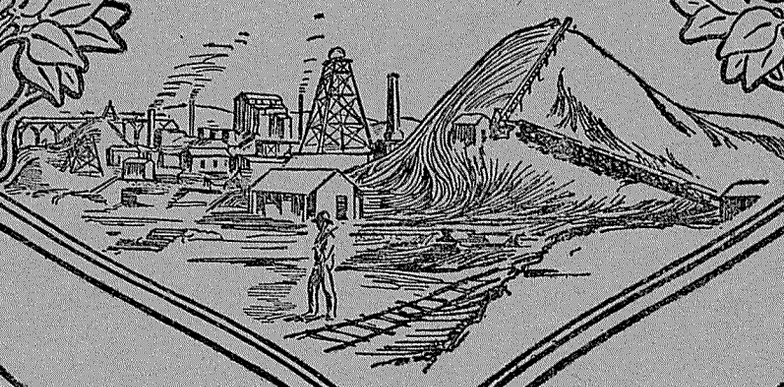
STATE MINING ENGINEER

REPORT
OF THE
DEPARTMENT OF MINES
FOR THE YEAR
WESTERN · 1943. · AUSTRALIA



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

1944.

—

WESTERN AUSTRALIA.

REPORT

of the

Department of Mines

FOR THE YEAR

1943

PERTH :
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ANNUAL REPORT OF THE DEPARTMENT OF MINES, WESTERN AUSTRALIA, 1943.

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STATE OF WESTERN AUSTRALIA.

Report of the Department of Mines for the State of Western Australia for the Year 1943.

To the Hon. Minister for Mines.

Sir,—I have the honour to submit the Annual Report of the Department for the year 1943, together with reports from the officers controlling Sub-departments, and comparative tables furnishing statistics relative to the Mining Industry.

I have, etc.,
A. H. TELFER,
Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1944.

Division I.

The Hon. Minister for Mines,—

I have the honour to submit, for your information, a report on the Mining Industry, for the year 1943.

The estimated value of the mineral output of the State for the year was £2,996,152 (calculating gold at £4 4s. 11.45d. per fine ounce); a decrease in value of £1,250,838 compared with the preceding twelve months. The estimated value of the premium paid to gold producers amounted to £A3,389,389, bringing the gross value of all minerals up to £A6,385,541, a decrease of £3,124,105 in Australian currency, compared with the 1942 production.

There were increases in the quantities and values of asbestos, bentonite, beryl, bismuth, clays, diatomaceous earth, glass sand, graphite, lead ore, mica, pyrites, red ochre, talc, tantalite, tungsten (scheelite), vermiculite. There was an increase in the value of coal, but a decrease in quantity. Decreased quantities and values of antimony, arsenic, copper ore, emery, felspar, glauconite, gypsum, iron ore, magnesite, soapstone, tin, tungsten (wolfram), and silver were reported.

The estimated value of gold received at the Perth branch of the Royal Mint and exported in gold bearing material was £A5,710,668 (and equalled 89.43 per cent. of all minerals). (See footnote to Table 1, Part II.)

Other minerals realised:—Coal, £489,721; Antimony, £41,676; Arsenic, £47,943; Asbestos, £12,975; Bentonite, £337; Beryl, £16,009; Bismuth, £137; Clays, £1,387; Copper Ore, £33; Diatomaceous Earth, £640; Felspar, £6,924; Glass Sand, £304; Glauconite, £2,450; Graphite, £55; Gypsum, £880; Iron Ore, £128; Lead Ore, £1,100; Mica, £715; Pyrites, £19,078; Red Ochre, £3,866; Talc, £170; Tantalite, £6,338; Tin, £1,833; Tungsten (Scheelite), £2,664; Tungsten (Wolfram), £18; Vermiculite, £2,117, and Silver, £15,375.

Dividends paid by mining companies amounted to £590,046, being an increase of £166,334, when compared with 1942. (See Table 6 of Part II.)

To the end of 1943, the total amount distributed by gold mining companies in dividends was £40,429,949. To the same date the value of the mineral production amounted to £228,088,903, of which the gold production accounted for £209,340,969, based on normal values; but premiums on sale of gold during 1920-24 and since 1930, and payments under the Gold Bounty Act, 1930, increased the total value of gold and mineral productions by £57,206,615.

GOLD.

The quantity of gold reported as being received at the Perth branch of the Royal Mint (540,067.08 fine ounces), together with that contained in bullion, concentrates and other gold bearing materials exported for treatment (6,408.34 fine ounces) totalled 546,475.42 fine ounces, and failed to equal that of 1942 by 301,705.03 fine ounces (*vide* Table 1, Part II.)

On the other hand, the total gold yield for the year, reported directly to the Department by the producers, was 531,747 fine ounces, which was a decrease of 314,025 fine ounces, in comparison with the previous year's figures (*vide* Table 3 of Part II.)

The non-collation of the two totals, mentioned above, is principally due to the fact that the gold reported as being received at the Mint and exported for treatment, is not all necessarily produced during the calendar year under review, a certain quantity being in the transitory or near transitory stage from the producer at the end of the year. Then again, unfortunately, a small percentage of the production is not reported to the Department, despite a strict surveillance. For these and other reasons, the former total is accepted as the official production of the State, whilst the latter is utilised in tracing the gold back to its source.

The calculated average value per ton of ore treated in the State as a whole declined from 22.275 shillings per ton in 1942 to 22.036 shillings per ton in 1943, calculated at the rate of £4 4s. 11.45d. per fine ounce, but the averaged premium obtained for gold during the twelve months (146.01 per cent) would more than double this estimate. For the East Coolgardie Goldfield (which produced approximately 54.89 per cent. of the State's reported yield of gold) the calculated average value of ore treated, decreased from 25.70 shillings per ton to 24.80 shillings per ton. The estimates for the East Murchison (Wiluna Gold Mines), Mt. Margaret (Sons of Gwalia, Ltd.) and Dundas Goldfields (Norseman Gold Mines, and Central Norseman Gold Corporation) were 11.31s. (12.93s.), 31.05s. (31.45s.), 25.36s. (30.66s.), respectively; 1942 figures are shown in parentheses.

The tonnage of ore reported to have been treated in 1943, viz., 2,051,011 tons was 2,240,698 tons less than the record tonnage in 1940.

Decreased tonnages were reported from the various goldfields as follows:—Kimberley, 409; Pilbara, 3,123; Ashburton, 40; Peak Hill, 375; East Murchison, 92,606;

Murchison, 408,428; Yalgoo, 2,585; Mt. Margaret, 53,766; North Coolgardie, 45,073; Broad Arrow, 10,341; North-East Coolgardie, 1,382; East Coolgardie, 406,617; Coolgardie, 40,638; Yilgarn, 71,801; Dundas, 36,499; Phillips River, 370; Outside Proclaimed Goldfields, 642.

MINING GENERALLY—GOLD.

The gold yield for 1943, as forecast in my last annual report is considerably less than in 1942.

The full effects of the war, particularly the conscription of manpower for direct war purposes, are now being experienced, and I anticipate a further gradual falling-off in production of gold until the day arrives when the satisfactory progress of the war will permit of renewed activity in industries other than strategic ores.

The figure of employment is still fairly stable around 4,500, and it is not expected that any further reduction will occur, unless, of course, most exceptional circumstances arise. This figure does not, however, permit of any development work being undertaken—hence the falling-off in output.

Stocks of mining stores, after four years of war, are much below normal, but I am happy to say that the Commonwealth Authorities in urgent cases have authorised the importation of same. A recent case in point was that of cyanide.

Since my last report, some further mines have been forced through manpower shortages to close down. It is most regrettable that, after having struggled on through four years of war, they have had to give in when times appear to be improving.

However, the manpower released by such closures will materially assist other short-staffed properties, and I am hopeful that the remainder of our big producers will be able to continue operations throughout the war period.

As stated in my last report, employing mines which have been forced to cease operations on account of war causes are being maintained by Government funds in such a state as will enable them to re-open without any great delay once sufficient manpower is offering. The amount of expenditure incurred on such maintenance during 1943 totalled £31,985.

The work being done in this regard includes care of machinery, unwatering operations, safety timbering underground, and in some cases repairs to houses owned by employees who have enlisted or been called up.

GOLD TAX.

The total gold tax collections from Western Australia since the Act came into force in 1939 until 31/12/1943 amounts to £2,808,113 6s. 10d., made up as follows:—

	£	s.	d.
Total to 31/12/1940	926,907	15	1
Year ended 31/12/1941	869,990	17	10
Year ended 31/12/1942	616,879	4	9
Year ended 31/12/1943	394,335	9	2
	£2,808,113	6	10

The amounts refunded to prospectors and low grade producers over the same period totals £435,236 12s. 2d.

Thus notwithstanding its very humble war-time priority rating the goldmining industry must occupy an exceedingly high place on the list of war-time tax contributors.

MINERALS.

Our programme of development of strategic minerals for the war effort has progressed very satisfactorily and a considerable production particularly of beryl, tantalite, mica, arsenic and antimony is taking place.

The Commonwealth Government has supplied substantial sums for the development of the Wodgina and Greenbushes tantalite mines, the Yinnietharra mica and beryl property, the Nullagine antimony mine, and the Edna May wolfram project, and I am very hopeful that these properties will remain as post-war producers. Pyrite, the source of sulphuric acid, with State financial assistance is being produced in considerable quantity from Norseman and is being used by the West Australian Companies in the manufacture of superphosphate. It replaces the pre-war imports of sulphur now unobtainable.

Phosphate from the Abrolhos Islands is also now being regularly produced by the British Phosphate Commission, and is additional to the State's general quota of superphosphate, while the Government mine at Campion supplies alunite from which its treatment works extracts potash.

A wide variety of other minerals is being produced as will be noted from the earlier part of this report.

The blue asbestos deposits in the Hamersley Ranges are being well developed by two substantial Companies, and there appears but little doubt that blue asbestos will figure as one of our main mineral products in the near future.

STRATEGIC MINERAL PROJECTS.

As Deputy in this State to the Commonwealth Controller of Minerals I have had to control the activities of several strategic mineral projects mentioned as being operated under Commonwealth funds. Competent managers and men have, of course, been engaged for the field operations but the Departmental staff has been used for all purchasing of food, stores, machinery, timber, etc., and the engagement of workmen, while we have also assayed all production and arranged shipment and despatch of same to the various required destinations. This has entailed a very great deal of work.

The expenditure incurred during the year 1943 on such projects including several private mines which are being financed in regard to the production of strategics totals £81,000. This will give some idea of the scale of operations and the work entailed. It is work quite foreign to the ordinary peace-time activities of the Department and members of the staff particularly concerned with it are to be congratulated on the results obtained which have already been of great benefit to our own and our Allies' war efforts.

COAL.

For various reasons the coal output in 1943 was below that of 1942. The new Wyvern Colliery and the Stockton Opencut which were specially sponsored by the Department in an effort to provide additional coal to meet the deficiency, came into production towards the end of 1943, and unless unexpected setbacks occur, Collie should in 1944 meet all calls made upon it for coal.

At Eradu, the Department is sinking a shaft on the coal deposit to ascertain its economic value. If results are satisfactory, Northern Railway requirements may ultimately be supplied from this seam.

MINING DEVELOPMENT ACT.

The expenditure incurred in rendering assistance to mine owners and the industry generally under the provisions of this Act totalled £6,240 12s. 8d., and in the preceding year £10,413 4s. 7d.

PART II.—MINERALS.

§ TABLE 1.—*Quantity and Value of Minerals produced and/or exported during Years* 1942 *and* 1943.

Description of Minerals.	1942.		1943.		Increase or Decrease for Year compared with 1942.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Statute tons.	£A.	Statute tons.	£A.	Statute tons.	£A.
Antimonial Concentrates (reported)	2,383	†64,708	1,127	41,676	— 1,256	— 23,032
Arsenic (reported)	2,727	57,267	2,283	47,943	— 444	— 9,324
Asbestos — Crocidolite (reported)	84	4,949	181	10,090	+ 97	+ 5,141
Asbestos — Chrysotile (reported)	11	550	53	2,798	+ 42	+ 2,248
Asbestos — Anthophyllite (reported)	24	289	9	87	— 15	— 202
Bentonite (reported)	16	33	159	337	+ 143	+ 304
Beryl (reported)	*Nil*	*Nil*	548	16,009	+ 548	+ 16,009
	lbs.		lbs.		lbs.	
Bismuth Concentrates (reported)	*Nil*	*Nil*	560	137	+ 560	+ 137
	tons.		tons.		tons.	
Clays (reported)	798	449	2,112	1,387	+ 1,314	+ 938
Coal (raised)	581,176	461,495	531,546	489,721	— 49,630	+ 28,226
Copper Ore (reported)	48	738	1	33	— 47	— 705
Diatomaceous Earth (reported)	*Nil*	*Nil*	40	640	+ 40	+ 640
Emery (reported)	13	130	*Nil*	*Nil*	— 13	— 130
Felspar (reported)	3,252	9,734	2,314	6,924	— 938	— 2,810
Glass Sand (reported)	111	141	340	304	+ 229	+ 163
Glauconite (reported)	260	6,500	98	2,450	— 162	— 4,050
Graphite (reported)	6	30	11	55	+ 5	+ 25
Gypsum (reported)	2,878	3,136	935	880	— 1,943	— 2,256
Iron Ore (reported)	150	225	84	128	— 66	— 97
Lead Ore (reported)	*Nil*	*Nil*	*1,250	*1,100	+ 1,250	+ 1,100
Magnesite (reported)	25	100	*Nil*	*Nil*	— 25	— 100
	lbs.		lbs.		lbs.	
Mica (reported)	389	115	13,908	715	+ 13,519	+ 600
	tons.		tons.		tons.	
Pyrites (reported)	368	607	10,189	19,078	+ 9,821	+ 18,471
Red Ochre (reported)	143	1,360	397	3,866	+ 254	+ 2,506
Soapstone (reported)	265	†975	*Nil*	*Nil*	— 265	— 975
Talc (reported)	38	57	73	170	+ 35	+ 113
Tantalite (reported)	1	471	6	6,338	+ 5	+ 5,867
Tin (reported)	23	4,634	9	1,833	— 14	— 2,801
	units.		units.		units.	
Tungsten Ore — Scheelite (reported)	†68	357	513	2,664	+ 445	+ 2,307
Tungsten Ore — Wolfram (reported)	21	115	3	18	— 18	— 97
	tons.		tons.		tons.	
Vermiculite (reported)	178	1,070	363	2,117	+ 185	+ 1,047
	fine ozs.		fine ozs.		fine ozs.	
Gold (exported and minted)	848,180	8,865,495	546,475	5,710,668	— 301,705	—3,154,827
Silver (exported)	188,421	23,916	118,803	15,375	— 69,618	— 8,541
	...	9,509,646	...	6,385,541	...	—3,124,105

Included in the Value of Gold shown are the following estimated premiums :—1942, £A5,262,656 ; 1943, £A3,389,389.

* Including 1,000 tons valued at £900 late reported as produced during 1941. † Amended figure. § As export information is not available under war conditions, reported figures are used for minerals other than gold and silver.

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

Year.	Total Exports.	Mineral Exports (exclusive of Coal).	Percentage.
INFORMATION NOT AVAILABLE UNDER WAR CONDITIONS.			

Table 3.

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

Goldfield.	Reported Yield.		Percentage for each Goldfield.		Average Value per ton of Ore Treated. (Gold at £4 4s. 11·45d. per fine oz.)	
	1942.	1943.	1942.	1943.	1942.	1943.
	fine ozs.	fine ozs.	%	%	shillings.	shillings.
1. Kimberley	968	326	·114	·061	95·252	60·949
2. Pilbara	16,901	15,759	1·998	2·964	71·601	79·117
3. Ashburton	78	45	·009	·008	88·649	108·338
4. Gascoyne	...	...	...	...	...	...
5. Peak Hill	352	480	·042	·090	38·389	*100·912
6. East Murchison	106,922	81,190	12·642	15·268	12·927	11·312
7. Murchison	86,447	25,336	10·221	4·765	15·324	30·409
8. Yalgoo	3,598	1,288	·425	·242	57·608	40·221
9. Mt. Margaret	49,064	28,773	5·801	5·411	31·448	31·045
10. North Coolgardie	18,970	8,412	2·243	1·582	27·311	51·301
11. Broad Arrow	9,480	6,455	1·121	1·214	28·533	30·683
12. North-East Coolgardie	847	705	·100	·133	42·826	*201·136
13. East Coolgardie	425,614	291,896	50·323	54·894	25·697	24·799
14. Coolgardie	28,508	15,244	3·371	2·867	23·299	20·466
15. Yilgarn	34,522	14,961	4·082	2·813	26·614	33·118
16. Dundas	62,444	40,737	7·383	7·661	30·663	25·365
17. Phillips River	709	57	·084	·011	151·626	*180·420
18. Outside Proclaimed Goldfield ...	348	84	·041	·016	46·050	...
Totals and Averages	845,772	531,748	100·000	100·000	22·275	22·036

* Principally from Sands.

