	12	...	4	...
238e	Crœsus North No. 1, Ltd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
90e, etc. ...	Crœsus South G.M., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	...
3880e, etc. ...	Devon Consols	25	...	...	...	...	...	...	...	...	...	...	...	...	...	12	...	1	...
4037e ...	Devon Consols South Extended	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
351e	Golden Horseshoe Estates Co., Ltd. ...	150	10	...	...	...	...	...	...	...	...	...	1	...	...	24	22	5	20
750e, etc. ...	Golden Links, Ltd.	20	1	...	...	...	...	...	...	...	...	...	...	...	...	6	...	6	...
2310e, etc. ...	Golden Ridge Proprietary leases ...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
873e	Great Boulder Main Reef, Ltd.	...	...	...	...	...	2	...	...	...	...	...	...	...	1	...	4	4	4
50e	Great Boulder No. 1, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	3	...
66e	Great Boulder Perseverance G.M. Co., Ltd.	...	...	...	13	...	...	...	...	...	...	...	...	...	...	...	24	...	13
16e, etc. ...	Great Boulder Proprietary G.Ms., Ltd. ...	...	...	...	12	...	2	...	1	...	...	...	...	...	...	...	18	2	13
3643e, etc. ...	Hainault G.Ms., Ltd.	30	...	...	...	...	...	...	...	...	...	...	...	...	1	15	12	3	2
Block 48 ...	Hampton Plains Estate, Ltd.	20	...	...	...	...	1	...	...	...	...	...	...	...	...	6	...	4	1
Block 50 ...	Hampton Properties, Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12e, etc. ...	Hannan's North G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Carried forward ...	355	11	...	25	1	20	...	1	...	...	...	5	...	2	114	101	44	63

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.														Cyaniding.			
		Batteries.	Other Mills.																
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	EAST COOLGARDIE GOLDFIELD—*continued.*																		
	Brought forward ...	355	11	...	25	1	20	...	1	...	...	...	5	...	2	114	101	44	63
942E	Hannan's Proprietary, Ltd.	...	...	...	...	3	...	...	...	...	...	...	...	...	...	12	...	3	...
M.A. 11E ...	Hannan's Public Crushing, Condensing, and Saw-mills Co. (W.A.), Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	1	1	12	6	7	11
97E	Hannan's Reward and Mt. Charlotte, Ltd. ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	11	...	...	...
15E, etc. ...	Hannan's Star G.Ms., Ltd.	...	...	1	...	...	2	...	...	...	...	...	...	...	...	...	4	11	2
31E	Ivanhoe Gold Corporation, Ltd.	100	...	...	...	...	2	..	...	...	...	...	...	...	...	32	11	...	6
6E, etc. ...	Kalgoorlie Amalgamated, Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
M.A. 2E ...	Kalgoorlie Gold Recovery Co., Ltd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	18	...	5	2
73E, etc. ...	Kalgoorlie Mint and Iron King Gold Estates, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
34E, etc. ...	Kalgurli G.Ms., Ltd.	...	...	...	...	...	9	...	...	...	...	...	...	...	...	...	8	10	3
25E, etc. ...	Lake View Consols, Ltd.	75	...	6	...	1	4	...	...	...	...	...	...	...	...	...	12	12	11
M.A. 35E ...	Lake View South G.M. (W.A.), Ltd.	20	...	...	...	...	...	...	...	...	...	...	1	...	1	3	3	2	2
35E, etc. ...	North Boulder G.Ms., Ltd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	4	...
287E	North Kalgurli Co., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	7	6	3
410E, etc. ...	Oroya-Brownhill Co., Ltd.	50	...	6	...	3	2	...	...	...	...	...	...	...	...	...	13	11	6
1208E ...	South Kalgurli G.Ms., Ltd.	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	9	8	11
12E, etc. ...	Weston's Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	2	...
	Total ...	**655**	**11**	**13**	**25**	**8**	**39**	...	**1**	...	...	...	**6**	**1**	**4**	**230**	**174**	**127**	**120**
	COOLGARDIE GOLDFIELD.																		
	Coolgardie District.																		
4085	Ada Extended	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
M.A. 7 ...	Bayley's Consols G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	2	...
M.A. 11, etc....	Bayley's G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	6	2	4	4
3847, etc. ...	Bendigo and Coolgardie Proprietary Co., Ltd.	15	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	3	...
4091	Big Blow: Flagstaff G.Ms., Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
134, etc. ...	Burbanks Birthday Gift G.Ms., Ltd. ..	60	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	4	...
2986, etc. ...	Burbanks Main Lode (1904), Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	3	...
4109	B.W.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3918	Coolgardie Redemption	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
	Coolgardie State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
1604, etc. ...	Flagstaff G.Ms., Ltd.	20	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...
595, etc. ...	Gem leases	20	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	3	...
3085	Gentle Annie	5	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
1902, etc. ...	Griffith's leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	11	...	...	...
M.A. 40 ...	Hepburn and Co. (Mt. Burgess)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	2	...
M.A. 22 ...	Highgate Works	3	...	..	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
3042	Iron King	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...
18	King Solomon's G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	1	...
284, etc. ...	Lady Loch Mines, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
2160, etc. ...	Lady Robinson G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...
3803, etc. ...	Lindsay Consolidated Mines, Ltd.	11	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
4049	Londonderry, G.M., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
3838	Prince of Wales G.M. Co., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
3404, etc. ...	Red Hill Westralia G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	2	...
73	Star of the South	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...
3830, etc. ...	Tindal's Coolgardie G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	...
1552	Vale of Coolgardie G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
144, etc. ...	Westralia and East Extension Mines, Ltd....	40	...	...	...	...	...	...	...	...	...	...	...	...	...	20	4	12	2
	Widgiemooltha State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**359**	...	...	...	**1**	...	...	...	...	...	...	...	...	...	**141**	**6**	**44**	**6**
	Kunanalling District.																		
M.A. 14s ...	(Berliner and Besta)	5	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	...	...
696s	Blue Bell	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
646s, etc. ...	Bow's No. 1	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
33s	Carbine	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
W.R. 4250s ...	(Cullen's)	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...
(568s) ...	(Fremantle Extended)	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
674s	Golden	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
M.A. 93s ...	Great Cement Proprietary, Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	4	...
	Carried forward ...	60	...	...	...	...	...	...	1	...	1	...	...	...	...	15	...	4	...

TABLE IV.—*Milling and Cyaniding Plants erected in the respective Goldfields and Districts, etc.*—continued.

Lease or Area on which erected.	Name of Company or Works.	Milling.													Cyaniding.			
		Batteries.	Other Mills.															
		Number of Heads of Stampers.	Ball.	Flint.	Griffin.	Huntington.	Krupp Ball.	Langley.	Prospecting.	Salford.	Tremain.	Arrastras.	Crushing Rollers.	Dry Crushers.	Puddlers.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
	COOLGARDIE GOLDFIELD—*continued.*																	
	Kunanalling District—continued.																	
	Brought forward ...	60	...	...	...	...	...	...	1	...	1	...	...	...	...	15	...	4	...
369s	Jourdie Hills G.M. Co., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	...	...
W.R. 53s ...	(Matthews and Gardiner)	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2s	(Perry's Reef)	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
(299s) ...	(Pole)	5	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
70s, etc. ...	Premier G.M. Co., N.L.	25	2	...	...	...	...	...	...	...	...	...	...	1	...	11	2	10	1
M.A. 13s ...	Stanley Battery	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
618s, etc. ...	Star of Fremantle	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
17s	Wealth of Nations	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	1	...
	Total ...	**140**	**2**	...	...	...	...	...	**1**	...	**1**	...	...	**1**	...	**48**	**2**	**15**	**1**
	YILGARN GOLDFIELD.																		
T.A. 12 ...	André's Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
508	Australia	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
T.A. 14 ...	Blue Hill	5	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	3	...
T.A. 9 ...	Brimage's Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	8	...	...	...
13, etc. ...	British and Foreign Development Syndicate, Ltd.	50	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
256, etc. ...	Fraser South Extended G.M. Co., Ltd. ...	20	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
552	Haddon	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
567	Hatt's Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	11	...	...	...
19, etc. ...	Hope's Hill G.M. Co., Ltd.	30	...	...	3	...	...	...	...	...	...	...	...	...	...	12	...	...	...
490	Lady Loch Mines, Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
212, etc. ...	Mt. Jackson G.Ms., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	7	...	3	...
	Southern Cross State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	...	...
	Total ...	**170**	...	...	**3**	...	...	...	...	...	...	...	...	...	...	**63**	...	**8**	...
	DUNDAS GOLDFIELD.																		
M.A. 30 ...	Break-o'-Day Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	4	4	...
129	Central Wealth Consolidated Goldfields, Ltd.	...	...	...	...	...	...	...	...	...	...	...	...	...	...	6	...	2	...
42, etc. ...	Cumberland G.M. Co.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	2	...
49	Lady Mary G.M. Co., N.L.	20	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	2	...
M.A. 18 ...	Mararoa Crushing and Cyaniding Works ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	...	...
T.A. 19 ...	Middleton's Cyanide Works	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	3	...
18, etc. ...	Norseman G.Ms., Ltd.	20	...	...	...	...	...	...	...	...	...	...	...	2	...	5	...	3	...
M.A. 28 ...	Pathway Mill	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
106, etc. ...	Princess Royal G.M. Co., N.L.	30	...	...	...	...	...	...	...	...	...	...	...	...	...	10	3	6	2
634, etc. ...	Princess Royal North G.M. Co., N.L. ...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(88)	(Three Colonies)	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...
	Norseman State Battery	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	1	4	1
	Total ...	**120**	...	...	...	...	...	**1**	...	**1**	...	...	...	**2**	...	**46**	**8**	**26**	**3**
	PHILLIPS RIVER GOLDFIELD.																		
43	Gilbert G.M., Ltd.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17	Grafter	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...	...
M.L. 52 ...	Harbour View leases	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
(21)	(Lucy)	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	Phillips River G.M. Co., N.L.	10	...	...	...	...	...	...	...	...	...	...	...	...	...	5	...	...	...
50	Plantagenet G.Ms., N.L.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
M.L. 60 ...	Red, White, and Blue	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**45**	...	...	...	...	...	...	**1**	...	...	...	...	...	...	**5**	...	...	...
	DONNYBROOK GOLDFIELD.																		
P.P.L. 1 ...	Donnybrook Goldfields, Ltd.	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	Total ...	**5**	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	STATE GENERALLY.																		
	Fremantle Smelter, Ltd.	...	1	...	...	...	...	...	...	...	...	...	2	1	...	...	...	...	...
	Total ...	...	**1**	...	...	...	...	...	...	...	...	...	**2**	**1**	...	...	...	...	...

TABLE V.

Return of Gold Bullion received at the Perth Branch of the ROYAL MINT from May, 1899, to the 31st December, 1904, showing, in gross ounces, the quantity obtained from the respective Goldfields and other Countries, and the Actual Value thereof.

Year.	Month.	Kimberley.	Pilbarra.	West Pilbarra.	Ashburton.	Gascoyne.	Peak Hill.	East Murchison.	Murchison.	Yalgoo.	Mt. Margaret.	North Coolgardie.	Broad Arrow.	North-East Coolgardie.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
1899	... ...	308·45	529·80	...	281·80	85·65	16,274·00	3,758·07	24,675·64	5,190·05	16,911·54	44,779·38	8,503·50	16,700·90
1900	... ...	644·02	7,493·88	137·33	474·26	86·10	18,019·08	32,049·74	48,540·12	8,851·52	67,748·45	88,688·14	14,376·10	40,503·12
1901	... ...	663·37	11,279·93	394·38	55·42	18·56	21,351·67	44,746·88	43,024·65	9,191·01	126,703·91	135,493·31	18,829·13	43,055·63
1902	... ...	439·93	10,706·03	3,284·37	...	124·86	32,637·17	62,357·98	47,628·18	5,116·94	144,663·12	182,543·06	15,903·42	53,901·58
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	148,006·49	197,229·08	21,528 20	42,649·25
1904	January	...	5·10	33·58	49·31	...	6,292·08	7,210·21	6,719·80	371·10	13,016·17	14,564·85	1,943·40	3,896·97
	February	6·23	2,232·92	1,053·04	...	..	...	3,883·50	4,617·72	183·06	10,369·27	13,895·34	1,998·62	2,955·31
	March	...	95·36	131·68	24·01	13·10	...	4,058·10	3,565·97	439·69	12,827·09	10,662·16	1,992·34	3,219·18
	April	8·00	...	886·21	...	...	...	6,664·68	7,632·07	512·06	10,094·47	13,996·05	2,520·13	2,879·60
	May	...	16·83	115·38	...	...	5,709·53	3,820·49	5,345·96	168·15	13,726·23	14,530·04	1,772·37	3,603·29
	June	...	2,595·66	8·01	19·43	...	...	6,951·56	7,417·66	386·16	10,606·30	14,897·94	1,474·81	3,010·63
	July	...	18·27	...	...	...	3,328·15	5,212·11	4,219·93	222·42	7,701·23	12,256·10	1,501·32	2,497·40
	August	...	85·75	1,389·42	...	...	50·19	7,007·64	3,582·52	131·60	14,962·28	11,882·55	2,510·73	3,648·40
	September	...	127·10	...	28·14	...	...	7,348·92	4,827·86	189·12	11,655·75	16,360·76	2,869·47	2,798·67
	October	...	2,986·17	785·29	...	...	2,717·16	7,568·65	4,583·94	222·03	11,390·03	13,644·22	2,933·50	3,527·66
	November	20·39	78·08	...	29·84	...	7·10	5,972·04	4,919·83	258·58	15,493·78	16,261·63	1,874·79	4,258·61
	December	3·07	52·34	767·45	...	...	2,805·78	11,539·41	5,604·45	261·85	11,610·91	13,988·18	1,330·05	3,503·83
	Total	2,605·21	52,520·75	15,467·72	1,097·51	364·56	143,876·18	297,239·27	291,033·48	33,383·33	647,487·02	815,672·79	103,861·88	236,610·03

Year.	Month.	East Coolgardie.	Coolgardie.	Yilgarn.	Dundas.	* Phillips River.	Donnybrook.	Goldfields generally.	TOTAL. Western Australia. Quantity.	TOTAL. Western Australia. Actual Value.	TOTAL. Other Countries. Quantity.	TOTAL. Other Countries. Actual Value.	GRAND TOTAL. Quantity.	GRAND TOTAL. Actual Value.
		ozs.	ozs.	ozs.	ozs.	ozs.	ozs,	ozs.	ozs.	£ s. d.	ozs.	£ s. d.	ozs.	£ s. d.
1899	... ...	33,051·33	27,611·24	9,070·70	473·63	...	196·17	904·39	209,306·24	762,546 11 6	103·46	336 18 3	209,409·70	762,883 9 9
1900	... ...	139,845·60	51,607·26	28,648·51	31,583·20	...	265·55	1,620·93	581,182·91	2,096,212 14 2	17·49	44 15 7	581,200·40	2,096,257 9 9
1901	... ...	263,514·75	78,026·07	29,433·84	32,825·75	...	4·64	1,667·79	860,280·69	3,033,311 0 4	92·25	297 5 8	860,372·94	3,033,608 6 0
1902	... ...	636,536·52	94,134·17	25,873·68	31,088·91	5,146·80	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	... ...	685,289·82	82,218·79	26,856·28	40,006·39	6,420·79	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	January ...	52,324·32	6,451·40	2,806·34	3,147·57	...	...	146·78	118,978·98	419,755 2 10	27·12	59 12 3	119,006·10	419,814 15 1
	February ...	60,258·37	5,253·84	2,555·48	1,552·80	...	...	59·56	110,875·06	389,897 6 11	...	...	110,875·06	389,897 6 11
	March ...	60,831·44	5,550·39	2,895·37	3,743·44	555·78	...	245·92	110,851·02	390,410 8 3	21·33	34 12 3	110,872·35	390,445 0 6
	April ...	51,533·37	6,857·02	3,544·72	3,519·03	...	...	156·46	110,803·87	389,784 11 0	20·36	64 7 3	110,824·23	389,848 18 3
	May ...	62,652·74	4,638·59	2,910·76	2,521·43	...	...	36·28	121,568·07	428,058 0 3	20·04	26 2 6	121,588·11	428,084 2 9
	June ...	56,314·94	5,004·62	3,702·89	2,785·00	1,068·99	...	146·03	116,390·63	410,960 4 11	7·17	12 1 5	116,397·80	410,972 6 4
	July ...	59,540·22	5,764·02	3,267·17	3,756·39	...	...	80·27	109,365·00	385,181 0 4	...	...	109 365·00	385,181 0 4
	August ...	58,605·17	6,315·55	2,701·32	3,459·99	...	...	173·48	116,506·59	413,465 10 8	16·97	51 18 1	116,523·56	413,517 8 9
	September ...	58,015·53	7,312·67	3,124·04	3,313·31	...	...	239·13	118,210·47	421,164 13 7	32·63	80 17 6	118,243·10	421,245 11 1
	October ..	55,091·61	5,269·68	2,391·52	3,381·14	825·26	...	51·23	117,369·09	416,850 9 3	84·76	185 1 5	117,453·85	417,035 10 8
	November ...	61,422·94	7,511·44	2,959·35	3,205·76	...	...	79·58	124,353·74	439,869 11 2	16·14	48 1 0	124,369·88	439,917 12 2
	December ...	62,884·70	7,147·44	2,995·91	3,122·25	...	...	193·75	127,811·37	450,473 9 10	16·53	51 18 1	127,827·90	450,525 7 11
	Total ...	2,457,713·37	406,674·19	155,737·88	173,486·99	14,017·62	630·96	11,613·88	5,861,093·62	20,779,097 4 10	787·30	2,035 16 3	5,861,880·92	20,781,133 1 1

* Prior to 1902 included in Goldfields generally.

TABLE VI.

Return of Gold Bullion entered for EXPORT and received at the Perth Branch of the ROYAL MINT, from 1st January, 1886, to 31st December, 1904, showing, in Fine Ounces, the Quantity obtained each Year from the respective Goldfields, and the Total Annual Value.

Year.	Kimberley.			Pilbarra.			a West Pilbarra.			Ashburton.			b Gascoyne.			c Peak Hill		
	Export.	Mint.	Total.	Export.	Mint.	Total.	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.	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	...	...	...	4,571·38	...	4,571·38
1898 ...	257·54	...	257·54	10,433·27	...	10,433·27	1,814·48	...	1,814·48	402·46	...	402·46	...	...	...	12,288·93	...	12,288·93
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	297·96	76·63	374·59	14,064·24	14,558·64	28,622·88
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	...	77·02	77·02	9,528·14	16,119·79	25,647·93
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	6·59	16·82	23·41	231·85	19,352·44	19,584·29
1902 ...	1·48	378·02	379·50	...	9,199·50	9,199·50	...	2,822·20	2,822·20	...	...	...	...	107·29	107·29	85·93	28,044·55	28,130·48
1903 ...	...	433·71	433·71	2·26	12,049·52	12,051·78	...	5,493·23	5,493·23	...	114·67	114·67	...	30·76	30·76	203·60	29,395·32	29,598·92
1904 ...	...	31·51	31·51	...	6,931·27	6,931·27	...	4,320·82	4,320·82	...	125·96	125·96	...	10·95	10·95	...	17,475·33	17,475·33
Total ...	**22,422·06**	**2,296·58**	**24,718·64**	**147,235·75**	**45,581·99**	**192,817·74**	**4,165·01**	**13,116·56**	**17,281·57**	**4,104·96**	**967·24**	**5,072·20**	**304·55**	**319·47**	**624·02**	**40,974·07**	**124,946·07**	**165,920·14**

Year.	c East Murchison.			Murchison.			d Yalgoo.			c Mt. Margaret.			e North Coolgardie.			f Broad Arrow.		
	Export.	Mint.	Total.	Export.	Mint.	Total.	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.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.
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	...	...	...	...	...	...	15,351·71	...	15,351·71	...	...	...
1897 ...	8,457·34	...	8,457·34	74,154·67	...	74,154·67	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 ...	35,393·19	...	35,393·19	83,794·22	...	83,794·22	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 ...	33,826·08	3,361·95	37,188·03	61,586·09	22,074·71	83,660·80	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 ...	23,545·54	28,671·55	52,217·09	53,815·70	43,423·77	97,239·47	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 ...	29,780·63	40,557·07	70,337·70	92,1 9·56	38,996·10	131,145·66	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 ...	25,450·63	53,583·10	79,033·73	141,731·91	40,926·08	182,657·99	483·32	4,396·91	4,880·23	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 ...	21,878·06	65,334·05	87,212·11	154,012·88	54,348·53	208,361·41	47·03	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 ...	21,296·85	64,550·36	85,847·21	165,232·67	52,683·16	217,915·83	....	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
Total ...	**199,628·32**	**256,058·08**	**455,686·40**	**1,038,798·86**	**252,452·35**	**1,291,251·21**	**11,269·83**	**29,515·68**	**40,785·51**	**426,334·43**	**560,210·21**	**986,544·64**	**229,028·12**	**705,734·35**	**934,762·47**	**104,897·09**	**90,105·78**	**195,002·87**

a Prior to 1st May, 1898, included with Pilbarra. *b* Prior to March, 1899, included with Ashburton. *c* From 1st August, 1897. *d* Prior to 1st April, 1897, included with Murchison. *e* Prior to 1st May, 1896, included with Coolgardie. *f* From 1st September, 1897.

TABLE VI.—*Return of Gold Bullion entered for EXPORT and received at the Perth Branch of the ROYAL MINT, etc.*—continued.

Year.	*a* North-East Coolgardie.			*a* East Coolgardie.			*b* Coolgardie.			Yilgarn.			*c* Dundas.		
	Export.	Mint.	Total.	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.	fine ozs.	fine ozs.	fine ozs.
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	132·37	...	132·37
1894	...	...	...	...	...	...	94,227·58	...	94,227·58	28,178·31	...	28,178·31	204·31	...	204·31
1895	...	...	...	...	...	...	111,919·21	...	111,919·21	17,666·25	...	17,666·25	216·40	...	216·40
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	3,891·77	...	3,891·77
1897	29,437·40	...	29,437·40	268,411·95	...	268,411·95	92,312·00	...	93,312·00	16,097·78	...	16,097·78	17,275·36	...	17,275·36
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	28,655·52	...	28,655·52
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	39,980·65	423·71	40,404·36
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	8,144·72	28,254·19	36,398·91
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	5,411·46	29,752·16	35,163·62
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	4,401·81	26,714·16	31,115·47
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	1,311·53	33,905·88	35,217·41
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	1,834·03	31,347·06	33,181·09
Total	224,943·71	205,923·15	430,866·86	4,428,550·17	2,105,849·28	6,534,399·45	658,576·78	353,231·06	1,011,807·84	196,828·65	135,380·45	332,209·10	111,459·43	150,397·16	261,856·59

Year.	*d* Phillips River.			*e* Donnybrook.			Goldfields generally.			GRAND TOTAL.			
	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Export.	Mint.	Total.	Value.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	fine ozs.	£ s. d.
1886	...	...	...	...	...	...	...	...	...	270·17	...	270·17	1,147 12 2½
1887	...	...	...	...	...	...	...	...	...	4,359·37	...	4,359·37	18,517 8 6½
1888	...	...	...	...	...	...	...	...	...	3,124·82	...	3,124·82	13,273 7 10
1889	...	...	...	...	...	...	...	...	...	13,859·52	...	13,859·52	58,871 9 11½
1890	...	...	...	...	...	...	...	...	...	20,402·42	...	20,402·42	86,663 19 5½
1891	...	...	...	...	...	...	...	...	...	27,116·14	...	27,116·14	115,182 0 10
1892	...	...	...	...	...	...	...	...	...	53,271·65	...	53,271·65	226,283 11 8½
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 2½
1896	...	...	...	...	...	...	...	...	...	251,618·69	...	251,618·69	1,068,808 5 2
1897	...	...	...	...	...	...	...	...	...	603,846·44	...	603,846·44	2,564,976 12 9½
1898	...	...	...	...	...	...	...	...	...	939,489·49	...	939,489·49	3,990,697 13 10
1899	...	...	...	277·27	175·49	452·76	...	809·07	809·07	1,283,360·25	187,244·41	1,470,604·66	6,246,731 10 7½
1900	...	...	...	...	237·56	237·56	5,644·83	1,450·08	7,094·91	894,397·2	519,923·59	1,414,310·86	6,007,610 13 4½
1901	...	...	...	...	4·20	4·20	215·91	1,511·63	1,797·54	923,686·96	779,729·56	1,703,416·52	7,235,653 9 1
1902	2,946·53	4,422·56	7·369·09	4·94	57·64	62·58	7·77	2,115·52	2,123·29	707,039·75	1,163,997·60	1,871,037·35	7,947,661 9 7½
1903	2,136·09	5,441·68	7,577·77	...	82·64	82·64	53·44	2,839·44	2,892·88	833,685·78	1,231,115·62	2,064,801·40	8,770,718 17 0½
1904	936·76	2,047·59	2,984·35	...	...	...	·86	1,344·25	1,345·11	810,616·04	1,172,614·03	1,983,230·07	8,424,225 17 3½
Total	6,019·38	11,911·83	17,931·21	282·21	557·53	839·74	5,922·81	10,069·99	15,992·80	7,861,746·19	5,054,624·81	12,916,371·00	54,865,256 11 9

a Prior to 1st May, 1896, included with Coolgardie. *b* Declared 5th April, 1894, to which date included with Yilgarn. *c* Prior to 1893, included with Yilgarn.
d Prior to 1902 included in Goldfields generally. *e* From 1st March, 1899.