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

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

Table 4.

Average Quantities of Gold Ore raised and treated, and Gold produced therefrom, per man employed on the several Goldfields of the State, during 1942, *and* 1943.

Goldfield.	1942.				1943.			
	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	107·94	61·68	121·02	69·16	151·67	75·83	108·75	54·38
2. Pilbara	339·81	117·27	286·46	98·84	423·27	114·40	393·97	106·48
3. Ashburton	9·31	4·38	9·72	4·57	11·67	4·38	14·87	5·58
4. Gascoyne	...	...	...	...	...	...	...	...
5. Peak Hill	77·88	31·15	35·19	14·08	40·40	17·57	47·96	20·85
6. East Murchison	1,439·87	793·97	219·10	120·82	1,487·94	812·32	198·02	108·11
7. Murchison	1,017·51	547·09	183·54	98·68	409·36	209·52	146·45	74·96
8. Yalgoo	102·05	46·96	69·20	31·84	136·09	71·62	64·40	33·89
9. Mt. Margaret	365·13	199·31	135·16	73·78	414·61	214·65	151·43	78·40
10. North Coolgardie	404·18	184·41	129·93	59·28	217·78	96·79	131·44	58·42
11. Broad Arrow	243·31	119·60	81·72	40·17	372·56	173·62	134·49	62·67
12. North-East Coolgardie ...	104·98	41·99	52·92	21·17	42·54	17·51	100·65	41·45
13. East Coolgardie	887·18	485·03	268·36	146·71	933·26	476·18	272·29	138·93
14. Coolgardie	340·82	177·69	93·47	48·73	430·69	206·90	103·70	49·82
15. Yilgarn	329·93	178·89	103·36	56·04	254·28	136·16	99·08	53·05
16. Dundas	570·98	324·59	206·09	117·16	580·89	284·39	173·35	84·87
17. Phillips River	44·11	18·90	78·73	33·74	9·00	3·00	19·10	6·37
18. Outside Proclaimed Goldfields	128·40	42·80	69·60	23·20	...	...	41·77	10·44
Total Averages ...	753·85	401·56	197·66	105·29	791·60	403·82	205·22	104·70

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 1943.

FIG. 1.

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

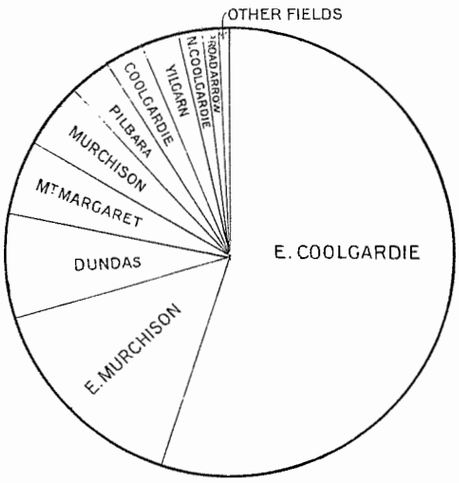


FIG. 2.

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

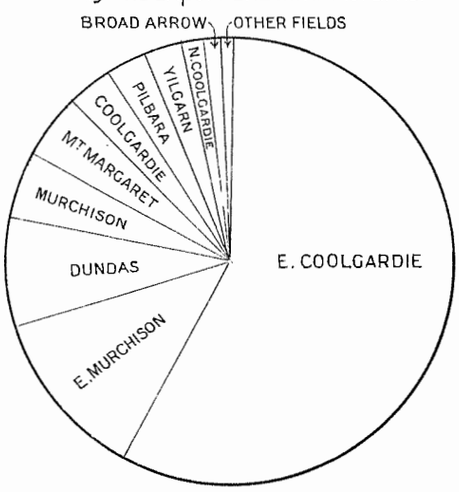


FIG. 3.

Value of Gold and other Minerals.

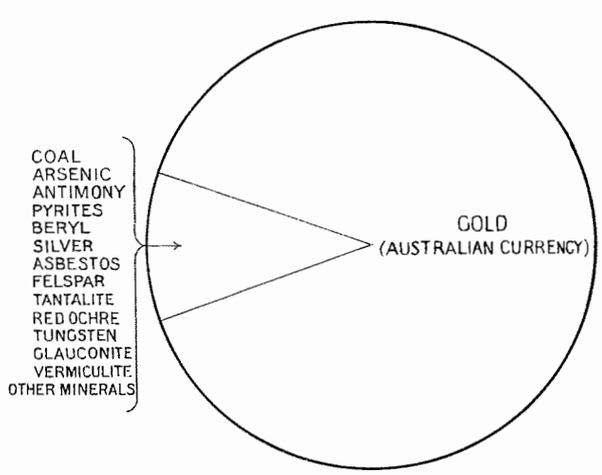


FIG. 4.

Value of Minerals other than Gold.

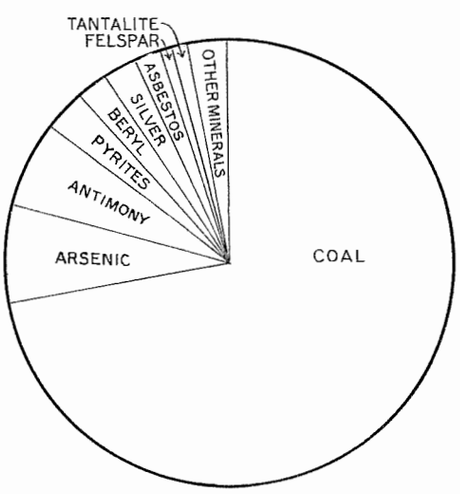


FIG. 5.

Areas of land leased for Goldmining on various Goldfields.

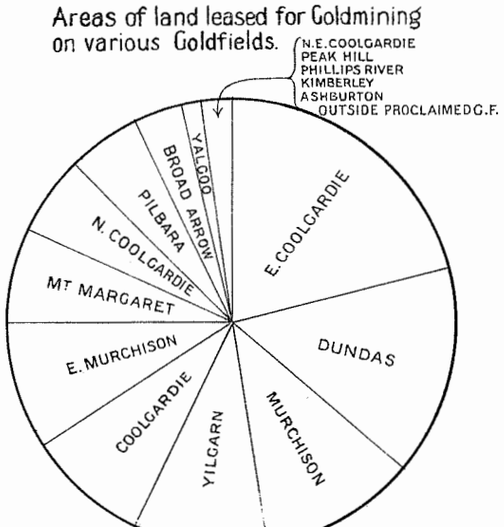


FIG. 6.

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

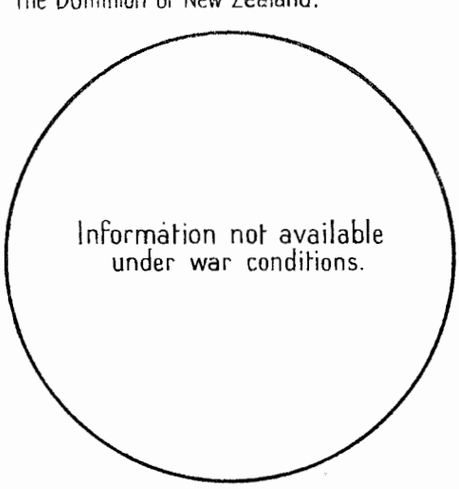


DIAGRAM OF GOLD OUTPUT

Showing Tonnage Treated (as reported to Mines Dept.); the Total Output of Gold Bullion, Concentrates etc., entered for export and received at the Perth Mint, and the Estimated Value thereof, in Australian Currency.

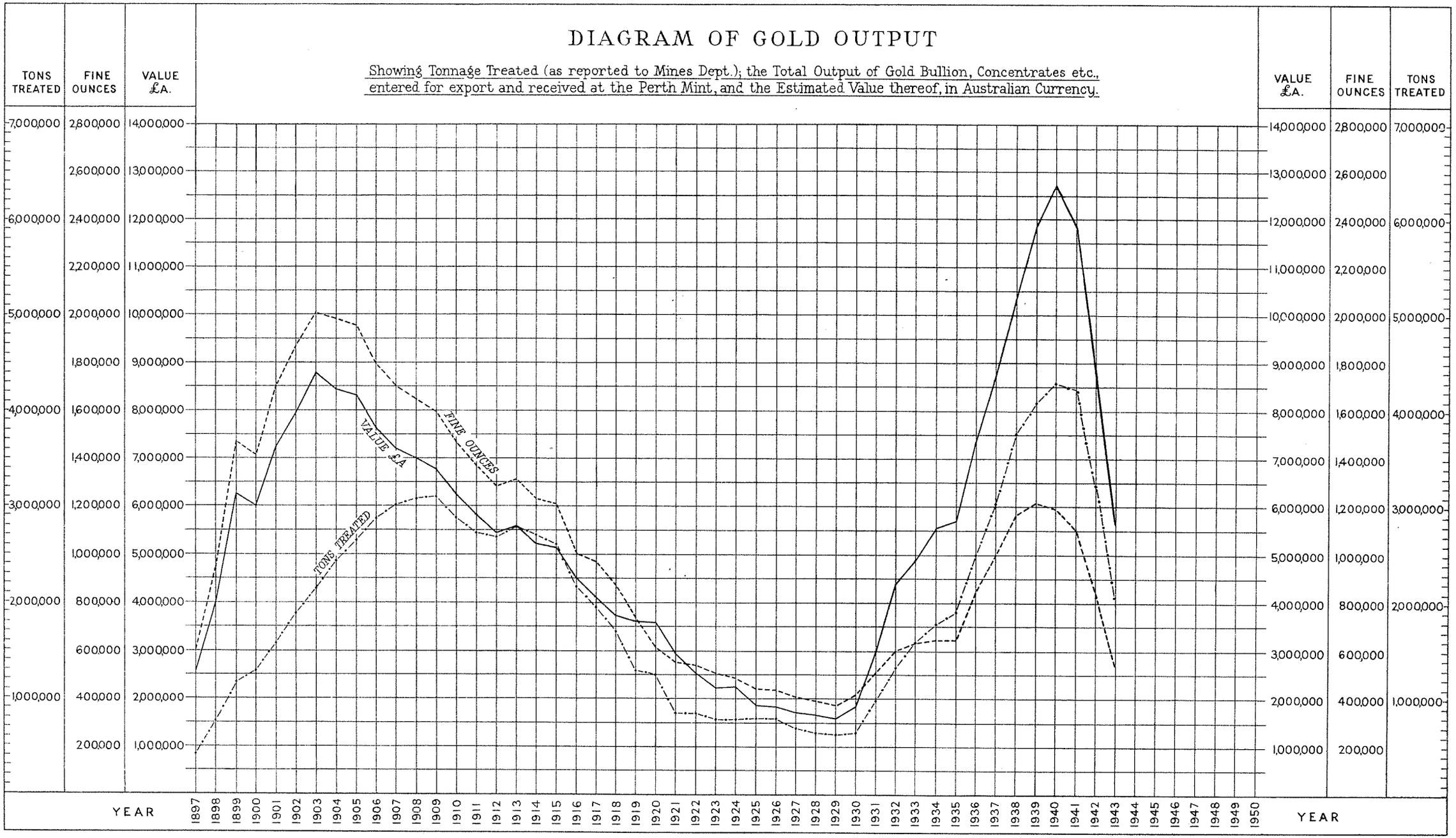
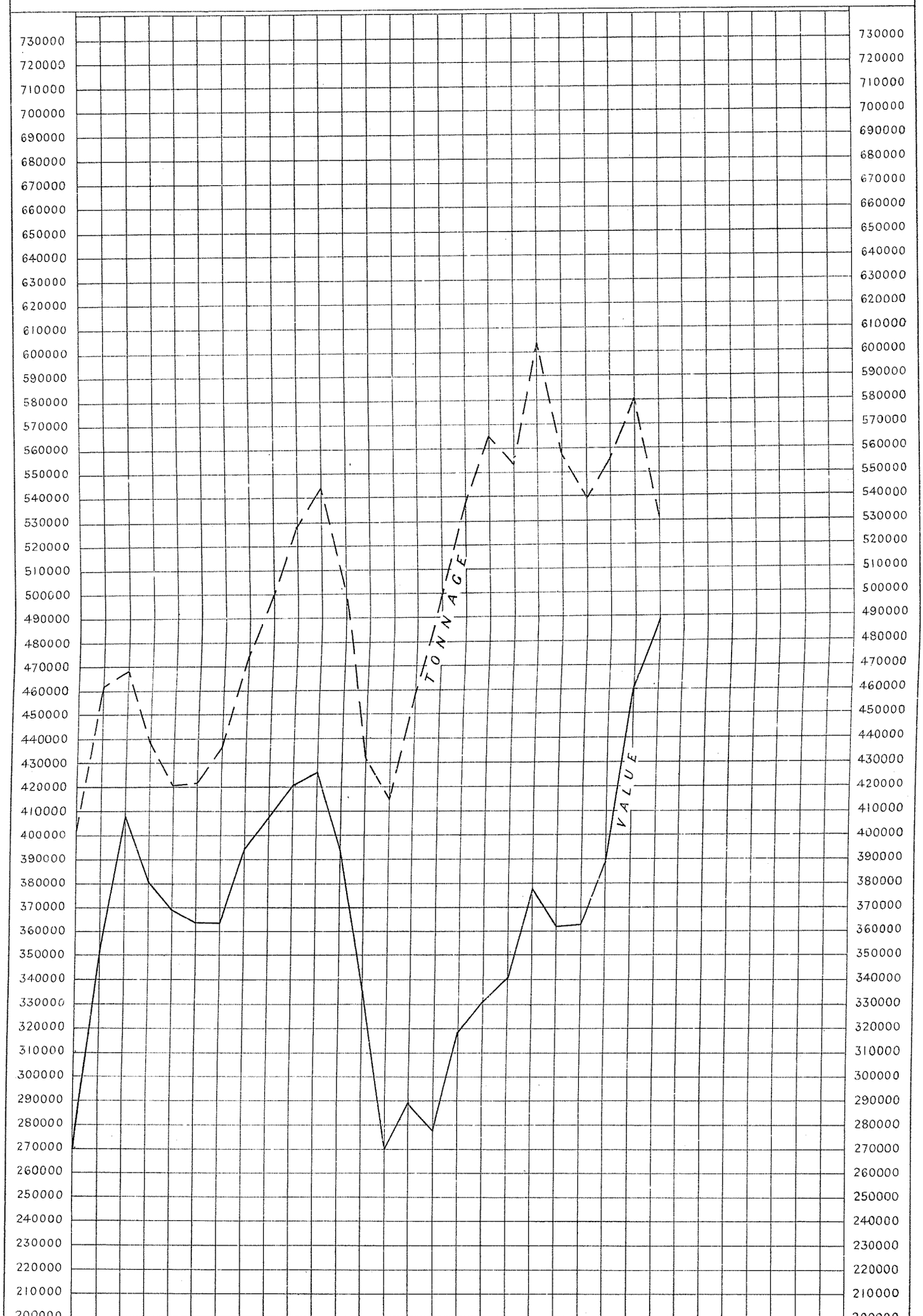


DIAGRAM OF COAL OUTPUT

Showing Quantities and Values as reported to Mines Dept. from 1919 onwards



YEAR	1919	1920	1921	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	1946	1947	1948	1949	1950	1951	YEAR
£ VALUE	270355	350346	407117	381555	368949	363255	363203	394400	407967	420145	426706	394758	336178	270630	289806	278704	318013	331565	340444	375083	362811	364500	389278	461495	489721									£ VALUE
TONS	401713	462021	468817	438443	420714	421864	437461	474819	501505	528420	544719	501425	432400	415719	458399	500343	537188	565075	553510	604793	557535	539427	556574	581176	531546									TONS

TABLE 5.

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

——	Output of Gold.	Value.	Percentage of Total.	
			Output of Commonwealth.	Output of Australasia.
INFORMATION NOT AVAILABLE UNDER WAR CONDITIONS.				

TABLE 6.

Dividends, etc., paid by Western Australian Mining Companies during 1943, *and the Total to date.*

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

Goldfield.	Name of Company.	Dividends Paid.	
		1943.	Grand Total to end of 1943.
		£	£
Pilbara	Various Companies	...	26,513
Peak Hill	do. do.	...	199,305
East Murchison	do. do.	...	1,914,053
Murchison	Hill 50 Gold Mine, N.L.	18,750	137,501
	Various Companies	...	2,674,945
Mt. Margaret	Sons of Gwalia, Limited	32,500	1,900,363
	Western Mining Corporation, Ltd.	16,242	67,547
	Various Companies	...	777,047
North Coolgardie	First Hit (1934) G.M's., N.L.	9,322	93,219
	Various Companies	...	614,671
Broad Arrow	do. do.	...	92,500
North-East Coolgardie	do. do.	...	(*a*) 129,493
East Coolgardie	Boulder Perseverance, Ltd.	44,964	(*e*) 2,384,060
	Gold Mines of Kalgoorlie, Ltd.	30,500	266,875
	Kalgoorlie Enterprise Mines, Ltd.	44,000	(*b*) 210,375
	Lake View & Star, Ltd.	210,000	(*e*) 2,989,500
	North Kalgurli (1912), Ltd.	55,000	790,000
	Paringa Mining and Exploration Co., Ltd. ...	28,976	(*c*) 164,735
	South Kalgurli Consolidated, Ltd.	19,792	1,075,942
	Various Companies	...	(*d*) 21,460,817
Coolgardie	do. do.	...	388,770
Yilgarn	do. do.	...	1,205,556
Dundas	Central Norseman Gold Corporation	80,000	80,000
	Various Companies	...	786,162
	Totals	590,046	40,429,949

(*a*) Also £45,091 in bonuses and profit-sharing notes in years 1935–36. (*b*) Also £42,000 in bonuses and profit-sharing notes in year 1934. (*c*) Also £75,000 in bonuses and profit-sharing notes and £93,750 Capital returned in years 1932–35. (*d*) Also £55,000 Capital returned in year 1932 by Golden Horseshoe (New), Ltd. (*e*) Totals of previous years revised.

TABLE 7.

Quantity and Value of Minerals, other than Gold, reported to the Mines Department during 1943.

Goldfield District or Mineral Field.	1943.		Increase or Decrease as compared with 1942.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£A.	tons.	£A.
ANTIMONY—				
East Murchison (Wiluna)	1,127	41,676	— 1,243	— 22,863
Pilbara (Nullagine)	*Nil*	*Nil*	— 13	+ 169
ARSENIC—				
East Murchison (Wiluna)	2,283	47,943	— 444	— 9,324
ASBESTOS (Crocidolite)—				
Outside Proclaimed Goldfield	181	10,090	+ 107	+ 5,641
Pilbara	*Nil*	*Nil*	— 10	— 500
ASBESTOS (Crysotile)—				
Pilbara	16	816	+ 16	+ 816
Outside Proclaimed Goldfield	37	1,982	+ 26	+ 1,432
ASBESTOS (Anthophyllite)—				
Outside Proclaimed Goldfield	9	87	— 15	— 202
BENTONITE—				
Outside Proclaimed Goldfield	159	337	+ 143	+ 304
BERYL—				
Pilbara	507	14,741	+ 507	+ 14,741
Outside Proclaimed Goldfield	41	1,268	+ 41	+ 1,268
	lbs.		lbs.	
BISMUTH—				
Outside Proclaimed Goldfield	560	137	+ 560	+ 137
	tons.	tons.	tons.	tons.
CLAYS—				
Outside Proclaimed Goldfield	2,112	1,387	+ 1,314	+ 938
COAL—				
Collie	531,546	489,721	— 49,630	+ 28,226
COPPER ORE—				
East Murchison	1	33	— 9	— 119
Peak Hill	*Nil*	*Nil*	— 13	— 268
Phillips River	*Nil*	*Nil*	— 9	— 241
Yilgarn	*Nil*	*Nil*	— 16	— 77
DIATOMACEOUS EARTH—				
Outside Proclaimed Goldfield	40	640	+ 40	+ 640
EMERY—				
Outside Proclaimed Goldfield	*Nil*	*Nil*	— 13	— 130
FELSPAR—				
Coolgardie	2,289	6,867	— 952	— 2,845
Outside Proclaimed Goldfield	25	57	+ 14	+ 35
GLASS SAND—				
Outside Proclaimed Goldfield	340	304	+ 229	+ 163
GLAUCONITE—				
Outside Proclaimed Goldfield	98	2,450	— 162	— 4,050
GRAPHITE—				
Outside Proclaimed Goldfield	11	55	+ 5	+ 25
GYPSUM—				
Outside Proclaimed Goldfield	935	880	— 1,943	— 2,256
IRON ORE—				
Outside Proclaimed Goldfield	84	128	— 66	— 97
LEAD ORE—				
Northampton	*1,250	*1,100	+ 1,250	+ 1,100
MAGNESITE—				
Coolgardie	*Nil*	*Nil*	— 25	— 100
	lbs.		lbs.	
MICA—				
Outside Proclaimed Goldfield	13,908	715	+ 13,519	+ 600

* Concentrates.

TABLE 7—*continued.*

Quantity and Value of Minerals, other than Gold, reported to the Mines Department during 1943—*continued.*

Goldfield District or Mineral Field.	1943.		Increase or Decrease as compared with 1942.	
	Quantity.	Value.	Quantity.	Value.
	tons.	£A.	tons.	£A.
PYRITES—				
Dundas	10,189	19,078	+ 9,821	+ 18,471
RED OCHRE—				
East Coolgardie	15	46	+ 15	+ 46
Outside Proclaimed Goldfield	382	3,820	+ 139	+ 2,460
SOAPSTONE—				
Greenbushes	*Nil*	*Nil*	— 10	— 25
Outside Proclaimed Goldfield	*Nil*	*Nil*	— 255	— 950
TALC—				
East Coolgardie	73	170	+ 35	+ 113
TANTALITE—				
Greenbushes	5	6,319	+ 5	+ 6,319
Pilbara	1	19	+ 1	+ 19
TIN—				
East Murchison	1	53	+ 1	+ 53
Greenbushes	3	615	— 10	— 1,754
Kimberley	1	143	+ 1	+ 143
Pilbara	5	1,022	— 6	— 1,243
TUNGSTEN (Scheelite)—	units.		units.	
Coolgardie	282	1,540	+ 244	+ 1,219
Dundas	2	9	+ 2	+ 9
North Coolgardie	7	24	— 3	— 11
Yalgoo	194	1,050	+ 194	+ 1,050
Yilgarn	8	41	+ 8	+ 41
TUNGSTEN (Wolfram)—				
Broad Arrow	*Nil*	*Nil*	— 16	— 88
Yalgoo	3	18	— 2	— 9
VERMICULITE—	tons.		tons.	
Yilgarn	20	60	+ 20	+ 60
Outside Proclaimed Goldfield	343	2,057	+ 165	+ 987

TABLE 8.

Quantity of Coal raised during 1942 *and* 1943 *estimated Value thereof, Number of Men employed, and Output per Man.*

Coalfield.	Year.	Quantity raised.	Estimated Value.	Men Employed.		Quantity Raised.	
				Above ground.	Under ground.	Per Man employed under ground.	Per Man employed above and under ground.
		tons.	£			tons.	tons.
Collie	1942	581,176	461,495	175	647	898	707
	1943	**531,546**	**489,721**	**188**	**650**	**818**	**634**

The quantity of coal raised during the year 1943 showed a decrease amounting to 49,630 tons, but an increase in value of £28,226. The average number of men employed increased by 16, but the number of tons raised per man employed showed a decrease of 73 tons when compared with figures for 1942.

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

TABLE 9.

Total Number and Acreage of Leases, Mineral Claims, and Prospecting Areas held for Mining on 31st December, 1942 and 1943.

	1942.		1943.	
	No.	Acreage.	No.	Acreage.
Gold Mining Leases on Crown Land	1,327	22,041	1,263	21,167
Gold Mining Leases on Private Property	3	72	3	72
Mineral Leases on Crown Land	172	38,573	167	38,436
Mineral Claims	116	6,495	133	7,927
Prospecting Areas	*453	7,128	†343	5,737
Totals	2,071	74,309	1,909	73,339

* Includes 44 Prospecting Areas for Minerals of a total of 1,277 acres.

† Includes 47 Prospecting Areas for Minerals of a total of 1,193 acres.

PART IV.—MEN EMPLOYED.

TABLE 10.

Average number of Men reported as engaged in Mining during 1942 *and* 1943.

Goldfield.	District.	Reef or Lode.		Alluvial.		Total.	
		1942.	1943.	1942.	1943.	1942.	1943.
Kimberley	...	14	6	...	...	14	6
Pilbara	Marble Bar	133	111	1	...	134	111
	Nullagine	38	37	1	...	39	37
Ashburton	...	17	8	...	...	17	8
Gascoyne	...	...	...	...	...	...	...
Peak Hill	...	25	23	1	...	26	23
East Murchison	Lawlers	125	94	...	...	125	94
	Wiluna	689	641	...	...	689	641
	Black Range	70	16	...	...	70	16
Murchison	Cue	509	107	2	...	511	107
	Meekatharra	124	90	1	...	125	90
	Day Dawn	38	21	1	...	39	21
	Mt. Magnet	205	120	3	...	208	120
Yalgoo	...	113	38	...	...	113	38
Mt. Margaret	Mt. Morgans	214	63	...	...	214	63
	Mt. Malcolm	327	263	...	...	327	263
	Mt. Margaret	125	41	...	...	125	41
North Coolgardie	Menzies	143	84	5	2	148	86
	Ularring	56	26	2	1	58	27
	Niagara	27	10	...	...	27	10
	Yerilla	95	20	2	1	97	21
Broad Arrow	...	235	98	11	5	246	103
North-East Coolgardie	Kanowna	30	9	4	1	34	10
	Kurnalpi	11	6	3	1	14	7
East Coolgardie	East Coolgardie	2,877	2,076	25	17	2,902	2,093
	Bulong	23	7	1	1	24	8
Coolgardie	Coolgardie	537	289	20	2	557	291
	Kunanalling	48	15	6	...	54	15
Yilgarn	...	616	282	1	...	617	282
Dundas	...	533	430	...	...	533	430
Phillips River	...	21	9	...	...	21	9
State Generally	...	15	8	...	...	15	8
Total—Gold Mining	...	8,033	5,048	90	31	8,123	5,079
MINERALS OTHER THAN GOLD.							
Alunite	...	46	69	...	...	46	69
Arsenic	...	23	23	...	...	23	23
Asbestos	...	15	56	...	...	15	56
Bentonite	...	1	1	...	...	1	1
Beryl	...	1	21	...	...	1	21
Bismuth	...	...	1	...	...	...	1
Clays	...	5	5	...	...	5	5
Coal	...	822	838	...	...	822	838
Copper Ore	...	5	1	...	...	5	1
Felspar	...	6	9	...	...	6	9
Glass Sand	...	1	1	...	...	1	1
Glauconite	...	3	2	...	...	3	2
Gypsum	...	11	2	...	...	11	2
Iron Ore	...	1	2	...	...	1	2
Lead	...	...	2	...	...	...	2
Magnesite	...	4	...	...	...	4	...
Mica	...	1	25	...	...	1	25
Pyrites	...	1	33	...	...	1	33
Red Ochre	...	3	3	...	...	3	3
Scheelite	...	6	14	...	...	6	14
Soapstone	...	1	...	...	...	1	...
Talc	...	1	1	...	...	1	1
Tantalite	...	1	30	...	...	1	30
Tin	...	15	7	...	...	15	7
Vermiculite	...	3	1	...	...	3	1
Wolfram	...	1	1	...	...	1	1
Total—Other Minerals	...	977	1,148	...	...	977	1,148
GRAND TOTAL	...	9,010	6,196	90	31	9,100	6,227

PART V.—ACCIDENTS.

TABLE 11.

MEN EMPLOYED IN MINES KILLED AND INJURED IN MINING ACCIDENTS DURING 1942 AND 1943.

A.—According to Locality of Accident.

Goldfield.	Killed.		Injured.		Total Killed and Injured.	
	1942.	1943.	1942.	1943.	1942.	1943.
1. Kimberley	...	...	...	...	...	...
2. West Kimberley	...	...	...	...	...	...
3. Pilbara	...	2	10	7	10	9
4. West Pilbara	...	...	...	...	...	...
5. Ashburton	...	...	...	...	...	...
6. Gascoyne	...	...	...	...	...	...
7. Peak Hill	...	...	...	...	...	...
8. East Murchison	5	1	87	99	92	100
9. Murchison	1	1	34	14	35	15
10. Yalgoo	...	...	...	...	...	...
11. Mount Margaret	2	...	58	31	60	31
12. North Coolgardie	...	...	6	...	6	...
13. North-East Coolgardie	...	...	...	...	...	...
14. Broad Arrow	...	1	...	...	...	1
15. East Coolgardie	8	5	502	372	510	377
16. Coolgardie	...	1	25	24	25	25
17. Yilgarn	1	...	18	17	19	17
18. Dundas	1	2	71	71	72	73
19. Phillips River	...	...	...	...	...	...
MINING DISTRICTS—						
Northampton	...	1	...	...	...	1
Greenbushes	...	...	...	...	...	...
Collie	2	1	252	291	254	292
South-West	...	...	10	8	10	8
Totals	20	15	1,073	934	1,093	949

From the above table it will be seen that the number of fatal accidents for the year 1943 was 15, as against 20 in 1942. The number injured showed a decrease of 139. In the report of the State Mining Engineer, published in Division II. of this report, these accidents are classified according to their causes.

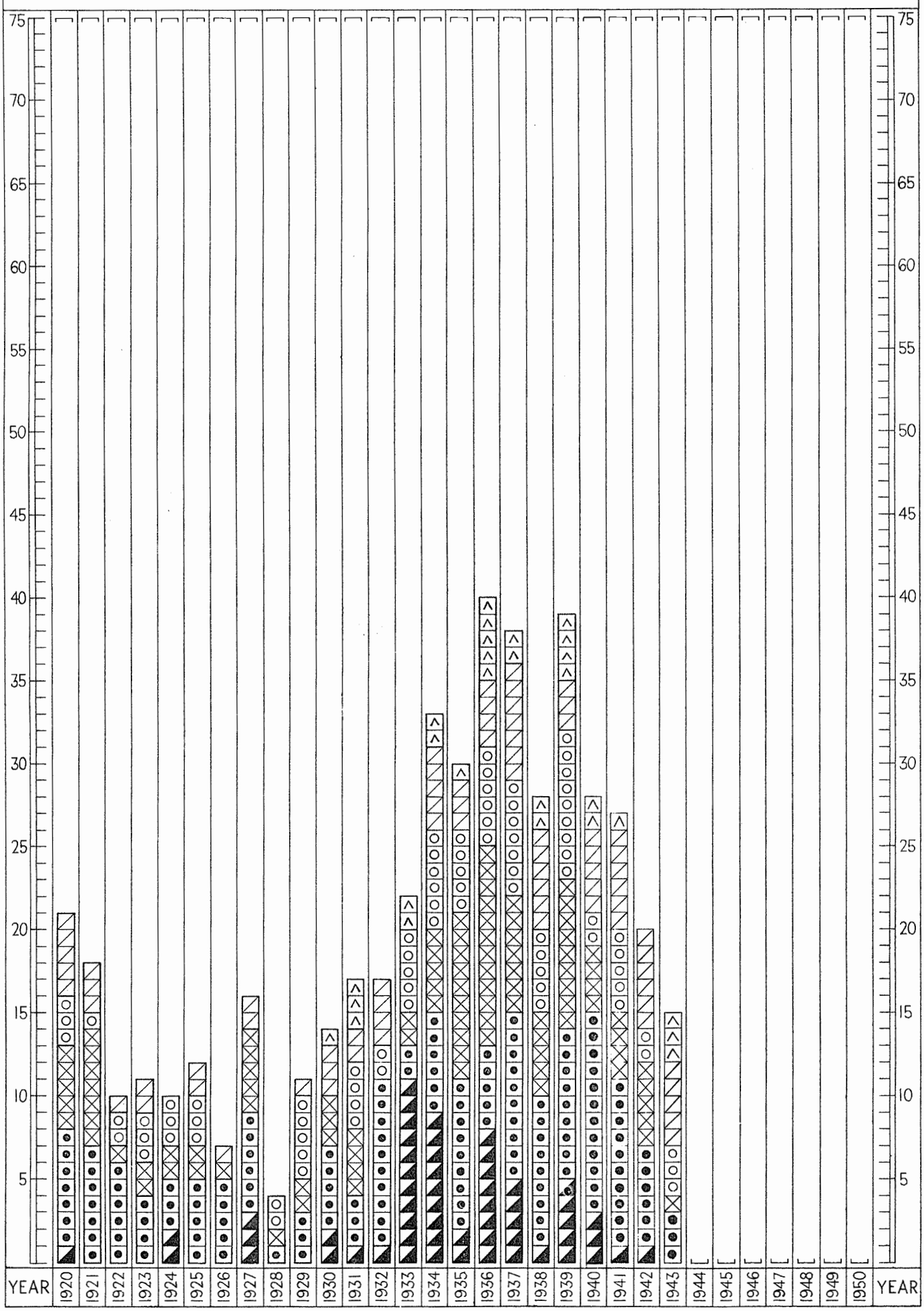
B.—According to Causes of Accidents.

Cause.	1942.		1943.		Comparison with 1942.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. Explosives	1	7*	...	14§	— 1	+ 7
2. Falls of Ground	6	89†	3	72‖	— 3	— 17
3. In Shafts	5	12	1	12	— 4	...
4. Miscellaneous Underground	2	723	3	628	+ 1	— 95
5. Surface	6	240‡	5	203¶	— 1	— 37
6. Fumes	...	2	3	5	+ 3	+ 3
Totals	20	1,073	15	934	— 5	— 139

* Includes 1 serious in Quarries. † Includes 2 serious in Quarries. ‡ Includes 7 serious in Quarries.
§ Includes 1 serious in Quarries. ‖ Includes 1 serious in Quarries. ¶ Includes 6 serious in Quarries.