TABLE VII.

Comparative Return of Gold Bullion entered for EXPORT and received at the Perth Branch of the ROYAL MINT, from 1st January, 1903, to 31st December, 1904, showing in Fine Ounces the Quantity recorded each Month and its Value.

Months and Quarters.	1903.				1904.			
	Export.	Mint.	Total.	Value.	Export.	Mint.	Total.	Value.
	fine ozs.	fine ozs.	fine ozs.	£ s. d.	fine ozs.	fine ozs.	fine ozs.	£ s. d.
January	86,102·30	92,257·19	178,359·49	757,622 19 1½	77,217·72	99,435·55	176,653·27	750,375 7 10¾
February	68,012·57	95,046·42	163,058·99	692,630 11 3½	69,738·89	92,662·78	162,401·67	689,838 8 11
March	66,874·77	98,155·54	165,030·31	701,004 3 11¾	44,191·93	92,642·68	136,834·61	581,236 9 6¾
1st January to 31st March	220,989·64	285,459·15	506,448·79	2,151,257 14 4½	191,148·54	284,741·01	475,889·55	2,021,450 6 4½
April	73,722·53	103,091·20	176,813·73	751,056 19 8½	88,396·06	92,603·28	180,999·34	768,836 6 6¼
May	78,631·49	97,227·78	175,859·27	747,002 13 11¼	58,680·69	101,599·36	160,280·05	680,826 7 6½
June	61,256·95	115,075·82	176,332·77	749,013 19 11¼	70,173·95	97,272·36	167,446·31	711,266 14 3½
1st January to 30th June	434,600·61	600,853·95	1,035,454·56	4,398,331 7 11½	408,399·24	576,216·01	984,615·25	4,182,379 14 8¾
July	76,425·73	103,671·70	180,097·43	765,005 5 1½	69,317·58	91,400·76	160,718·34	682,688 2 3½
August	69,720·74	105,389·77	175,110·51	743,822 3 4	71,063·11	97,369·28	168,432·39	715,455 6 3¾
September	60,665·79	110,027·08	170,692·87	725,057 4 6	67,058·42	98,793·28	165,851·70	704,493 4 10
1st January to 30th September	641,412·87	919,942·50	1,561,355·37	6,632,216 0 11	615,838·35	863,779·33	1,479,617·68	6,285,016 8 2
October	61,439·17	100,252·98	161,692·15	686,824 11 11¼	76,517·54	98,090·10	174,607·64	741,686 2 2½
November	64,220·13	106,276·76	170,496·89	724,224 15 1	60,005·52	103,927·46	163,932·98	696,343 0 9
December	66,613·61	104,643·38	171,256·99	727,453 9 1	58,254·63	106,817·14	165,071·77	701,180 6 2¼
Total	**833,685·78**	**1,231,115·62**	**2,064,801·40**	**8,770,718 17 0¼**	**810,616·04**	**1,172,614·03**	**1,983,230·07**	**8,424,225 17 3¾**

TABLE VIII.

Monthly Returns of GOLD BULLION, GOLD ORES, and FINE GOLD BARS entered for EXPORT during 1904.

Month.	New South Wales.		South Australia.		Victoria.		Queensland.		United Kingdom.		TOTALS OF BULLION AND ORE.			Minted Gold Exported.*
	Bullion.	Ore.	Bullion.	Ore.	Bullion.	Ore.	Bullion.	Ore.	Bullion.	Ore.	Bullion.	Ore.	Total.	
1904.	Gross ozs.	Estimated gross ozs.	Gross ozs.	Estimated gross ozs.	Gross ozs.	Estimated gross ozs.	Gross ozs.	Estimated gross ozs.	Gross ozs.	Estimated gross ozs.	Gross ozs.	Estimated gross ozs.	Gross ozs.	ozs.
January	...	225·35	...	84·50	4,068·38	...	...	8·15	85,678·79	2,329·20	**89,747·17**	**2,647·20**	**92,394·37**	9,467·68
February	...	325·99	...	...	3,001·03	...	...	...	79,680·02	438·59	**82,681·05**	**764·58**	**83,445·63**	9,463·57
March	...	68·73	...	...	2,053·51	63·10	...	...	50,683·78	8·45	**52,737·29**	**140·28**	**52,877·57**	4,739·36 † 523·08
April	...	339·10	...	...	2,470·79	...	...	...	102,931·03	28·82	**105,401·82**	**367·92**	**105,769·74**	9,490·71
May	...	36·62	...	2·00	1,531·47	...	...	...	68,637·29	6·63	**70,168,76**	**45·25**	**70,214·01**	4,900·20
June	...	115·52	...	...	2,285·35	...	...	...	81,540·46	24·86	**83,825·81**	**140·38**	**83,966·19**	9,498·50
July	...	172·20	...	...	2,009·21	..	...	...	80,385·40	374·70	**82,394·61**	**546·90**	**82,941·51**	9,472·53
August	...	169·03	...	...	1,291·02	1·41	...	...	83,568·66	...	**84,859·68**	**170·44**	**85,030·12**	14,265·78
September	...	33·15	...	...	1,466·86	...	...	...	78,738·32	...	**80,205·18**	**33·15**	**80,238·33**	4,752·78
October	...	530·17	...	...	1,672·66	...	...	...	89,353·75	...	**91,026·41**	**530·17**	**91,556·58**	9,502·05
November	...	188·73	...	...	1,347·89	...	...	...	70,262·61	...	**71,610·50**	**188·73**	**71,799·23**	11,869·40
December	...	9·00	...	...	1,385·51	...	...	...	68,309·70	...	**69,695·21**	**9·00**	**69,704·21**	2,348·78
Totals ...	...	2,213·59	...	86·50	24,583·68	64·51	...	8·15	939,769·81	3,211·25	**964,353·49**	**5,584·00**	**969,937·49**	100,294·42

* When considering the total production of the State, these amounts must be disregarded, having already been recorded in the total receipts of gold at the Mint.
† To South Australia. All the other amounts were fine bars of minted gold exported to India.

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 1904 and previous years.

Year.	Month.	BLACK TIN.						COPPER ORE.											
		Greenbushes Mf.		Marble Bar D.		Total.		Day Dawn D.		Mt. Malcolm D.		Northampton Mf.		Phillips River Gf.		West Pilbarra Gf.		Total.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1899 ...	...	tons. 1,590·33	£ 66,108	tons. 75·45	£ 4,419	tons. 1,665·78	£ 70,527	tons. ...	£ ...	tons. ...	£ ...	tons. ...	£ ...	tons. ...	£ ...	tons. 7,018·00	£ 55,270	tons. 7,018·00	£ 55,270
1899 ...	...	277·32	21,658	57·50	3,612	334·82	25,270	...	...	273·00	4,338	136·00	2,122	...	...	2,555·00	29,478	2,964·00	35,938
1900 ...	...	435·62	29,528	387·87	27,174	823·49	56,702	5·15	91	4,539·00	30,718	..	...	34·00	725	1,605·00	12,139	6,183·15	43,673
1901 ...	...	321·34	18,852	412·98	21,148	734·32	40,000	10·50	76	7,660·00	40,738	38·50	277	1,089·14	12,918	1,162·00	15,891	9,960·14	69,900
1902 ...	...	403·21	24,680	216·35	15,103	619·56	39,783	...	...	1,954·00	6,852	...	...	308·25	1,238	...	...	2,262·25	8,090
1903 ...	...	524·94	34,362	292·11	21,528	817·05	55,890	...	...	18,965·00	45,557	...	...	1,561·33	10,984	...	...	20,526·33	56,541
1904 ...	January ...	34·57	2,121	30·35	2,290	64·92	4,411	...	...	...	...	...	...	455·52	2,580	...	...	455·52	2,580
Do. ...	February ...	32·73	2,136	30·55	2,088	63·28	4,224	...	...	...	...	...	...	587·01	4,348	...	...	587·01	4,348
Do. ...	March ...	62·40	3,874	27·80	2,115	90·20	5,989	...	...	500·00	900	...	...	511·77	3,327	...	...	1,011·77	4,227
Do. ...	April ...	30·85	2,066	20·30	1,522	51·15	3,588	...	...	...	...	...	...	...	...	...	...	...	...
Do. ...	May ...	41·17	2,644	25·40	1,927	66·57	4,571	...	...	...	...	...	...	290·99	2,210	...	...	290·99	2,210
Do. ...	June ...	51·69	3,170	19·25	1,364	70·94	4,534	...	...	...	...	...	...	365·86	2,734	...	...	365·86	2,734
Do. ...	July ...	46·01	2,822	19·44	1,457	65·45	4,279	...	...	...	...	...	...	250·76	1,654	...	...	250·76	1,654
Do. ...	August ...	60·18	3,728	29·09	2,377	89·27	6,105	...	...	...	...	...	...	221·52	1,627	...	...	221·52	1,627
Do. ...	September ...	51·00	3,368	29·80	2,272	80·80	5,640	...	...	...	...	...	...	298·94	2,114	...	...	298·94	2,114
Do. ...	October ...	44·19	2,989	28·45	2,572	72·64	5,561	...	...	...	...	...	...	113·09	751	...	...	113·09	751
Do. ...	November ...	39·00	2,757	25·95	1,886	64·95	4,643	...	...	...	...	...	...	136·95	1,094	...	...	136·95	1,094
Do. ...	December ...	39·85	2,787	34·48	2,485	74·33	5,272	...	...	...	...	...	...	236·48	1,841	...	...	236·48	1,841
	Total ...	**4,086·40**	**229,650**	**1,763·12**	**117,339**	**5,849·52**	**346,989**	**15·65**	**167**	**33,891·00**	**129,103**	**174·50**	**2,399**	**6,461·61**	**50,145**	**12,340·00**	**112,778**	**52,882·76**	**294,592**

Year.	Month.	IRONSTONE.						LEAD ORE.		SILVER-LEAD ORE.		COAL.		LIMESTONE.						DIAMONDS.	
		West Pilbarra Gf.		State generally.		Total.		Northampton Mf.		Ashburton Gf.		Collie River Coal Mf.		Yilgarn Gf.		State generally.		Total.		Nullagine D.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
Previous to 1899 ...	...	tons. 100·00	£ 300	tons. ...	£ ...	tons. 100·00	£ 300	tons. ...	£ ...	tons. ...	£ ..	tons. 3,508·00	£ 1,761	tons. ...	...	tons. ...	...	tons. ...	...	carats. ...	...
1899 ...	...	...	...	12,852·00	8,939	12,852·00	8,939	82·75	912	...	...	54,336·00	25,951	...	...	17,593·00	2,838	17,593·00	2,838	*	24
1900 ...	...	...	...	12,251·00	9,258	12,251·00	9,258	268·00	533	...	...	118,410·10	54,835	269·85	273	15,657·00	3,321	15,926·85	3,594	...	...
1901 ...	...	...	...	20,569·00	13,246	20,56 ·00	13,246	...	...	21·05	152	117,835·80	68,561	1,642·00	919	16,568·00	3,429	18,210·00	4,348	...	...
1902 ...	...	...	...	4,800·00	2,040	4,800·00	2,040	...	...	35·85	277	140,883·90	86,188	535·00	340	4,545·35	1,000	5,080·35	1,340	...	...
1903 ...	...	...	...	220·00	88	220·00	88	...	...	...	...	133,423·62	69,128	102·00	75	1,177·50	103	1,279·50	178	...	...
1904 ...	January ...	...	...	...	...	...	...	...	...	...	...	11,485·80	5,453	...	...	...	...	...	...	...	...
Do. ...	February ...	...	...	...	...	...	...	...	...	...	...	10,579·80	5,105	...	...	...	...	...	...	...	...
Do. ...	March ...	...	...	...	...	...	...	...	...	...	...	12,207·00	5,866	...	...	1,827·35	239	1,827·35	239	...	...
Do. ...	April ...	...	...	...	...	...	...	...	...	...	...	11,015·00	5,281	...	...	...	...	...	...	...	...
Do. ...	May ...	...	...	...	...	...	...	...	...	...	...	12,632·65	6,195	...	...	...	...	...	...	...	...
Do. ...	June ...	...	...	436·00	175	436·00	175	...	...	...	...	12,053·85	5,730	...	...	3,250·00	456	3,250·00	456	...	...
Do. ...	July ...	...	...	...	...	...	...	...	...	...	...	13,182·00	6,455	...	...	...	...	...	...	...	...
Do. ...	August ...	...	...	...	...	...	...	...	...	...	...	11,806·00	5,786	...	...	...	...	...	...	...	...
Do. ...	September ...	...	...	145·00	58	145·00	58	...	...	...	...	11,565·50	5,098	...	...	4,107·00	583	4,107·00	583	...	...
Do. ...	October ...	...	...	...	...	...	...	...	...	...	...	10,896·70	5,539	...	...	...	...	...	...	...	...
Do. ...	November ...	...	...	...	...	...	...	...	...	...	...	11,279·64	5,665	...	...	...	...	...	...	...	...
Do. ...	December ...	...	...	860·50	344	860·50	344	...	...	...	...	9,846·10	5,001	...	...	4,212·85	421	4,212·85	421	...	...
	Total ...	**100·00**	**300**	**52,133·50**	**34,148**	**52,233·50**	**34,448**	**350·75**	**1,445**	**56·90**	**429**	**706 950·46**	**373,598**	**2,548·85**	**1,607**	**68,938·05**	**12,390**	**71,486·90**	**13,997**	...	**24**

NOTE.—As the collection of Statistics of Minerals other than Gold commenced during 1899, the total Production from the different localities previous to that date can only be approximately estimated by the Customs Records. * Weight unknown.

TABLE X.

Quantity and Value of BLACK TIN reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registerd Name of Company or Mine.	1904.		Total to Date.		Remarks.
				Quantity.	Value.	Quantity.	Value.	
				tons.	£	tons.	£	
Greenbushes, Mf.	Greenbushes	35	(Horans)	...	...	188·35	11,605	
Do ...	do	35, 169 218, 228 272, 287	Westralian Stannaries, Ltd.	11·52	793	77·20	5,081	
Do ...	do ...	356 (40)	Cornwall	2·33	163	2·33	163	
Do ...	do ...	(56, 217)	(Amanda leases)	·64	36	22·83	1,471	
Do ...	do ...	73	(Nelson)	...	...	22·40	1,675	
Do ...	do ...	73, 233	Nelson leases	9·21	568	34·48	2,161	
Do ...	do ...	147	Haphazard	1·08	74	7·78	468	
Do ...	do ...	(330), 331	(Ivy) and Lady Esther leases	...	...	7·00	532	
Do ...	do ...	169	(Horans No. 1 North) ...	...	...	9·50	684	
Do ...	do ...	218	(W.A. Mount Bischoff) ...	...	...	5·38	342	
Do ...	do ...	244	Mount Pleasant	·65	47	13·90	943	
Do ...	do ...	(257), 273	Dixie Extended	...	...	12·97	818	
Do ...	do ...	271	Pioneer	...	...	1·84	117	
Do ...	do ...	296	Central	12·84	930	18·06	1,306	
Do ...	do ...	300, (315)	South Cornwall leases ...	4·50	330	13·10	931	
Do ...	do ...	317	Queen May Consols ...	14·89	986	20·78	1,360	
Do ...	do ...	337, 706c	Gladstone	6·42	434	6·42	434	
Do ...	do ...	Locs. 289, 290	Freehold ground (Clarth and others)	27·79	2,031	27·79	2,031	
Do ...	do ...	...	Voided leases	...	...	93·83	5,880	
Do ...	do ...	...	Sundry claims	441·77	28,070	3,500·46	191,648	
			Total	533·64	34,462	4,086·40	229,650	
Marble Bar D. ...	Cooglegong ...	...	Sundry claims	114·34	8,664	619·22	40,145	
Do ...	Moolyella ...	...	Voided leases	...	...	330·53	21,340	
Do ...	do ...	...	Sundry claims	117·00	8,948	674·98	45,981	
Do ...	Old Shaw ...	...	Voided leases	...	...	6·75	424	
Do ...	do ...	...	Sundry claims	80·57	6,107	120·94	8,712	
Do ...	Wodgina ...	77	Stanum	2·60	139	3·60	195	
Do ...	do ...	84	Mount Cassiterite ...	6·35	497	6·35	497	
Do ...	do ...	...	Sundry claims	...	...	·75	45	
			Total	320·86	24,355	1,763·12	117,339	
			Grand Total ...	854·50	58,817	5,849·52	346,989	

TABLE XI.

Quantity and Value of COPPER ORE reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904. Quantity. Ore.	1904. Quantity. Metallic Copper.	1904. Value.	Total to Date. Quantity (Ore).	Total to Date. Value.	Remarks.
				tons.	tons.	£	tons.	£	
Day Dawn D. ...	Day Dawn ...	...	Voided leases ...	...	...	...	15·65	167	
Mt. Malcolm D. ...	Murrin Murrin	(6c) 10c, etc.	Murrin Copper Mines, Ltd.	500·00	20·00	900	33,891·00	129,103	
Northampton Mf.	Geraldine ...	...	Voided leases ...	...	...	...	136·50	1,992	
Yandanooka Mf. ...	Yandanooka	...	Voided leases ...	...	...	..	38·00	407	
Phillips River Gf.	Kundip ...	(149)	(Australia)	8·69	1·84	92	16·48	168	
Do ...	do ...	52	Harbour View ...	43·99	8·96	449	555·63	4,177	
Do ...	do ...	179	Mosaic	33·72	4·64	232	33·72	232	
Do ...	do ...	(180)	(Mount Pleasant) ...	3·92	·59	30	3·92	30	
Do ...	do ...	60	Red, White, and Blue	42·34	6·82	341	61·06	613	
Do ...	Mt. Desmond	174	British Flag	26·78	4·99	249	26·78	249	
Do ...	do ...	186	C.D.C.	18·43	2·53	126	18·43	126	
Do ...	do ...	184	Christmas Gift ...	12·16	2·30	115	12·16	115	
Do ...	do ...	185	Desmond	14·16	2·69	134	14·16	134	
Do ...	do ...	168	Elverton South ...	4·34	·83	41	18·48	119	
Do ...	do ...	109	Mt. Desmond ...	64·35	9·60	481	122·82	1,099	
Do ...	do ...	(173)	(Mt. Garrity) ...	15·01	3·30	165	15·01	165	
Do ...	do ...	108	Mt. Stennett	65·56	8·66	432	197·66	1,633	
Do ...	do ...	95	Phillips River Options Syndicate, N.L.	1,228·73	152·05	7,602	2,308·61	17,861	
Do ...	do ...	199	P.L.P	7·43	1·04	52	7·43	52	
Do ...	do ...	(158)	(Rio Tinto)	6·50	1·17	59	6·50	59	
Do ...	do ...	(169)	(Welcome Stranger)	2·92	·35	18	12·77	92	
Do ...	do ...	...	Voided leases ...	...	...	...	63·41	868	
Do ...	do ...	...	Sundry claims ...	10·68	1·79	90	10·68	90	
De ...	Ravensthorpe	(176)	(Blue Ribbon) ...	11·35	1·77	88	11·35	88	
Do ...	do ...	187	Copper Horseshoe ...	12·30	1·72	87	12·30	87	
Do ...	do ...	(177)	(Duke of York) ...	1·81	·12	6	1·81	6	
Do ...	do ...	124	Emily Hale	14·53	2·04	102	65·93	537	
Do ...	do ...	(131)	(Federal)	8·67	1·06	53	8·67	53	
Do ...	do ...	154	Great Oversight ...	33·41	5·02	250	34·55	266	
Do ...	do ...	119	Kilmore	29·77	3·92	196	61·69	465	
Do ...	do ...	116	Last Chance	374·43	58·62	2,930	538·64	4,437	
Do ...	do ...	(120)	(Last Chance Proprietary)	12·88	1·57	79	34·87	252	
Do ...	do ...	16	Marion Martin ...	322·49	51·73	2,586	536·44	4,434	
Do ...	do ...	7	Mary	327·24	45·81	2,291	599·67	4,357	
Do ...	do ...	175	Mt. Benson	120·94	13·51	676	227·14	1,430	
Do ...	do ...	15	Mt. Catlin	78·29	9·96	498	99·42	663	
Do ...	do ...	(123)	(Mt. McMahon) ...	5·02	·75	38	5·02	38	
Do ...	do ...	(189)	(Puzzle)	32·94	4·71	235	32·94	235	
Do ...	do ...	115	Sunset	286·30	39·23	1,961	351·66	2,382	
Do ...	do ...	114	Surprise	153·96	23 78	1,189	159·46	1,251	
Do ...	do ...	166	Turn of the Tide ...	4·21	·25	13	4·21	13	
Do ...	do ...	...	Voided leases ...	...	...	...	133·16	945	
Do ...	do ...	...	Sundry claims ...	19·14	2·10	105	22·47	135	
West River ...	... ...	...	Sundry claims ...	14·50	3·20	189	14·50	189	
			Total ...	3,468·89	485·02	24,280	6,461·61	50,145	
West Pilbarra Gf.	Croydon ...	31	British Exploration of Australasia, Ltd.	...	...	...	453·00	5,593	
Do ...	do ...	...	Voided leases ...	...	...	...	40·00	595	
Do ...	Egina ...	...	Voided leases ...	...	...	...	530·00	6,571	
Do ...	Roebourne ...	...	Voided leases ...	...	...	...	181·00	2,746	
Do ...	Whim Creek	34	Balla Balla Copper Mines, Ltd.	...	...	...	2,009·00	12,036	
Do ...	do ...	...	Freehold of 100 acres	...	...	...	9,097·00	84,987	
Do ...	do ...	...	Voided leases ...	...	...	...	30·00	250	
			Total ...	...	...	...	12,340·00	112,778	
			Grand Total ...	3,968·89	505·02	25,180	52,882·76	294,592	

TABLE XII.

Quantity and Value of IRONSTONE reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904.		Total to Date.		Remarks.
				Quantity.	Value.	Quantity.	Value.	
				tons.	£	tons.	£	
West Pilbarra Gf.	Whim Creek	...	Voided leases	...	...	100·00	300	
East Coolgardie Gf.	Boulder ...	...	Voided leases	...	...	450·00	247	
	* *From State generally—*							
	Avon			...	...	22,223·00	16,241	
	Clackline			860·50	344	12,667·50	6,554	
	Coates' Paddock			...	...	4,712·00	3,277	
	Greenbushes			581·00	233	7,481·00	4,629	
	Werribee			...	...	4,600·00	3,200	
			Total	**1,441·50**	**577**	**52,233·50**	**34,448**	

* Ore flux received by the Fremantle Smelter, Ltd.

TABLE XIII.

Quantity and Value of LEAD ORE reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904.		Total to Date.		Remarks.
				Quantity.	Value.	Quantity.	Value.	
				tons.	£	tons.	£	
Northampton Mf.	Narra Tarra	...	*From locality generally* ...	...	...	225·00	185	
Do ...	Northampton	...	Voided leases	...	...	106·75	1,048	
Do ...	Victoria ...	...	Voided leases	...	...	19·00	212	
			Total	...	...	**350·75**	**1,445**	

TABLE XIV.

Quantity and Value of SILVER-LEAD ORE reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904.		Total to Date.		Remarks.
				Quantity.	Value.	Quantity.	Value.	
				tons.	£	tons.	£
Ashburton Gf.	Ashburton ...	...	Voided leases	...	...	56·90	429	
			Total	...	...	**56·90**	**429**	

TABLE XV.

Quantity and Value of COAL reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904.		Total to Date.		Remarks.
				Quantity.	Value.	Quantity.	Value.	
				tons.	£	tons.	£
Collie River Mf.	Collie ...	197, etc.	Cardiff Coal Mining Co., Ltd.	46,879·64	22,235	70,428·26	32,560	
Do ...	do ...	151, etc.	Collie Boulder Coal Co., Ltd.	434·50	111	6,300·50	3,128	
Do ...	do ...	238, etc.	Collie Co-operative Collieries	634·90	334	634·90	334	
Do ...	do ...	85-100	Collie Proprietary Coalfields of W.A., Ltd. (No. 2 Pit)	59,086·00	29,078	240,256·40	135,223	
Do ...	do ...	88	Collie Proprietary Coalfields of W.A., Ltd. (No. 1 Pit) *late* Westralian Wallsend Colliery	31,515·00	15,416	363,760·55	189,423	
Do ...	do ...	...	Voided leases	...	...	25,569·85	12,930	
			Total	**138,550·04**	**67,174**	**706,950·46**	**373,598**	

TABLE XVI.

Quantity and Value of LIMESTONE reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904. Quantity.	1904. Value.	Total to Date. Quantity.	Total to Date. Value.	Remarks.
				tons.	£	tons.	£
Yilgarn Gf. ...	Southern Cross	...	Voided leases	...	...	2,548·85	1,607	
			* *From State generally*—					
			Fremantle	13,397·20	1,699	68,938·05	12,390	
			Total	**13,397·20**	**1,699**	**71,486·90**	**13,997**	

* Ore flux received by the Fremantle Smelter, Ltd.

TABLE XVII.

Quantity and Value of DIAMONDS reported to the Mines Department during 1904, and the Total Output to date.

Goldfield, District, or Mineral Field.	Locality.	Number of Lease.	Registered Name of Company or Mine.	1904. Quantity.	1904. Value.	Total to Date. Quantity.	Total to Date. Value.	Remarks.
				carats.	£	carats.	£	
Nullagine D. ...	Nullagine ...	M.R.C.6L	(Morgans, A. E.)	...	...	§	24	§230 tons conglomerate returned 25 small diamonds (weight unknown) and 77·70ozs. gold.
			Total	...	...	...	**24**	

TABLE

Return of Ore and Minerals other than Gold, entered for EXPORT from 1850-1904, inclusive, showing

METALLIC

COPPER ORE.