DIAGRAM OF ACCIDENTS

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



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

VI.—STATE AID TO MINING.

(A) *State Batteries.*

1. The number of State Batteries existing at the end of the year was 23, with three leased. From inception to the end of 1942, gold and tin to the value of £12,221,300.27 including Gold Premium estimated at £2,979,337.97 have been received from State plants; 612,431.19 tons of auriferous ore have been treated and have produced £9,147,556.14 plus estimated premium of £2,979,337.97 and 81,786 tons of tin ore produced tin to the value of £93,833.96 and residues to the value of £572.2.

2. During the year 19,074 tons of ore were crushed for 15,560.85 ounces of bullion estimated to contain 13,187.16 fine ounces of gold equal to 13 dwts. 19.8 grains per ton. The average value of tailings produced was 5 dwts. 7.8 grains making the average head value of 19 dwts. 3.6 grains.

The estimated value of gold produced was 13,187.16 ozs. by amalgamation and 5,404.12 ozs. from tailing treatment, a total of 18,591.28 ozs., valued at £A180,769.50.

3. The working expenditure for all plants for the year was £21,746 12s. 4d. and the revenue £19,769 11s. 5d. which shows a loss of £8,529 4s. 11d. on the year's operations.

4. The capital expenditure since inception of the scheme has been £542,066 12s. 3d., £405,932 6s. 5d. from General Loan Fund, £93,726 4s. 5d. from Consolidated Revenues; £28,621 13s. 5d. from Assistance to Gold Mining Industry and £13,786 8s. from Commonwealth Assistance to Metalliferous Mining.

5. Head Office expenditure including insurance under the Workers' Compensation Act, Pay Roll Tax and War Damage Insurance was £5,123 6s. 8d. as against £6,780 4s. for 1942.

The working expenditure from inception to the end of the year exceeds revenue by £82,657 16s. 11d.

(B) *Geological Survey.*

The work of the Geological Survey during the year 1943 is represented by the following reports which are published in the Annual Progress Report of the Geological Survey for that year:—

Alluvial Tantalite, M.C.1, Greenbushes.
Water Supply at Blue Spec Antimony Mine, Nullagine, Pilbara Division.
A spodumene deposit, Ravensthorpe, S.W. Division.
The Young River Vermiculite Deposits, Eucla Division.
The Kendenup Graphite Deposits, S.W. Division.
Talc and Soapstone Deposits, Mt. Monger, North-East Coolgardie Goldfield.
The Munglinup Graphite Deposits, Munglinup River, Eucla Division.
Recent Developments on Columbite and Cassiterite Lode M.C. 9, Greenbushes, S.W. Division.
Lithium Bearing Minerals in the Coolgardie-Londonderry District, Coolgardie Goldfield.
The Felspar Quarry, Londonderry, Coolgardie Goldfield.
Notes on Ora Banda Amalgamated Gold Mines, Grant's Patch, Broad Arrow Goldfield.
The Tungsten Deposits on M.Cs. 24 and 25, Callie Soak, Murchison Goldfield.
The Molybdenite Deposits on Prospecting Areas 2323 and 2324, Mt. Mulgine, Yalgoo Goldfield.
Bentonite at Marchagee, S.W. Division.
Notes on the Salt Deposit near Wyalkatchem, S.W. Division.
Notes on Salt Lakes in the Campion District, S.W. Division.
Scheelite Deposits in the Central Goldfields.
A Lepidolite Deposit near Tantalite Hill, Londonderry, Coolgardie Goldfield.

A number of reports describing work on the Greenbushes Tinfield are not published because of their length and the fact that they will be included in a comprehensive bulletin dealing with the Greenbushes Tinfield, which is now in course of preparation. Various reports dealing with phosphate deposits are also withheld pending the completion of a report covering all the phosphate deposits of this State.

The field officers of the Survey continue to provide much practical assistance to prospectors and miners in the course of their field work, and the Head Office of the Geological Survey continue to meet numerous requests for information concerning the mineral resources of the State.

(C) *Assistance Under Mining Development Act,* 1902.

The following statement shows the sums advanced during the year 1943 under this Act:—

	£	s.	d.
1. Advanced in aid of mining work and equipment of mines with machinery	3,432	5	10
2. Subsidies on stone crushed for the public, being amounts paid to owners of plants crushing at fixed rates	105	2	6
3. Providing means of transport, equipment and sustenance for prospectors	2,266	4	7
4. Other assistance granted from the vote during the year on various matters totalled	436	19	9
	£6,240	12	8

The receipts under this Act exclusive of interest payments amounted to:—

	£	s.	d.
(1) Refund of Advances	2,344	13	7
(2) Prospecting Refunds	865	7	9
(3) Miscellaneous Refunds	20	4	0
	£3,230	5	4

PART VII.—INSPECTION OF MACHINERY.

The Chief Inspector of Machinery reports that the number of useful boilers registered at the end of the year totalled 4,963, against 4,851 total for the preceding year, showing an increase after all adjustments of 112 boilers.

Of the total 4,963 useful boilers, 2,963 were out of use at the end of the year, 1,937 thorough and 178 working inspections were made and 1,930 certificates were issued.

Permanent condemnations totalled 38 and temporary condemnations 19. There were no conversions. Ten boilers were transferred beyond the jurisdiction of the Act.

Two hundred and fifteen applications for engine-drivers' and boiler attendants' certificates were received and dealt with, and 188 certificates, all classes, were granted as follows:—

Winding Competency (including certificates issued under regulation 40 and section 60)	3
First Class Competency (including certificates issued under regulations 40 and 45, and sections 60 and 63)	6
Second Class Competency (including certificates issued under regulation 40 and section 60)	25
Third Class Competency (including certificates issued under regulations 40 and 45 and sections 60 and 63 of the Act)	20
Locomotive Competency (including certificates issued under regulation 50 and section 60)	8
Traction Competency (including certificates issued under regulation 40 and section 60)	—
Internal Combustion Competency (including certificates issued under regulation 40 and section 60)	39
Crane and Hoist Competency (including certificates issued under regulation 40 and section 60)	15
Boiler Attendants' Competency (including certificates issued under regulation 40 and section 60)	65
Interim	—
Copies	6
Transfers	1
	188

The total number of machinery groups registered was 17,527 against 16,505 for the previous year, showing an increase of 1,022.

Inspections made total 11,714 and 3,647 certificates were granted.

The total miles travelled for the year were 53,425, against 60,016 miles for the previous year, showing a decrease of 6,591 miles. The average miles travelled per inspection were 3·86 as against 4·19 miles per inspection for the previous year.

The total revenue from all sources during the year was £8,243 16s. 11d., as against £8,368 12s. 2d. for the previous year, showing a decrease of £124 15s. 3d.

The total expenditure for the year was £8,043 12s. 3d., as against £8,550 17s. 10d. for the previous year, showing a decrease of £507 5s. 7d.

PART VIII.—SCHOOL OF MINES.

(a) *Kalgoorlie.*—The individual enrolment for 1943, exclusive of Correspondence Course students, reached a maximum of 305 compared with 295 in 1942, while the Correspondence Course enrolments totalled 18.

The enrolment included 36 munition trainees under the Commonwealth Technical Training Scheme and 83 Royal Australian Air Force personnel, who were admitted to classes at a special concession rate.

In the Public Assay Branch of the School, 53 gold and 93 mineral determinations were carried out for prospectors.

The Metallurgical Laboratory dealt with eight investigations into the treatment of ores and minerals, two particularly important ones being the flotation of pyrite from the Iron King Mine at Norseman and the production of marketable graphite from graphite ore at Munglinup.

(b) *Wiluna,* (c) *Norseman.*—The maximum enrolments were 80 and 48 respectively, which were quite good in view of the times.

PART IX.—MINER'S PHTHISIS ACT AND MINE WORKERS' RELIEF ACT.

In 1943 all Goldfields with the exception of Ashburton, Gascoyne, Kimberley, Phillips River, West Kimberley and West Pilbara were visited.

The number of examinations conducted were 4,298, compared with 5,824 for 1942.

STAFF.

Eighty-four officers at time of writing are in the fighting services, while six others have been seconded to the Munitions Department for the duration of the war. Temporary employees, comprising some older men, but mainly women and girls have replaced the younger men and under the circumstances have done very well.

The older permanent employees have, however, had a great deal of additional responsibility thrust upon them and have shouldered it without demur and with great loyalty to the department.

In dealing with the various activities, I have commented only on the principal items. Divisions II. to IX. of this publication contain the detailed reports of the responsible officers.

I have, etc.,

A. H. TELFER,

Under Secretary for Mines.

Department of Mines,
Perth, 31st March, 1944.

Division II.

Report of the State Mining Engineer for the Year 1943.

The Under Secretary for Mines.

Sir,—I have the honour to submit, for the information of the Hon. the Minister for Mines, my report on this branch of the Mines Department for the year 1943.

STAFF.

There were no changes in the staff during the year. In the absence of Inspectors Brisbane, Olive and Boyland on war service, the remaining Inspectors of Mines were very fully occupied.

ACCIDENTS.

Fatal and serious accidents on mines and quarries reported to the Department for the year are shown below. Corresponding figures for 1942 are shown in brackets.

There were 15 (20) fatal and 934 (1,073) serious accidents, including 1 (2) fatal and 299 (262) serious on coal mines and quarries.

Of the fatal accidents 12 (18) occurred on gold mines, 1 (2) on coal mines, 1 (0) on a lead mine, and 1 (0) on a tantalite mine. No fatalities were reported in quarries.

The total number of serious accidents reported on gold mines was 635 (811). The average number of men employed on such mines was 5,079 (8,123). The average accident rate per 1,000 men employed on gold mines was thus 2·36 (2·22) for fatal and 125·02 (99·84) for serious accidents.

On the coal mines the number of serious accidents was 291 (252), while the average number of men employed was 839 (825). The average accident rate, therefore, was 1·19 (2·42) fatal and 346·84 (305·45) serious accidents per 1,000 men employed.

A classification of the serious accidents showing the nature of the injuries sustained is given in Table A.

Table B. shows the number of fatal accidents recorded year by year for the past five years and the death rates per 1,000 men employed.

TABLE A.

SERIOUS ACCIDENTS—1943.

Goldfield.	Major Injuries—Exclusive of Fatal.																						
	Fractures.											Amputations.						Loss of Eye.	Serious Internal.	Hernia.	Dislocations.	Other Major	Total Major.
	Head.	Shoulder.	Arm.	Hand.	Spine.	Rib.	Pelvis.	Thigh	Leg	Ankle.	Foot.	Arm.	Hand.	Finger	Leg.	Foot	Toe.						
East Coolgardie	....	....	1	....	....	3	1	....	3	....	1	....	....	5	....	....	....	....	....	4	....	4	22
Yilgarn	....	....	....	....	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	1	....	2	5
Coolgardie	....	....	1	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	1	4
Dundas	....	....	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	4
Mt. Margaret	....	2	2	1	....	2	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	9
East Murchison	....	....	....	....	....	....	1	1	....	2	1	1	....	1	....	....	....	....	....	2	....	1	10
Murchison	1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	1	....	....	3
Pilbara	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2
South-West Mining District	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Collie Coalfield	....	....	....	2	....	9	1	....	1	1	5	....	....	1	....	....	....	....	....	2	2	4	28
Total	1	2	4	4	....	17	4	1	4	4	9	1	....	9	....	....	....	....	....	11	2	14	87

Goldfield.	Minor Injuries.												
	Fractures.		Head.	Eyes.	Shoulder.	Arm.	Hand.	Back.	Rib.	Leg.	Foot.	Other Minor.	Total Minor.
	Finger.	Toe.											
East Coolgardie	7	6	9	13	10	24	112	49	8	47	51	14	350
Yilgarn	....	....	1	....	1	1	2	....	....	3	3	1	12
Coolgardie	1	....	....	1	1	4	4	1	....	4	4	....	20
Dundas	1	....	3	3	....	10	12	13	1	15	7	2	67
Mt. Margaret	1	....	3	....	2	1	6	4	1	2	1	1	22
East Murchison	5	4	1	3	1	7	25	12	4	13	7	7	89
Murchison	1	....	....	....	....	1	5	....	....	2	1	1	11
Pilbara	....	....	....	....	....	....	2	....	....	1	1	1	5
South-West Mining District	....	....	....	....	....	1	3	1	....	1	2	....	8
ollie Coalfield	5	5	6	11	10	20	65	22	4	39	29	47	263
Total	21	15	23	31	25	69	236	102	18	127	106	74	847

TABLE B.

——	1939.	1940.	1941.	1942.	1943.
Fatal accidents to men engaged in mining (exclusive of quarries)	39	28	27	20	15
Total number of men engaged in mining (average)	16,199	15,500	14,021	9,100	6,227
Accident death rate per 1,000 men engaged in mining ...	2·41	1·81	1·93	2·23	2·41

FATAL ACCIDENTS.

Following is a brief description of all fatal accidents that were reported on mines during the year.

Name and Occupation.	Date.	Mine.	Details and Remarks.
		Surface (5).	
Pedersen, Harry James (Filter Hand)	4–2–43	Comet Gold Mine ...	Was aciding zinc shavings in a wire enclosure adjoining the gold room from 6 a.m. In the afternoon he became sick and had to stop work. He became worse and was sent to hospital and some days later was flown to Perth, where he died on the 11th February, as a result of inhaling arsenic fumes. This was the last batch of zinc shavings treated by this method as Merrill Crowe treatment has been in use since the accident. Apparently no one suffered ill effects from the fumes before this accident. Masks were available, but apparently not used.
Feralli, Pascal Charles (Carpenter)	20–5–43	Kalgoorlie Ore Treatment, Limited	Feralli's body was found in an agitator, floating face downwards. A post mortem examination revealed that death was caused by a blow on the head, a fracture of the sternum being a contributory factor. It is thought that he fell down a flight of steps leading from a cone classifier to the agitator, struck his head and fell into the agitator.
Bader, Gerhard (Mill Hand)	30–5–43	Wiluna Gold Mines, Limited	Was found lying unconscious on the cracker platform, apparently having fallen from another platform about 10 ft. above. There is no evidence as to what caused him to fall, but he was found to have a fractured skull and he died without recovering consciousness.
King, Albert (Miner) ...	17–8–43	Consolidated Gold Mines of Coolgardie, Ltd.	Was walking on the surface towards the rock drill shop, when a truck bringing employees to work from Coolgardie was pulling up. Evidence shows that he was walking towards the truck, the front portion of which had passed him. A bump was felt and the truck stopped within a few feet. King was found near the bodies of two mine trucks which may have contributed to the accident. He was found to have three fractures of the pelvis girdle and died within a few hours of the accident.
Thompson, Charles (Leading Mill Hand)	1–11–43	Tantalite Mine, Strelley	Thompson by some unexplained means became caught in the belt working the strake screen in the mill and was whirled round the countershaft, receiving shocking multiple injuries which must have resulted in instantaneous death. There was no witness to the accident.
		Miscellaneous Underground (5).	
Topp, Lawrence John (Machine Miner)	15–1–43	Ora Banda Amalgamated	Topp was working in a shrink stope from which ore was being trucked. A cavity was formed in the broken ore, leaving a bridge of loose dirt which collapsed under Topp and buried him. As the ore chute was running well, neither Topp nor the trucker suspected the presence of such cavity. It is usually the machine man's practice to let the trucker know when sufficient ore has been pulled from the stope and it is considered that Topp should have noticed the lack of movement in the surface of the broken ore in the stope.
Davis, Thomas (Scraper Hoist Driver)	2–3–43	Central Norseman Gold Corporation	Was operating the scraper-driver in a stope when the rope broke. He was repairing the rope when he received an electric shock which killed him. It is thought that the wire rope became electrified owing to a fault in the earthing system. Instructions were given to the management to alter the whole electric installation to comply with S.A.A. Wiring Rules.
Sexton, William Lloyd (Timberman	19–3–43	Norseman Gold Mines	Was engaged in enlarging a hole on the level, for timbering purposes, when he was dislodged by a footwall movement caused through a water soakage along a slide in the footwall. Before he could regain his footing, a further slide occurred which knocked him to the bottom of the stope below, causing injuries which resulted in his death.
Pozzi, Giovanni (Miner) ...	1–9–43	Moyagee	Was working at the 150 ft. level. To reach this level he had to descend 14 ft. of ladder in the shaft, immediately above the level. He appears to have fallen off the ladderway and to have crashed through the stage at the 210 ft. level into water at an approximate depth of 225 ft. He was dead when assistance reached him.