Year.	West Pilbarra Gf.		Northampton Mf.		Phillips River Gf.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
1850	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	[2]†	7·50	...	...	...	...	...	7·50
4	...	...	...	...	...	...	...	...	...	..
5	...	...	2·05	26·45	...	...	...	...	2·05	26·45
6	...	...	57·00	1,017·90	...	...	...	...	57·00	1,017·90
7	...	...	80·00	1,920·00	...	...	...	...	80·00	1,920·00
8	...	...	433·25	9,531·50	...	...	...	...	433·25	9,531·50
9	...	...	941·50	14,122·50	...	...	...	...	941·50	14,122·50
1860	...	...	517·50	8,021·25	...	...	...	...	517·50	8,021·25
1	...	...	409·00	6,339·50	...	...	...	...	409·00	6,339·50
2	...	...	783·50	12,536·00	...	...	...	...	783·50	12,536·00
3	...	...	763·00	12,208·00	...	...	...	...	763·00	12,208·00
4	...	...	1,076·00	17,216·00	...	...	...	...	1,076·00	17,216·00
5	...	...	886·00	13,290·00	...	...	...	...	886·00	13,290·00
6	...	...	557·50	8,362·50	...	...	...	...	557·50	8,362·50
7	...	...	337·00	5,055·00	...	...	...	...	337·00	5,055·00
8	...	...	83·00	1,245·00	...	...	...	...	83·00	1,245·00
9	...	...	155·00	2,325·00	...	...	...	...	155·00	2,325·00
1870	...	...	6·00	90·00	...	...	...	...	6·00	90·00
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	...	...	...	...	...	...
3	...	...	56·50	847·50	...	...	...	...	56 50	847·50
4	...	...	66·50	997·50	...	...	...	...	66·50	997·50
5	...	...	204·75	3,071·25	...	...	...	...	204·75	3,071·25
6	...	...	279·00	4,185·00	...	...	...	...	279·00	4,185·00
7	...	...	53·50	802·50	...	...	...	...	53·50	802·50
8	...	...	9·00	135·00	...	...	...	...	9·00	135·00
9	...	...	...	...	...	...	...	...	...	...
1880	...	...	8·00	120·00	...	...	...	...	8·00	120·00
1	...	...	...	...	...	...	...	...	...	..
2	...	...	1·50	22·50	...	...	...	...	1·50	22·50
3	...	...	5·00	75·00	...	...	...	...	5·00	75·00
4	...	...	118·00	1,770·00	...	...	...	...	118·00	1,770·00
5	...	...	119·50	1,792·50	...	...	...	...	119·50	1,792·50
6	...	...	249·00	3,735·00	...	...	...	...	249·00	3,735·00
7	...	...	23·00	345·00	...	...	...	...	23·00	345·00
8	...	...	87·50	1,487·50	...	...	...	...	87·50	1,487·50
9	...	...	112·00	1,904·00	...	...	...	...	112·00	1,904·00
1890	...	...	8·00	136·00	...	...	...	...	8·00	136·00
1	262·50	4,462·50	...	...	...	...	...	...	262·50	4,462·50
2	[1]† 412·00	6,318·80	155·00	2,377·20	...	...	...	...	567·00	8,696·00
3	50·00	606·00	...	...	...	...	...	...	50·00	606·00
4	...	...	...	...	...	...	...	...	...	...
5	802·00	12,832·00	24·00	120·00	...	...	...	...	826·00	12,952·00
6	6·30	100·00	...	...	...	...	...	...	6·30	100·00
7	64·85	731·25	21·15	302·00	...	...	...	...	86·00	1,033·25
8	*a* 280·87	3,334·00	*b* 74·53	931·50	...	...	...	...	355·40	4,265·50
9	1,404·50	31,978·50	586·55	9,473·25	...	...	...	...	1,991·05	41,451·75
1900	543·55	10,696·00	...	...	105·15	2,411·00	*c* 197·41	3,355·00	*d* 846·11	16,462·00
1	1,058·00	26,464·00	·50	10·00	1,205·00	22,107·00	396·75	6,322·00	2,660·25	54,903·00
2	68·50	1,698·00	20·00	330·00	162·00	2,469·00	33·00	489·00	283·50	4,986·00
3	3·60	180·00	25·05	460·00	301·70	3,538·00	15·45	349·00	345·80	4,527·00
†4	50·00	500·00	...	...	11·00	154·00	72·00	1,589·00	133·00	2,243·00
Total	**5,006·67**	**99,901·05**	**9,394·83**	**148,744·30**	**1,784·85**	**30,679·00**	**714·61**	**12,104·00**	**16,900·96**	**291,428·35**

† These figures are liable to revision, as they refer to Countries *beyond the Commonwealth only*. The interstate export figures of Western not stated. [2]† Probably the produce of the Greenbushes Tinfield. *a* 280 tons. 17cwts. 2qrs. *b* 74 tons 10cwts. 2qrs. *h* 278 tons 8cwts. 1qr. *i* 101 tons 18cwts. 3½qr.

XVIII.

the Quantity obtained from certain Goldfields and Mineral Fields, and the declared Value thereof.

MINERALS.

LEAD ORE.		BLACK TIN (Dressed Tin).						Year.
Northampton Mf.		Pilbarra Gf.		Greenbushes Mf.		Total.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
tons.	£	tons.	£	tons.	£	tons.	£	
5·00	55·00	...	...	...	...	...	...	1850
...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	2
[2]†	4·00	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	4
25·00	250·00	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	6
...	...	...	...	...	...	...	...	7
...	...	...	...	...	...	...	...	8
13·50	135·00	...	...	...	...	...	...	9
98·50	985·00	...	...	...	...	...	...	1860
79·00	790·00	...	...	...	...	...	...	1
9·00	90·00	...	...	...	...	...	...	2
230·00	2,300·00	...	...	...	...	...	...	3
80·00	800·00	...	...	...	...	...	...	4
703·00	8,436·00	...	...	...	...	...	...	5
273·50	3,282·00	...	...	...	...	...	...	6
902·00	10,824·00	...	...	...	...	...	...	7
1,100·50	13,206·00	...	...	...	...	...	...	8
699·50	8,394·00	...	...	...	...	...	...	9
1,209·50	14,514·00	...	...	...	...	...	...	1870
420·00	5,040·00	...	...	...	...	...	...	1
364·00	4,368·00	...	...	...	...	...	...	2
965·50	11,586·00	...	...	...	...	...	...	3
2,143·75	25,725·00	...	...	...	...	...	...	4
2,289·00	27,468·00	...	...	...	...	...	...	5
2,191·50	26,298·00	...	...	...	...	...	...	6
3,955·50	47,466·00	...	...	...	...	...	...	7
3,617·50	43,410·00	...	...	...	...	...	...	8
2,775·00	33,300·00	...	...	...	...	...	...	9
1,921·00	15,368·00	...	...	...	...	...	...	1880
1,400·50	11,204·00	...	...	...	...	...	...	1
1,793·50	14,348·00	...	...	...	...	...	...	2
1,038·00	7,266·00	...	...	...	...	...	...	3
696·00	4,872·00	...	...	...	...	...	...	4
465·00	3,255·00	...	...	...	...	...	...	5
611·00	4,277·00	...	...	...	...	...	...	6
471·00	4,710·00	...	...	...	...	...	...	7
532·00	5,320·00	...	...	...	...	...	...	8
250·00	2,500·00	...	...	...	...	[3]†5·00	300·00	9
213·50	2,135·00	...	...	...	...	[3]†67·50	5,400·00	1890
25·00	250·00	...	...	204·00	10,200·00	204·00	10,200·00	1
29·75	150·00	...	...	*f* 265·49	13,843·00	*f* 265·49	13,843·00	2
...	...	56·45	3,470·00	171·50	7,664·00	227·95	11,134·00	3
...	...	19·00	949·00	371·25	14,325·00	390·25	15,274·00	4
...	...	...	...	277·15	9,703·00	277·15	9,703·00	5
...	...	...	...	137·25	4,338·00	137·25	4,338·00	6
[2]†	4·00	...	...	95·55	3,275·00	95·55	3,275·00	7
5·00	33·00	...	...	*g* 68·14	2,760·00	*g* 68·14	2,760·00	8
16·00	96·00	29·55	2,025·00	*h* 278·41	21,138·00	*j* 307·96	23,163·00	9
26·85	242·00	*e* 368·34	30,146·00	*i* 101·94	8,032·00	*k* 470·28	38,178·00	1900
...	...	439·00	34,600·00	67·50	4,895·00	506·50	39,495·00	1
...	...	248·00	19,698·00	31·00	2,870·00	279·00	22,568·00	2
...	...	267·00	20,988·00	24·70	1,868·00	291·70	22,856·00	3
...	...	64·00	4,932·00	24·00	1,389·00	88·00	6,321·00	†4
33,643·85	**364,756·00**	**1,491·34**	**116,808·00**	**2,117·88**	**106,300·00**	**3,681·72**	**228,808·00**	

Australia for 1904 are not yet available, [1]† *See* Woodward's Mining Handbook, Perth; By Authority, 1895; p. 123. [2]† Declared; weight
c 197 tons 8cwts. 1qr. *d* 846 tons 2cwts. 1qr. *e* 368 tons 6cwts. 3qrs. *f* 265 tons 9cwts. 3qrs. *g* 68 tons 2cwts. 3qrs.
j 307 tons 19cwts. 1qr. *k* 470 tons 5cwts. 2¼qrs.

TABLE XVIII.—*Return of Ore and Minerals, other than Gold,*

YEAR.	NON-METALLIC MINERALS.						ORES NOT OTHERWISE ENUMERATED.			
	ASBESTOS.		COAL.		MICA.				COPPER INGOT.	
	State generally.		Collie River Coal Mf.		State generally.				State generally.	
	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	...	...	...	...	...	...	...	...	...	...
8	...	...	...	...	...	...	...	...	...	...
9	...	...	...	...	...	...	...	...	...	...
1890	...	...	...	...	...	...	...	...	...	...
1	...	...	...	...	...	...	...	...	...	...
2	...	...	...	...	[2]†	25·00	...	...	...	...
3	...	...	...	...	[2]†	4·00	...	...	...	...
4	...	...	...	...	...	...	...	...	...	...
5	...	...	...	...	[2]†	3·00	...	...	...	...
6	...	...	...	...	...	...	...	...	...	...
7	...	...	...	...	[2]†	209·00	...	...	...	...
8	...	...	1·00	1·00	...	...	...	...	...	...
9	†	1·00	798·00	772·00	[4]†	50·00	...	...	...	...
1900	...	...	355·00	350·00	[2]†	3·00	5·00	85·00	248·90	17,475·00
1	...	...	970·75	969·00	...	...	[2]†	4·00	439·40	31,062·00
									§441·10	24,804·00
2	...	...	12·00	12·00	...	...	[7]†3·00	47·00	§175·00	7,918·00
3	·20	10·00	...	...	...	...	[8]†22·00	230·00	51·45	3,371·00
									§1,023·80	29,917·00
†4	...	...	11·00	7·00	...	...	[9]†·05	2·00	99·00	3,676·00
Total	·20	11·00	2,147·75	2,111·00	...	294·00	30·05	368·00	2,478·65	118,223·00

[2]† Declared; weight not stated. [4]† 13 packages; weight not stated. [5]† Estimated; no tonnage given. [6]† No tonnage given,
[9]† 1 cwt. plumbago ore. ¶ Advantage has been taken of the series of years

entered for ***EXPORT*** *from 1850–1904, inclusive*—continued.