FATAL ACCIDENTS—*continued.*

Name and Occupation.	Date.	Mine.	Details and Remarks.
		Miscellaneous Underground—continued	
Spencer, George Edward (Set Rider)	7–10–43	Co-operative Colliery	Was riding on the front of a set of four full skips of coal when he appears to have fallen in front of the skips, two of which passed over him, causing injuries to which he succumbed before reaching hospital. It is the usual practice to ride with one foot on the rope and one on the skip. It is thought likely that a jerk or kick of the rope dislodged him. The Inspector of Mines issued instructions for the road to be graded more evenly in order to minimise such jerking in future.
		Falls of Earth (1).	
Ravlich, Marijan (Machine Miner)	8–10–43	Kalgoorlie Enterprise, Limited	Coming on shift after firing on the previous shift had barred down loose ground in the stope and rigged the bar preparatory to boring out another face. About three tons of rock came away without warning from the back of the stope. A piece weighing about 3 cwt. fell on Ravlich, causing fatal injuries. Both Ravlich and his mate were experienced miners and there was no evidence of neglect.
		Shafts (1).	
Penn, Sydney Alfred (Miner)	23–3–43	Prothero Lead Mine, Nabawa	Was working at the bottom of a shaft which was 10 ft. vertical and then 157 ft. deep on the underlay. He had filled a kibble and sent it to the surface. At about 10 ft. from the surface the kibble left the rope and crashed to the bottom of the shaft, striking Penn and inflicting injuries to which he succumbed almost immediately. It was found that the hook by which the kibble was attached to the rope was straightened out. The Inspector of Mines, after investigation of the accident, was of the opinion that the hook was adequate for the work required, but had been improperly attached to the kibble by the deceased.
		Fumes (3).	
Turley, Keith (Trucker); Graham, James (Machine Miner); McNamara, Francis Vincent (Trucker)	17–7–43	Great Boulder Pty., Ltd.	This distressing accident was due to the fact that none of the victims realised the presence of fumes. A face had been fired in a crosscut from the bottom of the winze at the end of the afternoon shift on the previous day. On the following morning Turley was the first man to descend the winze and was overcome by fumes. He was subsequently found hanging down with one leg in the kibble. Thinking that Turley was entangled in the hoist rope, McNamara and Graham followed successively to his assistance and were both overcome by the fumes. A fourth man, Edward Graham, also followed and was overcome, but was rescued alive. Commendable bravery was shown by all engaged in the rescue operations. Certain amendments to the Mines Regulation Act are under consideration with the object of reducing the risk of similar occurrences in the future.

Table C. shows the total number of fatal and serious accidents that were reported during the year classified according to the gold or mineral field on which they occurred and also according to their causes.

Table 11, showing fatal and serious accidents and the districts in which they occurred is forwarded herewith for inclusion in your Annual Report, together with a diagram showing fatal accidents year by year according to their causes.

WINDING MACHINERY ACCIDENTS.

There was only one accident during the year involving winding machinery, when the engine went ahead while changing the cage at the surface brace, causing some injury to the braceman.

PROSECUTIONS.

Two men were prosecuted under section 35 of the Mines Regulation Act, General Rule 3, paragraph (o), for approaching a misfired hole before one hour had elapsed from the time of lighting the fuse. Fines were imposed in both cases.

EXEMPTIONS.

In accordance with the provisions of section 34, subsection 4, of the Mines Regulation Act, 1906-38, 14 certificates were issued, exempting the holders from the operation of subsection 1 (b) of the same section, as compared with 40 during 1942.

SUNDAY LABOUR.

A permit was issued to 11 men to work on two Sundays on operations which could not be carried out on week days without seriously interfering with production.

A permit was issued to 11 men to work on three Sundays on extensive underground drainage work, which could not be carried out on working shifts on account of continuous trucking on the level.

Four permits were issued for four men in each case to work underground sinking the main shaft, to avoid loss of time in the subsequent working of the mine.

ADMINISTRATION.

Amendments of Acts.

The Mining Act, 1904-1937.

Schedule. (1) Amendment of Regulation 55, paragraph 7.

(2) Amendment of Regulation 157.

(3) Amendment of Regulation 181. Gazetted 4/6/43.

Coal Mines Regulation Act, 1902-26.

Schedule. Amendment of Regulation 9, clause (a). Gazetted 5/3/43.

TABLE C.

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

	Explosives.		Falls of Ground.		In Shafts.		Fumes.		Miscellaneous Underground.		Surface.		Total.	
	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.	Fatal.	Serious.
1. East Coolgardie ...	...	5	1	16	...	4	3	2	...	255	1	90	5	372
2. Mt. Margaret ...	...	...	...	2	...	3	...	...	...	16	...	10	...	31
3. Coolgardie ...	...	2	...	1	...	...	...	...	...	14	1	7	1	24
4. North Coolgardie...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
5. North - East Coolgardie	...	...	...	...	...	...	...	...	...	...	...	...	...	...
6. Broad Arrow ...	...	...	1	...	...	...	...	...	...	...	...	...	1	...
7. Dundas	...	1	1	7	...	1	...	1	1	50	...	11	2	71
8. Yilgarn	...	...	...	...	...	...	...	1	...	10	...	6	...	17
9. Murchison ...	...	...	...	...	...	...	...	...	1	10	...	4	1	14
10. East Murchison ...	...	1	...	11	...	4	...	...	...	55	1	28	1	99
11. Peak Hill ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
12. Yalgoo	...	...	...	...	...	...	...	...	...	...	...	...	...	...
13. Northampton ...	...	...	...	...	1	...	...	...	...	...	...	...	1	...
14. Greenbushes ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
15. South-West ...	...	1	...	1	...	...	...	...	...	...	...	6	...	8
16. Phillips River ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
17. Collie	...	4	...	33	...	...	...	...	1	216	...	38	1	291
18. Pilbara	...	...	...	1	...	...	...	1	...	2	2	3	2	7
19. West Pilbara ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
20. Ashburton ...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Totals for 1943 ...	...	14	3	72	1	12	3	5	3	628	5	203	15	934
Totals for 1942 ...	1	7	6	89	5	12	...	2	2	723	6	240	20	1,073

VENTILATION.

Inspector Lloyd's report on his work as Ventilation Officer is quoted in full hereunder—

From the attached summary of dust sampling for the year, it will be noted the number of surveys carried out covered portion of the year only, this being due to the fact that apart from general inspection duties, I was called upon to make investigations in connection with ventilation for the Railway Department (Swan View Tunnel), and dust at the wheat bins, Fremantle, for the Industrial Registrar.

With regard to ventilation of the mines, apart from the fatal fuming accident which occurred at the Great Boulder Main Shaft on the 17th July, when three lives were lost, conditions were found to be satisfactory.

Accidents from fumes as reported to this office for the year, were as follows:—

	Serious.	Minor.
East Coolgardie	2	14
Dundas	1	2
Coolgardie	—	1
Yilgarn	1	—
	4	17

In most cases, these accidents were investigated and reported upon, and in all cases in the East Coolgardie and Dundas areas, under the heading of serious, statements were obtained from the injured persons.

DUST SAMPLING.

Summary of Samples taken during 1943.

Month.	Level.		Development.		Stoping.		Surface.		Number of places showing count of 1000 p.p.c.c.			
	No.	Average Count.	No.	Average Count.	No.	Average Count.	No.	Average Count.	Level.	Development.	Stope.	Surface.
January	...	...	...	...	...	...	...	...	...	...	...	...
February	...	...	...	...	...	...	...	...	...	...	...	...
March	...	...	...	...	...	...	...	...	...	...	...	...
April	1	236	1	307	9	295	...	...	...	...	...	...
May	2	156	5	155	6	187	...	...	1	1	...	...
June	...	...	5	152	15	203	...	...	...	1	1	...
July	...	...	...	...	...	...	...	...	...	...	...	...
August	...	...	...	...	...	...	...	...	...	...	...	...
September	...	...	...	...	...	...	...	...	...	...	...	...
October	...	...	...	...	...	...	...	...	...	...	...	...
November	1	282	8	187	6	158	...	...	1	...	...	...
December	...	...	...	...	...	...	...	...	...	...	...	...
Total	4	207	19	175	36	216	...	...	Total—5.			

Fuming accidents under the heading of minor, necessitated only a day or so from work, and invariably the employee would not obtain medical advice.

Complaints of bad conditions—ventilation and dust—as reported by the Workmen's Inspectors, were investigated and remedial action taken.

On the 15th November a fire broke out in a stope above the No. 3 level at the Iron King Mine, Norseman, due to spontaneous combustion in the pyritical ore, but apart from the skipman, who was detained in hospital as suffering from fumes—later diagnosed as slight diphtheria—no accident occurred, and the fire was successfully dealt with.

Apart from ventilation and general inspections frequent visits have been made in connection with salt at Widgiemooltha. Inspection of the salt deposit at Esperance and copper smelting at Ravensthorpe was carried out and later, drawings were prepared in connection therewith.

GOLD MINING.

The gold mining industry is deteriorating progressively as war-imposed conditions continue. The average number of men employed dropped from 8,123 in 1942, to 5,079 in 1943. This figure is now less than one-third of the average number of men engaged in the industry before the war.

The total reported gold production for the year under review amounted to 531,747 fine ounces, valued at £5,556,756. The tonnage of ore treated for this output was 2,051,011 tons. Corresponding figures for the previous year were 845,772 fine ounces, valued at £A.8,840,642, from the treatment of 3,225,704 tons of ore.

Tonnage treated and gold won per man employed were very slightly in advance of the previous year's record at 403.8 tons and 104.7 fine ounces respectively. Corresponding figures for 1942 were 397 tons and 104.1 ounces.

The average value of ore treated was the record low figure of 5.19 dwt. per ton.

The following major mines ceased operations during the year—

Big Bell Mines, Limited, in February.
Hannan's North (B.H.P., Ltd.), in January.
Evanston Gold Mine, in July.
Consolidated Gold Areas, N.L., in September.
Blue Bird Gold Mines, N.L., in March.
Burbidge Gold Mines, N.L., in March,

while among the better known minor producers to close down were, Westralian Tailings Treatment, Mt. Ida Gold Mines, N.L., Porphyry Gold Mine, N.L., New Milano Gold Mine, Swan Bitter, Metropolitan Mining and Development, Rising Sun, Sterling Gold Mines and Lake View South.

The number of individual producers of 5,000 ounces and upwards has fallen from 36 in 1940 to 21 in 1943, while the total number of individual producers, as classified in Table F has fallen from 731 to 324 over the same period.

Owing to a rather drastic curtailment of development, due to manpower shortage, ore reserves generally have shown a decrease, although the reserves of most of the principal mines are still in a fairly sound position as a result of the vigorous development policy of the late pre-war years.

The falling off of prospecting and small mining activities is evidenced in the fact that State batteries treated only 19,074 tons of ore for the year for a return of 18,591 fine ounces, as compared with 101,433 tons for 65,803 ounces in 1939.

Table D shows the production statistics year by year since 1929.

TABLE D.

Gold Production Statistics.

Year.	Tons Treated. (2,240 lbs.)	Total Gold Yield.	Estimated Value of Yield.	Value of Yield per Ton.	Number of Men Employed.	Average Value of Gold per Oz.	Average Yield per Ton of Ore.
	tons.	fine ozs.	£A.	shillings A.		shillings A.	dwt.
1929 ...	628,400	372,064	1,580,426	50·30	4,108	84·96	11·84
1930 ...	645,344	419,767	1,874,484	58·09	4,284	89·33	13·01
1931 ...	982,163	518,045	3,042,019	61·94	5,961	117·44	10·55
1932 ...	1,327,021	599,421	4,358,989	65·70	8,695	145·44	9·03
1933 ...	1,588,979	636,928	4,884,112	61·48	9,900	153·36	8·01
1934 ...	1,772,931	639,871	5,461,004	61·60	12,523	170·69	7·22
1935 ...	1,909,832	646,150	5,676,679	59·45	14,708	175·71	6·77
1936 ...	2,492,034	852,422	7,427,687	59·61	15,698	174·27	6·84
1937 ...	3,039,608	1,007,289	8,797,662	57·99	16,174	174·68	6·64
1938 ...	3,759,720	1,172,950	10,409,928	55·38	15,374	177·50	6·24
1939 ...	4,095,257	1,188,286	11,594,221	56·62	15,216	195·14	5·80
1940 ...	4,291,709	1,154,843	12,306,816	57·35	14,594	213·15	5·38
1941 ...	4,210,774	1,105,477	11,811,989	56·10	13,105	213·70	5·25
1942 ...	3,225,704	845,772	8,840,642	54·81	8,123	209·04	5·24
1943 ...	2,051,011	531,747	5,556,756	54·185	5,079	209·00	5·185

NOTE.—In this table the figures given are those reported to the Department by the various producers.

OPERATIONS OF THE PRINCIPAL MINES.

Table G (p. 25) lists the outputs and yields of the principal gold mines of the State for the past five years and provides a somewhat melancholy picture of the result of the war on the State's principal industry. Every endeavour is being made to maintain those mines which have been forced to cease operations in a condition which will enable them to re-open as speedily as possible when the manpower and supply position eases. Important items of plant rendered idle by closure of the mines are eagerly acquired by various Commonwealth authorities for essential services. While the necessity of such action is realised, it will unfortunately hold up the re-opening of the mines later.

Some of the minor producers warranting special mention during the year are listed hereunder.

Mine.	Tons Treated.	Gold Output.	Yield per ton.	Remarks.
		fine ozs.	dwt.	
Mt. Ida Gold Mines, N.L.	5,251	3,195	12·17	Closed December.
Mountain View (Day Dawn)	572	1,586	55·45	
Edward's Reward	2,725	1,339	9·86	
Westralian Tailings Treatment	....	1,322	....	Closed July.
Moyagee (Mt. Magnet)	1,073	1,003	18·70	
Consols North (Meekatharra)	208	755	72·60	
Radio	765	702	18·35	
Pharlap (Meekatharra)	713	685	19·21	
Ingliston Consols Extended	313	587	37·51	
New Milano Gold Mine, N.L.	1,609	587	7·29	Closed July.
Porphyry (1939) Gold Mine, N.L.	3,337	555	3·32	Closed February.
Carnation	1,025	543	10·59	
Lake View South	2,151	529	4·93	Closed September.

EAST COOLGARDIE GOLDFIELD.

On the East Coolgardie Goldfield the ore treated during 1943 amounted to 1,000,451 tons for a return of 291,896 fine ounces of gold. The average yield per ton was therefore 5.83 dwt. The average number of men employed was 2,101.

These figures represent 48.8 per cent. of the total tonnage treated for the State, 54.9 per cent. of the gold output and 41.3 per cent. of the men employed.

Production per man employed was 476 tons treated and 139 fine ounces of gold, compared with 481 tons and 145 fine ounces during the previous year.

The general outlook has not altered materially, except that the output of the mines deteriorated as was anticipated. The mining companies are doing good work in the face of the difficulties with which they have to contend.

Lake View and Star, Limited, mined and treated 260,720 tons for a return of 87,196 fine ounces, the average yield being 6.69 dwt. per ton.

Only day shift was worked on this mine, which allows for better supervision, resulting in improved efficiency. Better work is said to be done by the men, who are more contented when working one shift only.

Other items which assisted in carrying out profitable operations with a greatly reduced staff are—

(a) broken ore reserves were increased by only 16,000 tons compared with 100,000 tons per annum for the previous three years;

(b) no stoping operations were carried out below the 2,400-ft. level;

(c) no work was done in filled stopes, with a consequent reduction in stope preparation and maintenance;

(d) development was reduced to approximately 50 per cent. of the normal amount, and was only carried out in known blocks of ore. The average monthly development footage was 750 feet, of which 50 per cent. consisted of winzing.

An increase of .37 dwt. per ton in the grade of the ore treated was due to the cessation of operations in filled stopes, which are mostly low grade, and some rich patches were mined, notably from the Lake View Lease, Perseverance lode stope at the 1,400-ft. level, where 5,500 tons were pulled, averaging 26 dwt. per ton. Good ore is still being drawn from such stope.

The Chaffers retreatment plant treated over 800,000 tons of tailings of a head value of 3.55s. per ton. The tail value was 2.29s., giving an extraction of 1.26s. per ton (these values are sterling). The sterling value of the gold won was £52,000, while costs were 1s. 5d. (Australian) per ton.

Ivanhoe Shaft.—No work was done.

Horseshoe No. 2 Shaft was retimbered from the 1,500-ft. to the 2,000-ft. level, and re-opened for servicing.

Chaffers Shaft.

On the 1,700-ft. level No. 4 lode was developed and 300 feet of driving averaged 6.4 dwt. per ton over a width of 6 feet. Some driving on the same lode at the 1,800-ft. level averaged 5.4 dwt. over 5 feet for a distance of 110 feet.

The west branch of No. 3 lode on the 2,400-ft. level was developed for a length of 270 feet, the average value being 7.5 dwt. per ton over a width of 5½ feet.

No. 6 (Minor) lode, between Nos. 2 and 3 lodes, was opened up by driving 300 feet on the 1,800-ft. level, values averaging 6.4 dwt. per ton over 61 inches. The same lode was driven 226 feet on the 2,000-ft. level, averaging 5 dwt. over a width of 5 feet.

Hannan's Star Shaft.

On the 700-ft. level, 300 feet of driving was completed in values averaging 7½ dwt. per ton over 5½ feet width.

All ore from this section, approximating 16,000 tons monthly, was hauled through Chaffers shaft.

The principal ore bodies being stoped were No. 2 lode, Chaffers main lode, Horseshoe Nos. 1 and 6 lodes, Hannan's Star main lode and Morrison East lode.

The Lake View lease provided approximately 7,000 tons monthly. Stoping operations were confined chiefly to the Perseverance, Central Boulder and East lodes.

In the north-east section of the Lake View lease, a new ore body was discovered on the 300-ft. level, striking 115°. This lode was opened for a distance of 130 feet, the average value being 5½ dwt. over a width of 15 feet.

This body has not been developed at other levels.

On the No. 26 level, below the internal shaft, the ore body disclosed in the diamond drill hole from the Great Boulder workings was further developed at the intersection of the West lode and the West lode branch. In the West lode 77 feet of driving disclosed an average value of 12 dwt. over a width of 68 inches, while on the West lode branch 108 feet of driving averaged 5 dwt. over 60 inches.

In between these two drives a north drive 52 feet long averaged 7.2 dwt. over 6 feet in width, while a south drive on the contact of the quartz dolerite and calc schist showed free gold and is estimated to be worth 70 dwt. over 6 feet.

On the No. 23 level, 350 feet of driving on the West lode averaged 7½ dwt. over a width of 66 inches.

The *Associated* lease provided approximately 5,000 tons of ore monthly. At the 600-ft. level, 135 feet of driving on the Australia East lode disclosed an average value of 10.6 dwt. over a width of 6 feet.

Stoping on No. 10 level at Tetley's shaft disclosed new ore which can be included in the estimate of ore reserves and which also furnishes information on the structure of the lodes which will affect the general layout of stope preparation.

Ore reserves at the end of June were computed at 4,112,000 tons worth 5.01 dwt. per ton.

Great Boulder Pty., Gold Mines, Ltd., produced 63,302 fine ounces of gold from the treatment of 283,201 tons of ore, the average yield per ton being 4.47 dwt.

Work in the oxidised zone proved the existence of a southern extension of the old alluvial channel beneath the tailings dump. The grade of the oxidised ore is good and a considerable tonnage of ore is supplied to the mill from this source.

In the Hamilton shaft section, development work off No. 2 winze was concentrated mainly on opening up the "Seventeen" and "Eighteen" lodes at the 2,950-ft. level and the "Eighteen" lode at the 3,100-ft. level. Fair values were exposed at the 2,950-ft. level, but at the 3,100-ft. level the "Eighteen" lode was poor. Generally the grade of the ore from both these horizons was much lower than that met on the 2,650 and 2,800-ft. levels.

In the upper levels of this section a short length of ore of good grade was developed in the Ivanhoe East lode at the 600-ft. level, and rising and winzing on the "Ten" lode at the 1,100-ft. level proved its continuity both above and below that horizon.

Development on the Ash lode and No. 2 Ivanhoe in the western lease was continued with satisfactory results. An appreciable extension northwards was developed at the 1,200-ft. level, and the downward extension of the lode below the 1,800-ft. level was proved by winzing to the 1,950-ft. horizon. A rise has also been put up from the 1,800-ft. to the 1,650-ft. level, where an intermediate drive will be opened during 1944. A very large body of ore exists on this lode between the 1,200-ft. and 1,800-ft. levels, but its development has been retarded by its distance from Hamilton shaft and by the lack of a through connection between such horizons.

At the main shaft, work was continued on the main No. 3 West caunter, X caunter, "Ten" and Robert-

TABLE E.

Classification of Gold Output for 1943, *by Goldfields and Districts.*

Goldfield or District.	Unclassified, Sundry Claims, Alluvial, etc. (fine ozs.)	Under 100 ozs.		100–500 ozs.		500–1,000 ozs.		1,000–2,000 ozs.		2,000–3,000 ozs.		3,000–4,000 ozs.		4,000–5,000 ozs.		5,000–10,000 ozs.		10,000–20,000 ozs.		20,000–30,000 ozs.		30,000–40,000 ozs.		40,000–50,000 ozs.		50,000–100,000 ozs.	
		No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).	No. of Producers.	Gold (fine ozs.).
Kimberley Goldfield	116	1	12	1	198	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ashburton Goldfield	17	1	28	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Pilbara Goldfield—																											
Marble Bar	395	10	257	3	1,113	....	....	....	....	....	....	....	....	....	....	....	....	1	13,265	....	....	....	....	....	....	....	....
Nullagine	143	6	192	1	394	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Peak Hill Goldfield	10	7	185	2	285	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Murchison Goldfield—																											
Lawlers	157	4	45	1	116	....	....	1	1,322	....	....	....	....	....	....	1	7,049	....	....	....	....	....	....	....	....	....	....
Wiluna	262	4	242	3	650	....	....	....	....	....	....	....	....	....	....	....	....	1	17,790	....	....	....	....	....	....	1	52,377
Black Range	8	4	91	6	1,081	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Murchison Goldfield—																											
Cue	260	6	136	4	996	1	941	....	....	....	....	....	....	1	4,220	....	....	....	....	....	....	....	....	....	....	....	....
Meekatharra	345	5	169	3	943	4	2,888	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Day Dawn	92	3	144	....	....	....	....	1	1,586	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Magnet	76	8	159	5	1,324	....	....	1	1,003	....	....	....	....	....	....	....	....	1	10,054	....	....	....	....	....	....	....	....
Yalgoo Goldfield	31	6	293	3	422	1	542	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Margaret Goldfield—																											
Mt. Morgans	560	10	251	6	1,878	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Mt. Malcolm	119	7	158	3	740	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	24,003	....	....	....	....	....	....
Mt. Margaret	432	12	268	1	364	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
North Coolgardie Goldfield—																											
Menzies	141	4	86	2	826	....	....	....	....	....	....	2	6,294	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Ularring	165	7	163	1	144	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Niagara	34	1	4	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yerilla	....	1	1	1	555	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Broad Arrow Goldfield	371	15	410	5	917	1	648	....	....	....	....	....	....	1	4,109	....	....	....	....	....	....	....	....	....	....	....	....
North-East Coolgardie Goldfield—																											
Kanowna	92	3	172	1	200	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Kurnalpi	194	2	46	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
East Coolgardie Goldfield—																											
East Coolgardie	731	18	342	9	2,140	4	2,472	....	....	1	2,276	....	....	....	....	....	....	4	63,043	3	70,316	....	....	....	....	2	150,498
Bulong	55	1	22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Coolgardie Goldfield—																											
Coolgardie	226	14	480	3	1,107	1	646	....	....	....	....	....	....	....	....	2	11,822	....	....	....	....	....	....	....	....	....	....
Kunanalling	52	1	54	3	857	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Yilgarn Goldfield	29	27	622	14	2,605	2	1,498	1	1,339	....	....	1	3,332	....	....	1	5,536	....	....	....	....	....	....	....	....	....	....
Dundas Goldfield	351	3	73	6	1,490	....	....	....	....	....	....	....	....	....	....	....	....	1	11,734	1	27,089	....	....	....	....	....	....
Phillips River Goldfield	35	2	22	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
State Generally	84	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
Totals	5,583	193	5,127	87	21,345	14	9,635	4	5,250	1	2,276	3	9,626	2	8,329	4	24,407	8	115,886	5	121,408	....	....	....	....	3	202,875

son's lodes with satisfactory results. A small amount of driving was done on a new ore body at the 2,800-ft. level.

An appreciable amount of development was carried out on low grade ore bodies in the Edwards-Lane shaft area. This consisted mainly of driving and winzing on the eastern lode formations.

At Edwards shaft a shoot of ore was opened up by driving at the 2,600-ft. level on fault "C," and a short shoot of ore was developed on the main lode.

Reserves show several years' supply of good milling ore.

Gold Mines of Kalgoorlie, Limited, mined and treated 87,928 tons for a return of 21,610 fine ounces, an average yield of 4·92 dwt. per ton.

Iron Duke.—Winzes were sunk to No. 12 level on the Blatchford lode in patchy values. Stoping was done at No. 12 level on this lode.

A fair tonnage was stoped on No. 9 level, the Oroya hanging wall lode and also on Nos. 2 and 3 caunter lodes.

A crosscut west off the Oroya hanging wall lode in Brown Hill ground cut good values going towards the Paringa, and driving is in progress.

The Australia East is being developed from a crosscut off the New North Boulder shaft at Nos. 2, 3, 5 and 12 levels. The No. 12 crosscut is going west and will be used to prospect the old Oroya shoot. The open cut still supplies about 3,000 tons of mill ore monthly.

Oroya South.

At No. 9 level, a little development was done on the cross lode extension from Tetley and encouraging results were met with. Some stoping took place on Nos. 9 and 11 levels.

Total development consisted of 1,957 feet of driving, 1,515 feet crosscutting, 1,328 feet of rising and winzing and 5,145 feet of diamond drilling.

Ore reserves were given at the end of March as 521,000 tons positive ore at 5.2 dwt. and 32,000 tons probable ore at 5.1 dwt. per ton.

North Kalgurli (1912), *Limited,* treated 78,181 tons for a recovery of 25,721 fine ounces, an average yield of 6.58 dwt. per ton.

The Union Jack and Croesus sections remained closed.

Kalgurli Shaft.

On the Australia East lode a winze was sunk from No. 5 to No. 6 level in values and leading stopes taken off at both Nos. 5 and 6 levels. Values were good.

On the N.E.D. series a winze was sunk below No. 15 level to a depth of 91 feet, and ore was pulled from broken ore reserves.

On the Birthday Gift lode a winze was sunk from No. 8 to No. 9 horizon and some stoping was done at No. 9 level.

No work was done in the North Kalgurli ground in the levels off the Kalgurli shaft workings.

East Lode Series.

On the No. 3 level some little development was done off the east crosscut. About 100 feet of driving shows low values, but better grade ore is anticipated further north where the main shoots will be met.

On No. 4 level 350 feet of development was done in good values. The veins are narrow, but rich, and good widths can be stoped for mill ore. Good faces are showing in the north.

On the No. 5 level about 250 feet of driving was completed in good values and here also the lode is enriched by narrow seams.

At No. 6 level no work was done on the 401 east lode. On the 214 east lode the drive north was continued for a further 60 feet in good values.

On No. 7 level some work was done on the cross lode.

At No. 8 level, 100 feet of driving was completed during the year and stripping to a width of 55 feet was done in excellent values. This great width is possibly due to a roll in the lode formation.

This east lode series is opening up well and appears to be improving.

Ore reserves at the end of the year were estimated at 975,000 tons of positive ore worth 6.38 dwt. per ton and 395,000 tons of probable ore at 5.55 dwt.

Paringa Mining and Exploration, Limited, mined and treated 74,108 tons for 17,104 fine ounces of gold, the average recovery per ton being 4.62 dwt. The average head value was reported as 5.33 dwt. per ton.

This company acquired two leases adjacent to the Paringa and also the Maritana Hill lease south of Cassidy Hill. Its total holdings now comprise an area of 260 acres.

No additions were made to surface plant or installations.

The total development footage for the year was 1,667 feet, consisting of 678 feet of driving, 581 feet crosscutting and 408 feet rising and winzing. This total fell short of the previous year's figure by 2,233 feet.

Fair values were maintained in the work done from the 500ft. level to the 800ft. level of the Paringa lease.

Some development was carried out on the Paringa Extended Lease at the 300ft. and 400ft. levels. A strong lode channel exists here and, although values are low, an improvement is expected.

On the Block 45 lease, development included 117 feet of driving and 28 feet of crosscutting on the 300ft. level, but only low values were obtained. It is intended to carry out further prospecting on the main shoot.

On the North Kalgurli Central lease only 25 feet of driving was done.

The total development footage completed by this company since the resumption of operations in 1934 amounts to 40,750 feet.

Two diamond drill holes were bored from the 962ft. level, North Kalgurli (1912), Limited, property, in an endeavour to cut the downward extension of the Greenhill shoot. No values were disclosed.

Ore reserves at the end of August were estimated at 155,000 tons valued at 7.62 dwt. per ton.

South Kalgurli Consolidated, Limited, reported the production of 19,135 fine ounces of gold from the treatment of 63,065 tons of ore, an average yield of 6.07 dwt. per ton.

The treatment plant was closed down on the 9th March and treatment continued at the plant of Kalgoorlie Ore Treatment Limited, as a rationalisation scheme by which some 50 men were made available for work elsewhere. The plant and mill will be reconditioned with a view to the resumption of operations at some later date.

There was an increase in diamond drilling with the object of locating new ore bodies or proving the extension of old ones. Such work is considered economical of manpower.

The only development of outstanding interest was that of the No. 2 cross lode at the 1,920ft. level, which exposed 79 feet of ore averaging 11 dwt. over a width of five feet. An extension of the same ore body was proved at higher levels.

On the Hainault cross lode at the 427ft. level, 92 feet of driving averaged 7 dwt. over a width of five feet.

Ore reserves were estimated at 21/9/43 as 206,000 tons of proved ore valued at 5.2 dwt. and 141,000 tons of probable ore at 5.08 dwt. per ton.

TABLE F.

Classification of Gold Output, 1939–1943.

Range of Output.	1943.			1942.			1941.			1940.			1939.		
	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.	No. of Producers.	Production.	Percentage of Total.
Fine ozs.		fine ozs.			fine ozs.			fine ozs.			fine ozs.			fine ozs.	
Over 100,000	...	...	...	1	127,149	15·0	1	170,550	15·4	1	165,894	14·4	2	281,948	23·7
50,000–100,000	3	202,875	38·1	2	146,795	17·4	4	279,155	25·2	3	237,863	20·7	2	149,896	12·6
40,000– 50,000	...	...	...	2	87,082	10·3	3	131,557	11·9	3	137,651	11·9	2	95,093	8·0
30,000– 40,000	...	...	...	4	134,164	15·8	1	38,145	3·5	3	101,711	8·8	6	204,218	17·2
20,000– 30,000	5	121,408	22·8	3	69,679	8·2	6	146,278	13·2	7	166,613	14·4	5	124,818	10·5
10,000– 20,000	8	115,886	21·8	7	101,217	12·0	8	107,847	9·8	5	72,370	6·2	5	80,351	6·8
5,000– 10,000	4	24,407	4·6	7	49,124	5·8	9	62,514	5·6	13	99,321	8·7	8	55,115	4·6
4,000– 5,000	2	8,329	1·6	4	19,032	2·3	3	12,796	1·2	2	8,850	0·8	2	8,195	0·7
3,000– 4,000	3	9,626	1·8	5	16,999	2·0	5	16,992	1·5	3	10,950	0·9	7	24,450	2·1
2,000– 3,000	1	2,276	0·4	4	9,692	1·2	5	11,018	1·0	4	9,137	0·8	6	14,120	1·2
1,000– 2,000	4	5,250	1·0	9	12,946	1·5	19	27,040	2·4	19	26,932	2·3	20	29,500	2·5
500– 1,000	14	9,635	1·8	27	18,253	2·2	35	24,906	2·3	42	30,418	2·6	33	23,362	2·0
100– 500	87	21,345	4·0	130	29,963	3·5	180	41,730	3·8	193	43,007	3·7	203	46,358	3·9
Under 100	193	5,127	1·0	330	10,569	1·2	396	13,193	1·2	433	15,550	1·4	429	16,954	1·4
Sundry Claims, P.As., etc.	...	5,583	1·1	...	13,108	1·6	...	21,696	2·0	...	28,066	2·4	...	32,908	2·8
Total	324	531,747	100·0	535	845,772	100·0	675	1,105,477	100·0	731	1,154,843	100·0	730	1,188,286	100·0

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

Boulder Perseverance, Limited, mined 81,965 tons which was treated at the Kalgoorlie Ore Treatment Plant for a recovery of 22,985 fine ounces of gold, an average yield of 5·61 dwt. per ton.

Work was carried out at most levels from the 700-ft. to the 2,200-ft. horizon. The footage of development carried out was approximately the same as in the preceding year, but the tonnage broken and treated decreased by some 25,000 tons as a result of the continued labour shortage.

The filling of the cavity left by the subsidence in the Lake View open cut was completed in February, a total of 23,500 tons of filling having been placed. No further subsidence has occurred.

An additional unit will be installed early in the compressor room.

Kalgoorlie Enterprise, Limited, reported the production of 16,110 fine ounces of gold from the treatment of 54,027 tons of ore, the average recovery being 5·96 dwt. per ton.

No shaft sinking was done. The development footage was reduced still further, as was the tonnage of ore mined and treated. The work carried out was confined principally to Nos. 11, 13, 17 and 19 levels.

A commencement was made with cut and fill stoping, which is considered a more suitable method than shrinkage for some of the lodes. The method of filling being tried is hydraulic, using current treatment plant residues. The residues are classified to 50 per cent. plus 200 mesh, thickened to at least 60 per cent. solids and then pumped through a three inch pipe a distance of 2,000 feet on the surface to Victoria shaft. In the shaft, the pulp flows through a two inch pipe to the stope, in which the filling is required. The nature of the filling material necessitates careful preparation of the initial stope floor to make it practically watertight before the filling is run in.