COMMERCIAL PRODUCTS. ¶						PRECIOUS STONES.		Year.
SILVER.		TIN INGOT. (White Tin.)		PIG LEAD.				
State generally.		Greenbushes Mf.		State generally.		State generally.		
Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
ozs.	£	tons.	£	tons.	£	carats.	£	
...	...	...	...	...	...	...	...	1850
...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	2
...	...	...	...	55·00	1,200·00	...	...	3
...	...	...	...	122·00	2,440·00	...	...	4
...	...	...	...	133·75	2,675·00	...	...	5
...	...	...	...	60·00	1,200·00	...	...	6
...	...	...	...	120·50	2,410·00	...	...	7
...	...	...	...	61·00	1,220·00	...	...	8
...	...	...	...	24·75	495·00	...	...	9
...	..	...	...	...	...	...	...	1860
...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	4
..	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	6
...	...	...	...	[5]†3·00	50·00	...	...	7
...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	9
...	...	...	...	...	...	...	...	1870
...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	4
...	...	...	...	4·25	89·25	...	...	5
...	...	...	...	[5]†7·00	155·00	...	...	6
...	...	...	...	[5]†1·00	15·00	...	...	7
...	...	...	...	...	...	...	...	8
...	...	...	...	...	...	...	...	9
...	...	...	...	[5]†5·00	89·00	...	...	1880
...	...	...	...	[5]†1·00	20·00	...	...	1
...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	4
...	..	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	6
...	...	...	...	[5]†6·00	120·00	...	...	7
...	...	...	...	[5]†2·00	40·00	...	...	8
...	...	...	...	...	...	..	...	9
...	...	...	...	...	...	...	...	1890
...	...	...	...	...	...	...	...	1
...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	...	...	3
...	...	...	...	...	...	...	...	4
...	...	...	...	...	...	...	...	5
...	...	...	...	...	...	...	...	6
...	...	...	...	[6]†·50	11·00	...	...	7
...	...	...	...	...	...	...	...	8
...	...	...	...	77·00	1,077·00	...	...	9
28,749·00	3,594·00	142·35	18,872.00	...	...	...	...	1900
60,869·00	7,609·00	96·50	12,607·00	...	...	...	...	1
83,293·00	9,190 00	141·00	16,380·00	...	...	...	...	2
168,113·00	19,153·00	235·35	29,277·00	...	...	...	...	3
399,190·00	45,912·00	129·00	16,155·00	5,352·00	63,170·00	...	...	†4
740,214·00	**85,458·00**	**744·20**	**93,291·00**	**6,035·75**	**76,476·25**	...	...	

6 packages estimated at 10 cwts. [7]† 2 tons cobalt ore, value £41; 1 ton plumbago ore, value £6. [8]† 22 tons antimony ore, value £230, covered by this table to show in detail the quantity of Commercial Products exported. § Copper Matte.

PART III.—

TABLE

Quantity and Estimated Value of MINING

Goldfield.	District.	State Batteries.	Motive Plant.								Pumping Plant.	
			Employed in Mining.			Employed in Reduction.						
				Steam Engines.								
			Steam Boilers.	Single Winding Gear.	Double Winding Gear.	Steam Boilers.	Steam Engines.	Portable Boilers and Engines.	Oil Engines.	Air Compressors.	Air Receivers.	Pumps (Cornish Lift or Plunger).	Steam Pumps.
1. Kimberley	... ...	... ...	...	...	...	3	2	2	...	...	...	...	1
2. Pilbarra	Marble Bar ...	... ...	4	4	...	2	4	3	...	1	1	3	10
	Nullagine ...	... ...	2	...	...	1	2	3	...	...	...	1	12
3. West Pilbarra	... ...	... ...	1	...	1	3	2	2	...	...	...	1	5
4. Ashburton	... ...	... ...	...	...	...	...	...	...	...	...	...	...	...
5. Gascoyne	... ...	... ...	...	...	...	...	...	...	...	...	...	...	...
6. Peak Hill	... ...	... ...	3	1	1	7	14	...	...	1	3	9	8
Do.	... ...	Ravelstone ...	...	...	...	1	1	...	...	...	...	...	4
7. East Murchison ...	Lawlers	... ...	39	15	16	26	26	3	...	6	6	8	93
	Do.	Lake Darlot ...	...	...	...	2	1	...	...	...	...	...	4
	Do.	Wiluna	...	...	...	1	...	1	...	...	...	...	3
	Black Range ...	... ...	...	...	1	3	2	...	...	...	...	...	5
	Do.	Black Range ...	...	...	...	1	1	...	...	...	...	...	2
8. Murchison ...	Cue	... ...	22	6	8	8	7	1	...	2	2	5	21
	Do.	Tuckanarra ...	...	...	...	1	1	...	...	...	...	...	2
	Nannine	... ...	22	10	12	18	20	3	1	2	3	14	53
	Do.	Meekatharra ..	...	...	...	2	2	...	...	...	...	...	6
	Day Dawn ...	... ...	27	7	10	13	9	4	...	8	9	4	27
	Mt. Magnet ...	... ...	21	3	11	12	6	2	...	2	2	6	16
	Do.	Boogardie ...	...	...	...	2	1	...	...	...	...	...	...
	Do.	Lennonville ...	..	1	...	1	1	...	...	...	...	...	4
9. Yalgoo	... ...	... ...	11	1	5	10	10	1	...	2	3	6	26
10. Mt. Margaret ...	Mt. Morgans ...	... ...	12	4	5	6	6	1	...	3	2	1	28
	Mt. Malcolm ...	... ...	42	12	17	15	18	4	...	7	8	4	79
	Do.	Leonora	...	...	...	1	1	...	...	...	...	...	4
	Do.	Pig Well	...	...	...	1	1	...	...	...	...	...	2
	Mt. Margaret ...	... ...	21	5	11	12	12	2	...	5	6	5	38
	Do.	Burtville ...	...	...	...	2	1	1	...	...	...	...	...
	Do.	Laverton ...	...	...	...	2	1	...	...	1	...	...	...
11. North Coolgardie	Menzies	... ...	22	9	16	17	15	7	2	11	9	6	59
	Do.	Menzies	...	...	...	2	1	...	...	...	...	...	3
	Do.	Mt. Ida	1	1	1	1	1	...	...	1	1	...	4
	Ularring... ...	... ...	6	3	2	5	5	2	...	4	4	...	7
	Do.	Mulline	...	...	...	2	1	1	...	...	...	1	4
	Do.	Mulwarrie ...	...	...	...	1	1	...	...	...	...	...	5
	Niagara	... ...	23	2	8	12	9	4	...	5	4	2	23
	Do.	Niagara	...	...	...	2	1	1	...	...	...	...	5
	Yerilla	... ...	9	5	2	11	5	2	...	2	2	3	13
	Do.	Yundamindera ...	...	...	...	...	...	...	...	...	...	...	4
12. Broad Arrow	... ...	... ...	28	5	17	18	16	4	...	3	3	11	52
13. N.E. Coolgardie ...	Kanowna ...	... ...	23	3	11	18	14	3	6	8	9	13	29
	Bulong	... ...	4	...	4	3	2	...	4	1	1	3	4
	Kurnalpi	... ...	...	...	...	1	2	...	...	...	...	1	...
14. East Coolgardie	... ...	... ...	138	14	75	184	64	10	2	58	71	53	166
15. Coolgardie ...	Coolgardie ...	... ...	38	8	28	32	29	7	1	12	14	7	93
	Do.	Coolgardie ...	...	...	...	2	1	...	...	...	...	...	2
	Do.	Widgiemooltha ...	...	...	...	1	1	...	...	1	1	...	3
	Kunanalling ...	... ...	16	5	10	11	9	8	...	1	1	3	56
16. Yilgarn	... ...	... ...	16	1	9	12	9	5	7	5	6	7	30
Do.	... ...	Southern Cross ...	...	...	...	1	...	1	...	...	...	...	4
17. Dundas	... ...	... ...	14	3	12	15	10	4	1	9	8	5	48
Do.	... ...	Norseman ...	...	...	...	2	1	1	...	...	...	...	5
18. Phillips River	... ...	... ...	2	1	2	4	3	3	1	1	1	1	8
19. Donnybrook	... ...	... ...	6	...	2	...	...	1	...	1	1	...	3
State generally	... ...	... ...	...	...	...	4	6	...	...	...	...	1	9
Total Gold-extracting Machinery			573	129	297	517	358	97	25	163	181	184	1,092
Tinfield ... Greenbushes Mineral Field			6	2	...	5	2	2	2	...	1	3	17
Tinfield ... Government Tin-dressing Plant			...	...	...	1	1	1	...	...	...	...	3
Copperfield ... Phillips River Government Smelter			...	...	...	1	1	1	...	...	...	...	2
Coalfield ... Collie River Coal Mineral Field			12	7	...	...	...	...	...	4	...	...	21
Total Machinery other than Gold-extracting			18	9	...	7	4	4	2	4	1	3	43
TOTAL MINING MACHINERY			591	138	297	524	362	101	27	167	182	187	1,135

ALL MINES.

XIX.

MACHINERY erected on the 31st December, 1904.

Hauling Plant.				Reduction Plant.																	
							Other Mills.														
Whims.	Whips.	Endless Rope Trams.	Hydraulic Lifts.	Stone Breakers.	Ore Feeders.	Batteries: No. of Heads of Stampers.	Ball Mills.	Griffin Mills.	Huntington Mills.	Prospecting Mills.	Tremain Mills.	Salford.	Langley.	Crushing Rollers.	Dry Crushers.	Puddlers.	Krupp Ball Mills.	Flint Mills.	Tailings Pumps.	Tailings Wheels.	Amalgamating Barrels and Pans.	Berdan Pans.
1	...	...	...	...	...	25	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	45	...	...	...	1	...	...	...	...	...	...	...	...	...	...	1
...	5	...	...	...	...	40	...	...	...	...	...	...	...	...	..	...	...	...	1	...	2
...	1	...	...	...	...	20	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...
...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	2	8	40	...	...	...	1	...	...	...	...	...	...	...	...	4	...	1
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
1	7	1	...	9	24	225	...	...	...	2	...	...	...	...	...	...	...	...	6	5	9	5
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	2	...	...	2	1	10	...	...	...	1	1	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	1	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
1	6	...	...	1	...	80	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	11
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2
1	4	...	...	7	14	194	...	...	1	1	...	...	...	...	...	...	...	...	3	5	...	25
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	2
...	4	...	...	5	26	175	...	...	...	...	...	...	...	...	...	...	...	...	6	1	1	1
2	4	...	...	4	8	100	...	...	...	...	1	...	...	...	...	...	...	...	2	3	2	5
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	10	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	2
...	5	1	...	3	4	75	...	...	1	1	...	...	...	...	...	...	...	...	2	...	1	4
...	1	1	...	3	17	90	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	2
...	3	...	...	7	25	246	...	...	...	...	2	...	...	..	...	...	...	...	5	4	1	11
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
1	16	1	...	3	13	130	...	...	...	2	...	...	...	...	...	...	...	...	3	3	2	1
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
1	19	1	...	6	17	160	...	...	...	2	...	...	...	...	...	...	...	...	6	1	3	18
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	3
...	2	...	...	2	6	50	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	3
...	...	...	...	...	...	20	...	...	...	...	...	...	...	...	...	...	...	....	...	...	...	4
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
1	3	...	...	5	19	110	...	...	...	...	1	...	...	...	...	2	...	...	2	1	1	3
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2
2	2	...	...	4	8	55	...	...	...	...	...	...	...	...	...	...	...	...	...	4	...	2
...	...	...	...	1	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
2	10	5	...	6	30	220	...	...	...	2	...	...	...	...	1	1	1	...	3	3	2	5
...	6	2	...	7	19	195	...	...	2	5	...	...	...	...	...	5	...	...	7	5	...	12
1	1	...	...	1	...	40	...	1	1	...	...	...	...	...	...	...	...	...	1	1	...	2
...	...	...	...	...	1	5	...	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...
...	17	4	...	56	150	655	11	25	8	1	...	...	...	6	1	4	39	13	38	9	52	19
1	13	...	...	13	47	339	...	...	1	...	...	...	...	...	...	...	...	...	6	4	...	25
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	1	1	...	...
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
3	17	1	...	4	12	140	2	...	...	1	1	...	...	...	1	...	...	...	2	...	...	2
..	4	...	...	9	24	160	...	3	...	...	...	...	...	...	...	...	...	...	2	2	...	14
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
1	16	...	...	9	14	110	...	...	...	...	...	1	1	...	2	...	...	...	2	2	3	14
...	...	...	...	...	...	10	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	2
...	2	...	...	1	2	45	...	...	...	1	...	...	...	...	...	...	...	...	2	...	...	1
...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	10	3	4	...	1	...	...	...	...	...	...	2	1	...	...	...	...	...	...	...
19	170	17	10	174	494	3,999	14	29	15	23	6	1	1	8	6	12	40	13	110	63	78	227
1	1	1	...	2	...	5	...	...	...	...	...	...	...	3	...	12	...	...	...	...	...	...
...	...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
1	1	2	...	2	...	10	...	...	...	...	...	...	...	3	...	12	...	...	...	...	...	...
20	171	19	10	176	494	4,009	14	29	15	23	6	1	1	11	6	24	40	13	110	63	78	227