This process is similar to that described in my 1942 Annual Report as being practised on the Great Boulder Mine.

Broken Hill Pty., Limited, at their *Hannan's North Mine,* ceased operations in January after the treatment of 695 tons of ore for the recovery of 441 fine ounces, the average yield being 12·69 dwt. per ton. This high yield was doubtless due to clean-up operations.

Consolidated Gold Areas, N.L., treated 8,127 tons of ore at the Celebration plant for a return of 2,276 fine ounces of gold, the average yield being 5·60 dwt. per ton. Operations ceased in September owing to manpower shortage.

The grade of ore mined at the time the mine closed was satisfactory and development at the 500-ft. level showed an improvement in values and widths. All power machinery has been taken over by the Allied Works Council for essential services, so that a speedy resumption of production after the war cannot be anticipated.

New Milano Gold Mines, N.L., at Mt. Monger, produced 587 fine ounces from the treatment of 1,609 tons of ore, and closed down in July.

The grade of the ore mined, up till the time when operations were suspended, was comparatively low and no new shoots of gold have been opened up for some considerable time.

The Leslie Gold Mine, which is owned by the New Milano Company, shows promise, and may prove valuable when the company resumes operations.

COOLGARDIE GOLDFIELD.

This usually active field was very quiet during the year. Apart from the operations of the two principal mines, Consolidated Gold Mines of Coolgardie, Ltd., and Phoenix Gold Mines, Ltd., the total production amounted to only 3,422 fine ounces, compared with 7,494 ounces in 1942 and 13,227 ounces in 1939.

Consolidated Gold Mines of Coolgardie, Ltd., mined and treated 32,983 tons of ore for a return of 5,127 fine ounces averaging 3·11 dwt. per ton.

This company has experienced a very difficult year. Shortage of manpower and of mining timber has retarded mining operations considerably and has been the cause of the low tonnage broken in shrink stopes.

The crushing section has given continuous trouble and is in urgent need of a complete overhaul, with numerous repairs and replacements. The low grade of the ore mined, in conjunction with the restricted output has made finance very difficult and some Government assistance was granted during the year to keep the mine in operation.

It is doubtful whether this mine will be able to continue in operation under the present conditions. Work on the lower levels indicates a continuation of the values and widths encountered on the upper levels.

Phoenix Gold Mines, Ltd., recovered 6,695 fine ounces of gold from the treatment of 24,719 tons of ore, the average yield being 5·42 dwt. per ton.

Manpower shortage was responsible for the curtailed production and no development of note was carried out.

Surprise Gold Mine. This mine is situated about six miles south-east of Coolgardie. During the year some very good crushings were put through the Coolgardie State Battery. Mining costs are low due to the soft nature of the country, the gold being confined to quartz leaders and schist country.

The Western Mining Corporation holds options over several leases in this locality.

YILGARN GOLDFIELD.

This field has also shown an enormous drop in productivity. In 1940 the total production was 68,142 fine ounces, while in 1943 it fell to less than 15,000 ounces.

Yellowdine Gold Development, Ltd., mined and treated 14,695 tons for 5,536 fine ounces of gold, averaging 7·53 dwt. per ton.

Tonnage treated was only a little over one half of that treated in 1942, but the grade of the ore appreciated by about 1½ dwt. per ton.

Development carried out consisted only of 30 feet of driving and 24 feet of rising and winzing.

This mine has little high grade ore in sight and unless future developments are favourable, its future looks doubtful.

Edna May Amalgamated Gold Mines, N.L., worked up to about one half capacity in treating 8,681 tons for 3,332 fine ounces. The average recovery works out at 7·68 dwt. per ton, about 2 dwt. less than the average yield for 1942.

Development, which was principally on the 575-ft. level, comprised 600 feet of driving, 523 feet crosscutting, 330 feet rising and winzing, and 1,143 feet of diamond drilling. The opening up of the 575-ft. level is not yet complete, but it is anticipated that, on completion, it will make available two years' supply of ore for the mill. The tonnage in reserve above the 426-ft. level is almost exhausted.

During the year a plant was installed for the recovery of tungsten minerals from current and accumulated tailings, and operations were commenced.

Evanston Gold Mine produced 796 fine ounces as a result of the treatment of 3,120 tons of ore. The average value extracted per ton was 5·10 dwt. Operations ceased in June.

Prior to the cessation of operations developments in the sulphide zone were promising, but further work is necessary in order to prove the extent of the ore body.

A large fall of earth occurred over a considerable portion of the mine early in the year and a heavy loss of oxidised ore resulted. It is estimated that some 20,000 tons of 1-oz. ore is buried. With skilled labour and competent supervision it is probable that a large proportion of this tonnage may be recovered when conditions return to normal.

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

Mine.	1943.			1942.			1941.			1940.			1939.		
	Tons treated.	Ounces Gold.	Dwt. per Ton.	Tons treated.	Ounces Gold.	Dwt. per Ton.	Tons treated.	Ounces Gold.	Dwt. per Ton.	Tons treated.	Ounces Gold.	Dwt. per Ton.	Tons treated.	Ounces Gold.	Dwt. per Ton.
Lake View and Star, Ltd.	260,720	87,196	6·69	402,071	127,149	6·32	618,191	170,550	5·52	591,671	165,894	5·61	604,340	171,623	5·68
Great Boulder Pty., Ltd.	283,201	63,302	4·47	328,277	81,057	4·94	392,779	93,216	4·75	417,298	97,141	4·66	358,364	110,325	6·16
Wiluna Gold Mines, Ltd.	479,069	52,377	2·19	548,226	65,738	2·40	568,900	72,586	2·55	583,516	86,732	2·97	581,245	90,169	3·10
Big Bell Mines, Ltd.	26,354	4,220	3·20	376,550	46,117	2·45	423,420	45,984	2·17	466,142	53,890	2·31	447,322	59,727	2·67
North Kalgurli (1912) Ltd.	78,181	25,721	6·58	115,488	40,965	7·09	140,911	45,415	6·44	135,957	45,674	6·72	139,205	49,476	7·11
North Kalgurli (Croesus Section)	....	....	....	7,488	2,172	5·80	65,450	14,025	4·27	*17,221	3,065	3·56	....	....	....
Central Norseman Gold Corporation, N.L.	76,864	27,089	7·05	89,085	39,994	8·98	121,212	53,913	8·89	98,799	34,626	7·01	88,313	35,255	7·98
Boulder Perseverance, Ltd.	81,965	22,985	5·61	107,377	32,757	6·10	121,313	38,145	6·29	111,996	36,103	6·45	114,589	37,681	6·58
The Sons of Gwalia, Ltd.	75,774	24,003	6·34	99,004	31,135	6·39	134,365	42,520	6·33	138,162	44,512	6·44	136,114	45,617	6·70
Gold Mines of Kalgoorlie, Ltd.	87,928	21,610	4·92	132,651	30,278	4·56	162,274	43,053	5·36	140,483	44,278	6·30	104,052	34,419	6·62
State Batteries	19,074	18,591	19·49	40,396	27,309	13·52	73,001	43,518	11·92	100,456	58,831	11·71	101,433	65,803	12·23
Moonlight Wiluna, Ltd.	100,577	17,790	3·54	113,791	24,798	4·36	105,881	26,141	4·94	106,467	26,735	5·07	95,805	26,816	5·60
South Kalgurli Consolidated, Ltd.	63,065	19,135	6·07	75,470	22,696	6·01	91,874	27,467	5·98	84,380	22,894	5·43	89,405	24,836	5·56
Paringa Mining and Exploration, Ltd.	74,108	17,104	4·62	83,798	22,185	5·29	92,289	22,460	4·87	92,000	21,206	4·61	79,676	18,749	4·77
Kalgoorlie Enterprise, Ltd.	54,027	16,110	5·96	62,241	19,911	6·40	70,806	22,495	6·35	66,424	20,953	6·31	59,336	19,274	6·49
Norseman Gold Mines, N.L.	58,215	11,734	4·03	80,428	18,731	4·66	138,813	26,220	3·78	152,289	25,906	3·40	123,404	31,046	5·03
Hannan's North (Broken Hill Pty., Ltd.)	695	441	12·69	38,939	14,298	7·34	40,444	16,211	8·26	40,018	16,828	8·41	37,162	17,022	9·16
Comet Gold Mines, Ltd.	12,905	13,265	20·56	12,977	13,324	20·54	15,844	12,221	17·32	10,901	8,027	14·73	5,872	5,564	18·95
Hill 50 Gold Mine, N.L.	36,459	10,054	5·52	38,068	11,533	5·90	30,863	10,688	6·93	26,065	9,802	7·52	24,764	7,912	6·39
Triton Gold Mine, N.L.	....	....	....	33,272	10,391	6·24	75,742	21,495	5·67	104,525	30,982	5·93	107,201	33,776	6·30
Yellowdine Gold Development, Ltd.	14,695	5,536	7·53	27,687	8,430	6·09	41,097	13,711	6·67	46,346	19,054	8·22	47,534	23,703	9·98
Consolidated Gold Mines of Coolgardie, Ltd.	32,983	5,127	3·11	43,169	8,252	3·82	72,507	13,175	3·63	69,086	12,857	3·72	43,106	8,764	4·07
Phoenix Gold Mines, Ltd.	24,719	6,695	5·42	28,214	7,942	5·63	33,831	9,631	5·69	24,282	7,329	6·03	....	....	....
Emu Gold Mines, Ltd.	28,567	7,049	4·93	30,827	7,792	5·06	18,484	3,119	3·37	47,050	11,941	5·07	48,452	12,649	5·21
Consolidated Gold Areas, Ltd.	8,127	2,276	5·60	22,105	5,762	5·19	31,152	6,642	4·26	34,377	7,315	4·26	....	....	....
Edna May Amalgamated Gold Mines, Ltd.	8,681	3,332	7·68	11,797	5,684	9·64	17,371	9,367	10·78	17,339	9,448	10·89	15,822	5,970	7·55
Ora Banda Amalgamated, N.L.	16,230	4,109	5·06	20,745	5,262	5·07	24,065	6,649	5·52	23,775	8,330	7·01	18,955	8,020	8·46
Gladiator Gold Mine, Ltd.	....	....	....	18,733	4,876	5·21	29,220	6,034	4·13	27,788	7,795	5·61	24,169	6,760	5·49
Spargo's Reward Gold Mine, N.L.	....	....	....	20,533	4,820	4·69	27,182	7,468	5·49	19,815	7,083	7·15	....	....	....
Evanston Gold Mine	3,120	796	5·10	9,959	4,448	8·95	15,284	6,219	8·01	11,352	8,391	14·78	....	....	....
First Hit Gold Mine, N.L.	4,260	3,099	14·55	5,624	3,849	13·69	7,760	5,397	13·91	8,065	5,570	13·81	7,949	5,034	12·67
Cox's Find (Western Mining Corporation, Ltd.)	....	....	....	5,636	3,236	11·48	21,890	12,397	11·33	19,116	9,200	9·63	17,615	12,657	14·37
Youanmi Gold Mines, Limited	....	....	....	3,893	2,825	14·51	73,858	17,023	4·61	85,017	22,560	5·31	77,221	20,696	5·36
Burbidge Gold Mines, N.L.	4,350	411	1·89	29,920	2,634	1·76	45,115	5,107	2·26	....	....	....	....	....	....
Blue Bird Gold Mines, N.L.	154	243	31·56	1,590	1,517	19·08	3,569	4,214	23·61	2,667	5,877	44·07	1,169	4,004	68·50
Lancefield (W.A.) Gold Mine, N.L.	....	....	....	....	....	....	....	....	....	49,179	11,690	4·75	128,343	32,041	4·99
Mt. Magnet Gold Mines, Limited	....	....	....	....	....	....	....	....	....	38,452	4,121	2·14	60,019	7,091	2·36
Total	2,015,067	487,314	4·84	3,067,119	759,867	4·95	3,946,657	974,476	4·94	4,008,475	1,012,749	5·05	3,785,887	1,028,475	5·43
Other Sources (excluding large retreatment plants)	35,944	33,739	18·77	158,585	72,876	9·19	264,117	116,638	8·85	283,133	109,979	7·77	309,470	131,004	8·47
Total (excluding large retreatment plants)	2,051,011	521,053	5·08	3,225,704	832,743	5·16	4,210,774	1,091,114	5·18	4,291,608	1,122,728	5·23	4,095,257	1,159,519	5·66
Golden Horseshoe Sands Retreatment	....	10,694	....	....	13,029	....	....	12,421	....	....	26,350	....	....	28,767	....
Morgans Sands Retreatment	....	....	....	....	....	....	....	1,942	....	....	5,765	....	....	....	....
GRAND TOTAL	2,051,011	531,747	5·19	3,225,704	845,772	5·24	4,210,774	1,105,477	5·25	4,291,608	1,154,843	5·38	4,095,257	1,188,286	5·80

* Tonnage from Croesus Section is for three months only. Prior to September, 1940, ore was treated at Kalgoorlie Ore Treatment Plant and was bulked with other North Kalgurli ore.

There are approximately 40,000 tons of sands stacked at the mine, estimated to contain 6 dwt. per ton. It is possible that a retreatment plant for such sands will be erected after the war.

Sunshine Reward Amalgamated (Edward's Reward) did very well for the year in spite of the labour shortage, in mining and treating 2,725 tons for a return of 1,339 fine ounces, an average yield of 9.86 dwts. per ton.

Some development was carried out, to the extent of 120 feet of driving and 200 feet of rising and winzing.

The ore body on this mine is now proved to the 400-ft. level, where values approximate 10 dwt. per ton over a width of five feet. It is proposed to sink a new shaft to the 500-ft. horizon after the war.

A plentiful supply of water is now available for the mill during the summer months.

Ore reserves are given as 9,000 tons. No value is quoted.

Latest reports indicate a prosperous future for this mine.

At the *Radio Mine* five men were employed breaking ore and attending to a five-head battery. The output for the year amounted to 702 fine ounces of gold from the treatment of 765 tons of ore, the average yield per ton, therefore, being 18.35 dwt.

No development was done during the year, but it is intended to sink the main shaft a further lift from the 300ft. to the 400ft. level when labour is available.

DUNDAS GOLDFIELD.

Gold production on this field, apart from the Norseman and Central Norseman mines, was almost negligible amounting in all to less than 2,000 ounces.

Norseman Gold Mines, N.L., mined and treated 58,215 tons of ore for 11,734 fine ounces of gold, averaging 4.03 dwt. per ton.

No ore from the *Iron King Mine* was mined for gold, but this mine was developed and worked for the production of pyrites throughout the year. This phase of operations will be discussed in the minerals section of this report.

This company also carried out some work on the Higginsville scheelite deposits, which will also be discussed in the minerals section.

Working costs for the year to 31st December, excluding development expenditure, on gold ore only were:—

	Per ton. £ s. d.
Ore extraction	1 2 1
Treatment	0 13 11
Total	1 16 0

Development.—The total expenditure for the year was:—

	£ s. d.
Norseman Mine operations on gold	9,472 13 1
Iron King Mine operations on pyrites	13,379 14 4
Higginsville Mine operations on scheelite	450 19 0
Total	23,303 6 5

Development footages are tabulated on Table H and show a substantial reduction on the main mine as compared with previous years, owing to the necessity for concentration on the development of the pyritic lode on the Iron King.

Most of the new development on the Norseman Mine was in connection with the completion of No. 9 level to Section 33, and stope preparation was largely devoted to a large block of ore between Nos. 8 and 9 levels, from Section 25 to Section 32. A small amount of exploratory driving and rising was also done from the north end of No. 2 level (Sections 18 and 19) in the Brown shaft workings.

The Brown shaft workings were closed in October to allow the transfer of additional men to operations on the Iron King. Work will be resumed there as soon as conditions permit.

Some exploration is being carried out above the south end of No. 8 level, with the object of investigating two veins of quartz intersected by diamond drilling in the hanging wall.

Gold ore reserves of this company were reported at the end of October to be:—

Norseman Gold Mine ..	235,000 tons at 4.0 dwt.
Iron King	333,000 tons at 2.2 dwt.

Expenditure during the year on alterations and additions to buildings and plant amounted to £6,360, including £403 for plant taken over from Norseman Developments, N.L., and Norseman Associated, N.L.

With the exception of a few small items, this outlay was entirely on account of the pyrite project, the principal items being as follows:—

(1) Completion of equipment of Red, White and Blue shaft.
(2) Equipment of main shaft at the Iron King Mine, including headframe, electric winder, etc.
(3) Pyrites flotation plant at the Norseman mine. (In addition to the actual flotation machine and accessories this item includes alteration and additions to a number of items of plant previously used in gold production.)
(4) Sundry underground equipment for the Iron King Mine, including mechanical loader, trucks, fans, etc.
(5) New Chevrolet tip truck with gas producer.

The foundry output for the year amounted to 51,084 lb. of various castings and 104 tons of grinding balls.