TABLE XIX.—*Quantity and Estimated Value of MINING*

GOLDFIELD.	DISTRICT.	STATE BATTERIES.	REDUCTION PLANT (*continued*).											
											Cyaniding.			
			Wheeler's Pans.	Settling Tanks.	Percussion and Shaking Tables.	Concentrators.	Classifiers.	Trommels or Revolving Screens.	Spitzkasten.	Vanners.	Leaching Vats.	Agitators and Agitating Vats.	Storage Vats.	Filter Presses.
1. Kimberley	... ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...
2. Pilbarra	Marble Bar	... ...	...	...	...	1	...	...	1	...	17	...	7	...
	Nullagine	... ...	...	15	...	...	...	...	...	...	5	...	3	...
3. West Pilbarra	... ...	... ...	...	...	...	...	...	...	...	...	4	...	...	...
4. Ashburton	... ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...
5. Gascoyne	... ...	... ...	...	...	...	...	...	...	...	...	...	...	...	...
6. Peak Hill	... ...	... ...	...	4	...	...	...	...	...	...	8	3	9	9
Do.	... .	Ravelstone	...	...	7	...	...	...	...	...	4	...	1	...
7. East Murchison	Lawlers	... ...	2	3	...	3	...	...	4	...	69	2	34	3
	Do.	Lake Darlôt	...	4	...	...	...	...	...	...	4	...	...	...
	Do.	Wiluna	...	...	...	...	...	...	...	...	4	...	2	...
	Black Range	... ...	...	...	...	...	...	...	...	...	4	...	...	...
	Do.	Black Range	...	...	...	...	...	...	...	...	...	...	...	...
	Cue	... ...	...	4	...	4	...	...	...	...	28	...	4	...
	Do.	Tuckanarra	...	...	...	...	...	...	...	...	4	...	2	...
	Nannine	... ...	...	7	10	7	...	...	...	...	43	...	6	...
	Do.	Meekatharra	...	1	...	...	...	...	...	...	4	...	...	...
8. Murchison	Day Dawn	... ...	3	2	...	21	1	...	12	...	40	6	7	6
	Mt. Magnet	... ...	...	...	...	...	...	...	...	...	34	...	13	...
	Do.	Boogardie	...	...	...	...	...	...	...	...	3	...	...	...
	Do.	Lennonville	...	...	...	...	...	...	...	...	3	...	4	...
9. Yalgoo	... ...	... ...	...	2	...	...	...	...	...	...	13	...	2	...
	Mt. Morgans	... ...	...	3	...	...	...	...	...	...	51	7	8	3
	Mt. Malcolm	... ...	8	6	...	11	...	...	7	1	57	5	19	1
	Do.	Leonora	...	2	...	...	...	...	...	...	4	...	4	...
10. Mt. Margaret	Do.	Pig Well	...	...	...	...	...	...	...	...	...	...	...	...
	Mt. Margaret	... ...	...	2	...	4	...	...	16	...	66	6	13	2
	Do.	Burtville	...	...	...	...	...	...	...	...	3	...	9	...
	Do.	Laverton	...	...	...	...	...	...	...	...	3	...	2	...
	Menzies	... ...	3	31	5	1	2	...	1	...	59	7	22	5
	Do.	Menzies	...	3	...	1	...	...	...	...	3	...	...	...
	Do.	Mt. Ida	...	...	...	1	...	...	...	...	...	...	4	...
	Ularring	... ...	...	11	...	2	...	...	...	...	18	2	7	...
11. North Coolgardie	Do.	Mulline	...	...	...	...	...	...	...	...	5	2	11	1
	Do.	Mulwarrie	...	...	...	...	...	...	...	2	4	...	2	...
	Niagara	... ...	...	5	...	12	...	...	36	...	52	4	17	3
	Do.	Niagara	...	5	...	...	...	...	...	...	3	...	3	...
	Yerilla	... .	1	18	...	...	...	...	...	...	26	...	6	...
	Do.	Yundamindera	...	...	...	...	...	...	...	...	...	...	...	...
12. Broad Arrow	... ...	... ...	1	21	1	2	...	...	...	...	60	11	23	3
13. N.E. Coolgardie	Kanowna	... ...	1	15	3	4	...	...	1	...	67	1	14	...
	Bulong	... ...	...	2	...	...	...	...	...	...	3	...	..	...
	Kurnalpi	... ...	...	...	...	...	...	...	...	...	...	..	...	...
14. East Coolgardie	... ...	... ...	119	76	30	116	70	1	291	16	230	174	127	120
15. Coolgardie	Coolgardie	... ...	...	30	4	3	...	...	3	...	137	6	44	6
	Do.	Coolgardie	...	6	...	...	...	...	...	...	4	...	...	...
	Do.	Widgiemooltha	...	...	...	...	...	...	...	...	...	...	...	...
	Kunanalling	... ...	...	47	...	..	...	...	2	...	48	2	15	1
16. Yilgarn	... ...	... ...	...	17	...	2	...	...	...	...	60	...	8	...
Do.	... ...	Southern Cross	...	3	...	...	...	...	...	...	3	...	...	...
17. Dundas	... ...	... ...	...	10	4	...	...	...	1	...	41	7	22	2
Do.	... ...	Norseman	...	10	...	...	...	...	...	...	5	1	4	1
18. Phillips River	... ...	... ...	...	5	3	2	...	...	...	...	5	...	...	...
19. Donnybrook	... ...	... ...	..	...	...	...	...	...	...	...	...	...	...	...
State generally	... ...	... ...	...	...	...	...	...	1	...	...	...	...	...	...
TOTAL GOLD-EXTRACTING MACHINERY	... ...		138	370	67	197	73	2	375	19	1,308	246	478	166
Tinfield	Greenbushes Mineral Field	... ...	..	...	...	3	...	2	...	...	...	...	...	...
	Government Tin-dressing Plant	...	...	...	...	2	1	...	1	...	...	...	...	...
Copperfield	Phillips River Government Smelter	...	...	...	...	...	...	...	...	...	...	...	...	...
Coalfield	Collie River Coal Mineral Field	...	...	...	...	...	...	...	...	...	...	...	...	...
TOTAL MACHINERY OTHER THAN GOLD-EXTRACTING		...	...	...	...	5	1	2	1	...	...	...	...	...
TOTAL MINING MACHINERY		...	138	370	67	202	74	4	376	19	1,308	246	478	166

MACHINERY erected on the 31st December, 1904—continued.

Chlorination.				Water Supply Plant.				Miscellaneous.									Estimated Value of Plant.		
													Coal Mining Machinery.						
Reverberatory Furnaces.	Cupelling Furnaces.	Refining Furnaces.	Assay Furnaces.	Dams and Reservoirs.	Tanks.	Condensers.	Windmills.	Rock Drills.	Fan Blasts.	Green Blowers.	Water Jackets.	Electric Light Plants.	Screens (Fixed).	Ventilating Fans and Furnaces.	Coal Cutting Machines.	Tumblers and Kickups.	State Batteries.	District.	Goldfield.
																	£	£	£
...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5,500
...	...	...	...	1	10	...	2	...	...	...	...	...	...	...	...	...	...	19,266	35,166
...	...	...	...	4	14	...	...	...	...	...	...	...	...	...	...	...	...	15,900	
...	...	1	...	3	5	...	...	...	...	...	...	...	...	...	...	...	...	...	3,500
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
...	1	1	1	1	6	2	...	2	...	...	...	3	...	...	...	...	...	...	106,242
...	...	...	...	1	3	...	...	...	...	...	...	...	...	...	...	...	5,000	...	
1	5	6	10	17	69	7	...	21	1	...	...	7	...	...	...	...	...		
...	...	1	1	...	4	...	...	...	...	...	...	...	...	...	...	...	4,000	277,485	
...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	4,000		288,591
...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	...	11,106	
...	...	...	...	...	2	...	...	...	...	...	...	...	...	...	...	...	3,500		
...	1	1	1	4	6	...	...	9	...	...	...	1	...	...	...	...	...		
...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	4,000	41,650	
...	2	4	7	4	29	26	1	9	1	...	...	1	...	...	...	...	...		
...	...	...	...	4	8	1	...	...	...	...	...	...	...	...	...	...	4,000	93,789	
...	2	3	10	5	41	18	4	58	1	1	...	1	...	...	...	...	...	277,845	485,003
...	2	7	4	2	41	3	...	12	...	...	...	2	...	...	...	...	...		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	5,000	71,719	
...	...	2	1	...	5	...	...	...	...	...	...	...	...	...	...	...	4,000		
...	2	4	3	3	12	...	1	11	...	...	...	...	...	...	...	...	...	...	30,560
...	1	5	4	2	8	5	2	43	...	...	...	4	...	...	...	...	...	163,012	
...	2	7	11	4	54	5	...	49	1	1	...	2	...	...	...	...	...		
...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	4,000	177,930	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,500		446,397
...	3	7	8	3	33	3	2	6	...	...	...	1	...	...	...	...	...		
...	2	1	1	...	4	...	...	...	...	...	...	...	...	...	...	...	4,000	105,455	
...	...	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	4,000		
...	3	9	10	14	52	29	2	44	...	...	3	5	...	...	...	...	...		
...	1	1	1	1	3	...	...	...	...	...	...	...	...	...	...	...	5,000	143,511	
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	4,000		
...	...	2	1	1	16	3	...	17	...	...	...	...	...	...	...	...	...		
...	...	...	...	...	4	1	...	...	...	...	...	...	...	...	...	...	10,000	48,150	
...	1	...	1	...	6	1	...	...	...	...	...	...	...	...	...	...	3,500		372,764
...	1	1	6	6	10	4	1	32	4	...	1	1	...	...	...	...	...		
...	1	...	4	...	3	...	...	...	...	...	...	...	...	...	...	...	4,000	148,940	
...	2	3	1	2	22	3	...	10	...	...	...	1	...	...	...	...	...		
...	...	...	...	...	5	...	...	...	...	...	...	...	...	...	...	...	2,400	32,163	
1	7	4	17	14	122	18	1	9	...	...	...	1	...	...	...	...	...	...	91,855
...	2	3	6	19	71	14	1	25	1	...	...	3	...	...	...	...	...	88,596	
...	...	...	...	...	38	5	...	3	...	...	...	...	...	...	...	...	...	16,240	105,086
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	250	
20	18	23	43	16	230	56	...	383	14	2	...	27	...	...	...	...	...	...	1,711,935
...	6	11	13	22	203	26	2	50	...	...	...	3	...	...	...	...	...		
...	...	...	1	...	2	...	...	...	...	...	...	...	...	...	...	...	5,000	220,564	256,651
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2,500		
1	2	5	4	9	77	18	1	4	...	...	...	2	...	...	...	...	...	36,087	
...	3	10	8	3	40	12	3	26	...	...	...	1	...	...	...	...	...	...	88,543
...	1	1	1	...	2	...	...	...	...	...	...	...	...	...	...	...	3,775	...	
...	2	5	3	10	60	18	4	47	1	...	1	2	...	...	...	...	...	...	101,970
1	...	3	2	1	10	1	...	...	...	...	...	...	...	...	...	...	6,000	...	
...	...	...	1	8	8	2	...	4	...	...	...	1	...	...	...	...	...	...	32,150
...	...	...	...	...	4	...	...	7	...	...	...	...	...	...	...	...	...	...	10,000
...	...	1	9	...	6	1	1	...	...	5	3	1	...	...	...	...	...	...	65,000
24	73	133	194	187	1,363	282	28	881	24	9	8	70	...	...	...	...	94,175	...	4,236,913
3	..	1	1	11	4	2	...	...	...	...	...	...	...	...	...	...	...		
...	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	2,000	57,887	...
...	...	...	2	...	2	2	...	...	...	1	1	...	...	...	...	...	6,232	6,232	...
...	...	...	...	2	3	...	...	1	...	...	...	2	8	3	4	4	...	43,948	...
3	...	1	3	14	9	4	...	1	...	1	1	2	8	3	4	4	8,232	...	108,067
27	**73**	**134**	**197**	**201**	**1,372**	**286**	**28**	**882**	**24**	**10**	**9**	**72**	**8**	**3**	**4**	**4**	**102,407**	...	**4,344,980**

TABLE XX.

Synopsis of ACCIDENTS, showing Killed and Injured, in the respective Goldfields and Mineral Fields, during 1904, together with a comparison for the previous year.

Goldfields and Mineral Fields.	Kimberley.		Pilbarra.		West Pilbarra.		Ashburton.		Gascoyne.		Peak Hill.		East Murchison.		Murchison.		Yalgoo.	
Number of Accidents.	...		...		...		...		...		3		6		15		1	
Class of Accidents.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1. By Explosives ... ... Killed	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Injured	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...
2. By Falls of Ground ... ... Killed	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2	...	...	...
Injured	...	...	...	...	...	...	...	...	...	...	...	...	...	3	...	5	...	...
3. In Shafts ... ... Killed	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	1	...
Injured	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	2	...	...
4. By Miscellaneous Underground Killed	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...
Injured	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...
5. On Surface ... ... Killed	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...
Injured	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	4	...	...
Total, 1904 ... **Killed**	...	...	...	...	...	...	...	...	...	...	1	...	2	...	3	...	1	...
Injured	...	...	...	...	...	...	...	...	...	...	...	2	...	4	...	12	...	...
Total, 1903 ... Killed	...	...	2	...	...	...	...	...	...	...	...	...	4	...	4	...	...	...
Injured	...	...	...	...	...	...	...	...	...	...	...	3	...	8	...	11	...	...
Comparison with 1903 ... Killed	...	...	-2	...	...	...	...	...	...	...	*1	...	-2	...	-1	...	*1	...
Injured	...	...	...	...	...	...	...	...	...	...	...	-1	...	-4	...	*1	...	...

Goldfields and Mineral Fields.	Mt. Margaret.		North Coolgardie.		Broad Arrow.		North-East Coolgardie.		East Coolgardie.		Coolgardie.		Yilgarn.		Dundas.		Phillips River.	
Number of Accidents.	21		18		1		6		88		10		2		4		1	
Class of Accidents.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1. By Explosives ... ... Killed	...	...	...	...	...	...	...	...	1	...	...	...	...	...	...	...	...	...
Injured	...	...	...	2	...	...	...	...	...	4	...	...	...	...	...	...	...	...
2. By Falls of Ground ... ... Killed	...	...	1	...	...	...	1	...	5	...	...	...	...	...	1	...	...	...
Injured	...	7	...	3	...	...	...	2	...	13	...	2	...	...	...	...	...	...
3. In Shafts ... ... Killed	2	...	4	...	...	...	1	...	9	...	...	...	...	...	1	...	...	...
Injured	...	5	...	4	...	...	...	7	...	16	...	5	...	...	...	...	...	...
4. By Miscellaneous Underground Killed	1	...	1	...	...	...	...	...	3	...	...	...	...	...	...	...	...	...
Injured	...	3	...	2	...	1	...	...	...	13	...	...	...	...	...	...	...	...
5. On Surface ... ... Killed	...	...	...	...	...	...	...	...	2	...	1	...	...	...	...	...	...	...
Injured	...	3	...	2	...	...	...	...	...	30	...	2	...	2	...	2	...	1
Total, 1904 ... **Killed**	3	...	6	...	...	...	2	...	20	...	1	...	...	...	2	...	...	...
Injured	...	18	...	13	...	1	...	9	...	76	...	9	...	2	...	2	...	1
Total, 1903 ... Killed	4	...	4	...	4	...	1	...	14	...	3	...	1	...	...	...	...	...
Injured	...	19	...	15	...	2	...	5	...	90	...	9	...	1	...	...	...	...
Comparison with 1903 ... Killed	-1	...	*2	...	-4	...	*1	...	*6	...	-2	...	-1	...	*2	...	–	...
Injured	...	-1	...	-2	...	-1	...	*4	...	-14	...	=	...	*1	...	*2	...	*1

Goldfields and Mineral Fields.	Donnybrook.		Mt. Margaret. (Copper.)		Northampton.		Yandanooka.		Greenbushes.		Collie.		Total. 1904.		Total. 1903.		Comparison with 1903.	
Number of Accidents.	...		...		...		...		1		4		181		206		-25	
Class of Accidents.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
1. By Explosives ... ... Killed	...	...	...	...	...	...	...	...	...	...	...	...	2	...	7	...	-5	...
Injured	...	...	...	...	...	...	...	...	...	...	...	1	...	8	...	20	...	-12
2. By Falls of Ground ... ... Killed	...	...	...	...	...	...	...	...	...	...	...	...	10	...	13	...	-3	...
Injured	...	...	...	...	...	...	...	...	...	...	...	1	...	36	...	35	...	*1
3. In Shafts ... ... Killed	...	...	...	...	...	...	...	...	1	...	...	...	20	...	9	...	*11	...
Injured	...	...	...	...	...	...	...	...	...	...	...	...	...	40	...	25	...	*15
4. By Miscellaneous Underground Killed	...	...	...	...	...	...	...	...	...	...	...	...	6	...	9	...	-3	...
Injured	...	...	...	...	...	...	...	...	...	...	...	1	...	21	...	46	...	-25
5. On Surface ... ... Killed	...	...	...	...	...	...	...	...	...	...	...	...	4	...	5	...	-1	...
Injured	...	...	...	...	...	...	...	...	...	...	...	1	...	48	...	53	...	-5
Total, 1904 ... **Killed**	...	...	...	...	...	...	...	...	1	...	...	...	42	...	...	...	...	...
Injured	...	...	...	...	...	...	...	...	...	...	...	4	...	153	...	...	...	...
Total, 1903 ... Killed	...	...	...	...	...	...	...	...	1	...	1	...	...	...	43	...	...	...
Injured	...	...	...	4	...	...	...	...	...	4	...	8	...	...	...	179	...	...
Comparison with 1903 ... Killed	...	...	–	...	...	...	...	...	–	...	-1	...	...	...	...	...	-1	...
Injured	...	...	...	-4	...	...	...	...	...	-4	...	-4	...	...	...	...	...	-26

* Represents plus.

TABLE XXI.

Deaths from Accidents in the respective Goldfields and Mineral Fields, during 1904, together with a Comparison for the previous Year.

Goldfields and Mineral Fields.	Men Employed.	By Explosives.	By Falls of Ground.				In Shafts.								By Miscellaneous Underground.									On Surface.					
			Falls of sides.	Falls of roof.	Miscellaneous.	Total Falls.	Ropes and chains breaking.	Whilst ascending or descending by machinery.	Falling into shaft from surface.	Things falling from surface.	Falling from part way down.	Things falling from part way down.	Miscellaneous.	Total in Shafts.	Suffocation.	Inhaling poisonous fumes.	Trams and trucks.	Machinery.	Ropes and chains breaking.	Falling into water.	Falling into winzes or passes.	Miscellaneous.	Total Miscellaneous underground.	By machinery.	Boilers bursting.	Railways and Tramways.	Miscellaneous.	Total on Surface.	Gross Total.
Goldfield.																													
1. Kimberley	5	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
2. Pilbarra	177	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
3. West Pilbarra	11	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
4. Ashburton	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5. Gascoyne	...	...	...	...	...	...	...	...	...	...	...	...	...	...	..	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Peak Hill	251	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
7. East Murchison	1,300	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1
8. Murchison	1,549	...	...	2	...	2	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	1	...	...	...	...	...	2
9. Yalgoo	66	...	...	...	...	...	...	...	...	...	1	...	...	1	...	...	...	...	...	...	...	...	...	1	...	...	...	1	3
10. Mt. Margaret	1,961	...	...	...	...	...	...	...	1	...	1	...	...	2	...	1	...	...	...	...	...	...	...	...	...	...	...	...	1
11. North Coolgardie	1,736	...	...	1	...	1	...	2	1	...	...	1	...	4	...	1	...	...	...	...	...	...	1	...	...	...	...	...	3
12. Broad Arrow	305	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	...	...	6
13. North East Coolgardie	682	...	...	1	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
14. East Coolgardie	6,255	1	...	5	...	5	1	8	...	...	...	...	1	9	1	1	...	...	...	...	...	...	...	...	...	...	...	...	2
15. Coolgardie	1,459	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	3	2	...	...	...	2	20
16. Yilgarn	394	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	1	...	...	...	1	1
17. Dundas	460	...	..	1	...	1	...	...	...	1	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
18. Phillips River	74	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	2
19. Donnybrook	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Goldfields generally	163	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
	16,848	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Coal — Collie River M.F.	358	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper — Mt. Malcolm D.	75	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Copper — Phillips River G.F.	94	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tin — Greenbushes M.F.	115	...	...	...	...	...	..	...	...	...	1	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Tin — Marble Bar D.	169	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Total 1904	**17,659**	**2**	...	**10**	...	**10**	**1**	**10**	**2**	**1**	**4**	**1**	**1**	**20**	**1**	**3**	...	...	...	...	**2**	...	**6**	**4**	...	...	...	**4**	**42**
Total 1903	18,219	7	1	10	2	13	1	1	1	...	...	...	6	9	2	...	...	...	...	...	4	3	9	3	...	...	2	5	43
Comparison with 1903	...	-5	-1	=	-2	-3	=	+9	+1	+1	+4	+1	-5	+11	-1	+3	...	...	...	...	-2	-3	-3	+1	...	...	-2	-1	-1

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 or under Police escort.

A circular can be obtained from the Deputy Master of the Mint giving all necessary information for intending depositors, conditions of the Escort Service, Coining Regulations, etc., etc.

An Escort Service is provided by the Police Department for parcels of all sizes. The consignor pays for the carriage by coach or train, but the escort charges are collected by the Mint.

Forms for use in connection with gold sent to the Mint by post or under Police escort can be obtained at the Mint.

The Mint charges are as follows:—

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.
48	0 10 0	420	4 7 6	1,500	11 9 2
50	0 10 5	430	4 9 7	1,600	12 1 2
60	0 12 6	440	4 11 8	1,700	12 14 8
70	0 14 7	450	4 13 9	1,800	13 6 2
80	0 16 8	460	4 15 10	1,900	13 19 8
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 2
260	2 14 2	780	6 19 2	3,700	25 4 8
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 8
390	4 1 3	1,200	9 11 8	5,000	33 6 2
400	4 3 4	1,300	10 4 2		
410	4 5 5	1,400	10 16 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 the case of metal of the value of £3 17s. 10½d. per oz.:—

Weight of Deposit.	Rate of Charge per oz.	Amount of Charge.	Net Value of Deposit.
Ounces.	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	2,230 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	1·5	64 11 8	38,872 18 4

NOTE.—From 1st July, 1905, 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 „ „ „ „
10,000ozs. upwards 4

The rate at which payment for silver is made is liable to fluctuation. The present price is 2s. 6d. an oz. fine.

GOLD ESCORT SERVICE.

Table of Rates fixed by the Commissioner of Police.

From	To	Period.	Rate per Ounce.	Remarks.
			d.	
Abbotts	Nannine	Monthly ...	1	
Australia United Mine	Malcolm	Do. ...	1½	
Burbanks	Coolgardie	Fortnightly	0½	
Burtville	Malcolm	Monthly ...	0⅞	Not less than 1,000ozs.
Do.	Laverton	Every two months	...	Actual cost: 19s. 3d.
Coolgardie	Perth	Fortnightly	0¼	On all gold for the Mint.
Cork Tree	Lawlers	Monthly ...	1	Or if escort is specially provided, cost £4 6s. 6d.
Cosmopolitan Proprietary, Ltd. ...	Kalgoorlie	Do. ...	1	
Cue	Geraldton	Do. ...	1	
Field's Find	Yalgoo	Do. ...	2	
Geraldton	Perth	Do. ...	2	
Kalgoorlie	Do.	Fortnightly	0¼	Special for Mint only.
Kanowna	Kalgoorlie	Do. ...	0¼	
Kathleen Valley	Lawlers	Monthly ...	0½	
King of the Hills	Kalgoorlie	Do. ...	2	
Laverton	Malcolm	Do. ...	0¾	Not less than 2,900ozs.
Lawlers	Leonora or Malcolm	Do. ...	1⅛	4,000ozs. to 4,500ozs.
Do.	Do. do.	Do. ...	1½	Exceeding 4,500ozs.
Leinster G.M. Co.	Lawlers	...	...	Actual cost: £2 10s. 4d.
Mt. Sir Samuel	Do.	Do. ...	0½	Not less than 1,600ozs.
Malcolm	Kalgoorlie	Do. ...	0⅛	Not less than 7,800ozs.
Morgans	Malcolm	Do. ...	0½	Not less than 4,300ozs.
Munara Gully	Nannine	Do. ...	0½	
Nannine	Cue	Do. ...	1	Under 2,000ozs.
Do.	Do.	Do. ...	0½	2,000ozs. to 3,000ozs.
Norseman	Coolgardie	Do. ...	2	
Peak Hill	Nannine	Do. ...	2½	2,000ozs. and not exceeding 2,500ozs.
Do.	Do.	Do. ...	2	2,500ozs. and not exceeding 3,000ozs.
Do.	Do.	Do. ...	1¾	Over 3,000ozs.
Ravensthorpe	Hopetoun	Do. ...	...	Under 500ozs.: Actual cost.
Do.	Do.	Do. ...	1¼	Not less than 500ozs.
Do.	Do.	Do. ...	0⅝	Not less than 1,000ozs.
Wiluna	Malcolm	Do. ...	3⅜	Not less than 2,000ozs.
Yalgoo	Geraldton	Do. ...	0½	
Yerilla	Kalgoorlie	Do. ...	1½	

Rates for carriage of gold on Government Railways :—

	Distance not over—							
	25 miles.	50 miles.	100 miles.	150 miles.	200 miles.	250 miles.	300 miles.	350 miles.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Gold dust and bullion per 100ozs. ...	1 0	2 0	3 0	3 9	4 6	5 0	5 6	6 0

6d. per 100ozs. for every additional 50 miles, or part thereof.

NOTE.—A special reduction of 25 per cent. is made for all gold dust or bullion consigned to the Perth Mint.

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
3792·8
26200
23705
2495

·805 × £3 17s. 10½d. =
·805 × £3·894
·805
19470
311520
£3·134(670)
20
s. 2·680
12
d. 8·160 = £3 2s. 8d., value per ounce of gold as produced from the mine.

J. F. CAMPBELL,
Deputy Master.

1st July, 1905.

By Authority: A. Curtis, Acting Government Printer, Perth.