The total number of men employed at the end of the year was 134 on gold and 92 on pyrite production.

Central Norseman Gold Corporation, N.L., treated 76,864 tons of ore for the return of 27,089 fine ounces of gold, an average recovery of 7.05 dwt. per ton.

Development carried out for the year comprised 1,582 feet of driving, 86 feet crosscutting and 1,009 feet rising and winzing. Diamond drilling underground totalled 642 feet.

The principal development work undertaken during the period has consisted of testing at depth the ground north of the present mine workings, by driving north and winzing at the No. 16 level. In addition, the lode at the northern end of Nos. 11 and 14 levels was further developed.

Work on the Hardy Norseman section of the Norseman reef has ceased.

Ore breaking on the lower levels increased during the year and stoping operations are now fairly evenly distributed throughout the mine below the No. 8 level.

Ajax Shaft.—Following negative results of the diamond drilling campaign, all gear was salvaged and the pumps withdrawn.

Princess Royal.—Shortage of labour and the delay in arrival of certain equipment prevented a start being made in unwatering this mine.

The following tabulation illustrates the falling off in employment figures during the past three years:—

	Number of Employees. December, 1941.	December, 1942.	December, 1943.
Surface	94	63	60
Underground ..	196	134	107
Staff	32	21	18
Totals ..	322	218	185

Ore reserves at 23rd March, 1943, were reported as:—

Phoenix Mine ..	288,000 tons at 7.0 dwt. per ton.
Lady Miller ..	21,000 tons at 7.3 dwt. per ton.

TABLE H.

Development Footages reported by Principal Mines for 1943.

Goldfield.	Mine.	Shaft Sinking.	Driving.	Cross-cutting.	Rising and Winzing.	Diamond Drilling.	Total.
		feet.	feet.	feet.	feet.	feet.	feet.
Pilbara	Blue Spec Gold Mines, N.L.	297	62	171	45	...	575
East Murchison	Wiluna Gold Mines, Limited	...	4,175	941	2,642	...	7,758
	Moonlight Wiluna Gold Mines, Limited ...	...	21	...	52	...	73
Murchison ...	Big Bell Mines, Limited	...	421	52	150	80	703
	Hill 50 Gold Mines, N.L.	110	52	...	98	...	260
Mt. Margaret ...	Sons of Gwalia, Limited	...	590	238	679	774	2,281
North Coolgardie	First Hit Gold Mine, N.L.	...	671	57	307	...	1,035
	Mt. Ida Gold Mines, N.L.	...	253	72	61	...	386
East Coolgardie	Boulder Perseverance, Limited	...	2,262	...	1,084	746	4,092
	Gold Mines of Kalgoorlie, Limited ...	...	1,957	1,515	1,328	5,145	9,945
	Great Boulder Pty., Limited	...	6,590	1,491	2,588	5,631	16,300
	Kalgoorlie Enterprise, Limited	...	1,390	...	709	874	2,973
	Lake View and Star, Limited	...	4,373	772	2,086	1,359	8,590
	North Kalgurli (1912), Limited	...	1,333	429	504	4,299	6,565
	Paringa Mining and Exploration, Limited	...	678	581	408	...	1,667
	South Kalgurli Consolidated, Limited ...	...	1,135	1,162	570	4,995	7,862
Yilgarn ...	Edna May Amalgamated Gold Mines, N.L....	...	600	523	330	1,143	2,596
	Sunshine Reward, Amalgamated	...	120	...	200	...	320
	Yellowdine Gold Development, Limited ...	...	30	...	24	...	54
Dundas ...	Central Norseman Gold Corporation, N.L.	...	1,582	86	1,009	642	3,319
	Norseman Gold Mines. N.L.—						
	Norseman Gold Mine	...	1,517	14	637	...	2,168
	Iron King (Pyrites)	367	2,333	202	833	903	4,638

BROAD ARROW GOLDFIELD.

Ora Banda Amalgamated, N.L., mined and treated 16,230 tons for a return of 4,109 fine ounces of gold averaging 5.06 dwt. per ton.

The general unsatisfactory mining conditions have been felt severely by this mine, and the low grade of the ore mined has made it difficult to carry on the operations profitably.

Curtailment of development has been responsible for a grave depletion of ore reserve, and it seems likely that the mine will have to cease operations in the near future. Indications are that the ore body, with payable values, continues underfoot.

Ora Banda United Mines, Ltd., completed their plant early in the year and commenced operations with their slackline equipment. It was found that a far greater amount of overburden had to be shifted than what was anticipated, that the ore mined was lower in grade than had been estimated, and also that the ground, which it was thought would be of a nature to be worked without explosives, had to be shot.

These disappointments, together with lack of finance, caused the closure of the mine shortly after the commencement of operations.

There is little else to report from this goldfield, except that prospecting and small mining operations were on a greatly reduced scale.

NORTH COOLGARDIE GOLDFIELD.

Yerilla District.—The only producer in this district for the year was the *Porphyry Gold Mine, N.L.*, which treated 3,337 tons for a return of 555 fine ounces of gold and ceased operations in February.

Niagara District was almost entirely inactive, the total gold production amounting to only 38 fine ounces.

Ularring District produced 472 fine ounces of gold, principally from Morley's Find.

Menzies District.

First Hit Gold Mine, N.L., mined and treated 4,260 tons of ore for 3,099 fine ounces, an average yield of 14.55 dwt. per ton.

Development carried out for the year comprised 671 feet of driving, 57 feet crosscutting and 307 feet rising and winzing. The average number of men employed was 26.

The only new plant installed for the year consisted of two clarifiers and two water storage tanks.

Mount Ida Gold Mines, N.L., produced 3,195 fine ounces of gold from the treatment of 5,251 tons of ore, the average yield being 12.17 dwt.

Development included 253 feet of driving, 72 feet crosscutting and 61 feet rising and winzing.

The labour shortage proved so severe a handicap that this promising mine was forced to close down on the 21st December, leaving four men employed on maintenance.

Development on this mine indicates a sound position with respect to ore reserves.

Apart from these two mines, the Menzies District produced a total of 1,063 fine ounces of gold for the year.

MOUNT MARGARET GOLDFIELD.

Mt. Malcolm District.

The Sons of Gwalia, Ltd., treated 75,774 tons of ore for a return of 24,003 fine ounces of gold, the average yield remaining consistent as usual with this mine at 6.34 dwt. per ton.

Development was seriously curtailed owing to labour shortage and the sinking of the internal shaft was suspended for the year. In spite of this adverse condition, however, development is still well ahead of stoping operations and ore reserves are in a healthy condition.

Development of No. 30 level is well ahead, but the lack of skilled timbermen has slowed up stope preparation.

No. 31 level, so far as it has been opened up, has disclosed that the dimensions and values of the ore body continue at that level as anticipated.

The number of men employed for the year averaged 209.

The production from the remainder of this district totalled 1,017 fine ounces.

Mount Margaret District has now no large mines working. Prospecting and small scale operations resulted in the production of 1,064 fine ounces.

Mount Morgans District produced 2.789 fine ounces as the result of prospecting and small mining operations.

EAST MURCHISON GOLDFIELD.

Lawlers District.

Emu Gold Mines, Ltd., mined and treated 28,566 tons of ore for the recovery of 7,049 fine ounces of gold, the average yield being 4·93 dwt. per ton.

The labour position was somewwhat easier than during the previous year and development was resumed on a limited scale.

A cross lode was discovered and opened up on Nos. 8 and 9 levels. This ore body enabled the management to keep up the grade of the ore milled and has added a considerable tonnage to the ore available above No. 9 level. This is an important feature, as the sinking of the shaft below the No. 9 level has not been possible owing to war-time disabilities.

Diamond drilling is to be carried out to prove the extent of the cross lodes.

Westralian Tailings Treatment, Ltd., working on the Bellevue sands, produced 1,322 fine ounces of gold and ceased operations in July.

Other activities in this district produced only 318 fine ounces.

Wiluna District.

Wiluna Gold Mines, Ltd., mined and treated 479,069 tons for a gross return of 52,377 fine ounces, averaging 2·19 dwt. per ton.

Ore reserves at 31st December were reported as 390,000 short tons at 2·9 dwt. per ton.

Development footages, as reported in Table H. (page 27) were completed in preparing stopes for ore extraction, no exploratory work being carried out during the year. No new ore was located.

It is expected that milling operations will be continued for some months, provided that the already meagre labour supply is not further reduced. It has not been possible to secure additional labour for shaft sinking and the opening of the 2,100-ft. level, and the stage has been reached where the present ore reserve is insufficient to enable such work to be completed before the developed and partially developed ore is mined out.

The whole of the antimonial ore has been mined and concentrated, and the product is stored pending sale.

Operating results for the year are said to have been adversely affected by excessive absenteeism.

Moonlight Wiluna Gold Mines, Ltd., mined and treated 100,577 tons for the recovery of 17,790 fine ounces of gold, an average yield of 3·54 dwt. per ton.

No development was done for the year apart from a very small amount of stope preparation.

Ore reserves at the end of the year were estimated at:—

Sulphide Ore .. 40,000 short tons @ 4·2 dwt. per ton.
Oxidised Ore .. 31,000 short tons @ 5·9 dwt. per ton.

The average number of men employed was 18 on the surface and 61 underground.

Other production in this district totalled 1,154 fine ounces.

Black Range District.

There is nothing of importance to note in this district, whose total output was 1,180 fine ounces.

MURCHISON GOLDFIELD.

Cue District.

Big Bell Mines, Ltd., treated 26,354 tons of ore for 4,220 fine ounces of gold, the yield averaging 3·20 dwt. per ton. These operations represented one month's work, and the mine closed down on February 1st for the duration of the war.

No official figures have been published of the ore reserves of this mine, but an unofficial estimate places them at 2,500,000 tons at 2·9 dwt. per ton. A skeleton crew is engaged on maintenance.

Triton Gold Mines, N.L. The work of maintaining this mine has proceeded smoothly during the year, and the underground workings are being kept in reasonably good condition. Permission was granted during the latter part of the year for a small amount of development to be carried out, but such work has not yet commenced on account of the shortage of miners. If such work is undertaken now, it should be extremely valuable when mining operations are resumed.

Minor operations in this district resulted in the recovery of 2,333 fine ounces of gold.

Meekatharra District produced 4,345 fine ounces in all, the principal producers being *Consols North* with 755 ounces from 208 tons, *Pharlap* with 685 fine ounces from 713 tons and *Ingliston Consols Extended* with 587 fine ounces from 313 tons of ore.

Day Dawn District.

The rich *Mountain View Mine* treated 572 tons for the recovery of 1,586 fine ounces of gold, averaging 55·45 dwt. per ton. Other production totalled 236 ounces.

Mount Magnet District.

Hill 50 Gold Mines, N.L., treated 36,459 tons for a return of 10,054 fine ounces, the average yield being somewhat lower than in previous years at 5·52 dwt. per ton.

Ore reserves at 30th June were reported at 219,000 tons at 5·8 dwt. per ton.

Owing to labour shortage, little development was carried out apart from sinking the main shaft a further lift to the 410-ft. horizon.

It is proposed to undertake 260 feet of driving at this level during the current year to intersect the first payable ore body.

No additions to plant or alterations to milling practice were made during the year.

Moyagee Gold Mine carried on successfully during the year and treated 1,073 tons for 1,033 fine ounces of gold, averaging 18·70 dwt. per ton.

Other operations in the district resulted in the production of 1,559 fine ounces.

Swan Bitter and *Metropolitan Mining and Development, Ltd.*, ceased operations during the year.

YALGOO GOLDFIELD.

The *Carnation* mine produced 543 fine ounces from the treatment of 1,025 tons of ore.

All other operations on the field produced 746 fine ounces.

PEAK HILL GOLDFIELD.

There was nothing of note to report from this field, the total gold production from which was 480 fine ounces.

PILBARA GOLDFIELD.

Marble Bar District.

Comet Gold Mines, Ltd., treated 12,905 tons of ore and 5,559 tons of residues for a return of 13,265 fine ounces of gold, a yield of 20·56 dwt. per ton of ore treated.

The ore treated was produced from both the Comet lode and the Alexander lode, also known as McKinnon's mine.

At the Comet mine preparations have been completed for the sinking of an underlay internal shaft, which will facilitate the development of the Comet lode at depth.

At the Alexander lode (McKinnon's), development on the No. 1 level (137 feet) has proved the ore body for a further length of 60 feet, making the total length of ore exposed at this horizon 526 feet.

At No. 2 level (269 feet), the East drive has advanced 106 feet in ore, making the total length of ore exposed at this level 526 feet. The grade of ore on this lode has been maintained.

Two winzes have been sunk to a depth of 130 feet below the 269-ft. level, and the main shaft will now be sunk to this horizon with the object of opening up No. 3 level.

Minor operations in the Marble Bar district were responsible for the production of 1,775 fine ounces of gold.

Nullagine District.

This district produced a total output of 729 fine ounces for the year.

The principal interest was centred in development and plant erection at the *Blue Spec Gold Mines, N.L.*

Development at this mine comprised 297 feet of shaft sinking, 62 feet of driving, 171 feet of crosscutting and 45 feet of rising and winzing. Two plats were cut off the main shaft, one at 128 feet and the other at 278 feet below the collar.

No further ore reserves have been calculated as a result of this development, the latest figures to hand being 15,000 tons valued at 17.7 dwt. per ton at December 20th, 1940. This estimate may be accepted as conservative, as little ore has been mined since that date and subsequent development has at least partly proved substantial additional quantities of ore.

Plant erection commenced in October and the following units are now complete:—

(a) Electric winding engine and shed.
(b) Steel headframe.
(c) Primary and secondary crushers.
(d) Ball mill.

Coarse and fine ore bins, classifier and conveyor were in course of erection at the end of the year and it was anticipated that they would be completed by the end of March, 1944.

In the power house the following machinery has been erected:—

(a) 110 h.p. Crossley diesel engine coupled to a 300 cub. ft. compressor.
(b) 155 h.p. Crossley diesel engine coupled to a 500 cub. ft. compressor.
(c) 250 h.p. Crossley alternator set.
(d) Steel frame of power house building.

Considerable trouble has been experienced in locating a suitable water supply, but it is now considered that such a supply has been found within reasonable pumping distance of the mine.

COAL MINING.

The output of the Collie Coalfield during 1943 as compared with 1942 is shown in the following tabulation:—

Mine.	1943.		1942.	
	Tons.	Value.	Tons.	Value.
		£A.		£A.
Proprietary	158,072	150,003	149,387	121,987
Co-operative	87,182	82,817	91,631	73,553
Cardiff	69,978	63,538	96,405	73,957
Stockton	118,089	110,166	135,032	106,181
Stockton Open Cut	2,308	2,180	....	....
Total, Amalgamated Collieries	435,629	418,704	472,455	375,678
Griffin	95,507	80,641	108,721	85,817
Wyvern	410	376	....	...
Total, Griffin Coy.	95,917	81,017	108,721	85,817
Grand Total	531,546	499,721	581,176	461,495

It will be seen from the figures above that the output was approximately 50,000 tons lower than that of the previous year, while the value appreciated by £36,774.

The average number of men employed rose from 825 in 1942 to 839 in 1943.

Proprietary Mine.

The number of working places in this mine increased from 70 at the beginning of the year to 90 at the end of December. This improvement is due principally to the re-opening of the partly developed No. 11 Section during the year. Men engaged on development are working two shifts, but all others are working only day shift, with the exception of two coal cutting machine men, who are working two shifts on account of power problems.

During the year an 8 B.U. Joy Loader was introduced into the mine and put to work in No. 21 Section. Results were disappointing and the machine was withdrawn and installed in the Stockton Mine.

In the right hand workings of this mine the ventilation is not as satisfactory as could be desired. Steps are being taken to remedy this deficiency.

Co-operative Mine.

There was no alteration during the year in the number of places on this mine available for working, which remained at 76.

The production, which was wholly from the area served by the 5-Right haulage road, fell off by 4,449 tons as compared with the previous year's output and totalled 87,182 tons.

The work of connecting the main dip with the productive area, which will enable a straight haulage to be completed to the surface, is in progress. The unwatering of the main dip showed the existence of a stone drive through the fault for a distance of approximately 10 chains. This drive has been connected with the lower workings by a shaft and preparations are in hand for grading operations to connect the workings on either side of the fault, so that the new haulage arrangements may be completed.

Some ventilation problems have been experienced, accompanied by higher temperatures than are usually met with in the Collie Coalfield. Improved conditions are already noticeable as the result of the connection and good working conditions as well as a substantially increased output can be confidently anticipated when the main tunnel is completed and the new haulage is in operation.

Stockton Mine.

The number of working places available on this mine at the end of the year totalled 70, compared with 62 at the end of 1942. This figure does not include places where bottom coal was worked by the Joy loader.

This machine was out of commission for some time before the end of the year, being laid up for repairs in the Central Workshop, after being damaged by a fall of earth from the roof.

Brief satisfactory runs have shown that the Joy loader is capable of loading skips very rapidly and the experience gained should enable it to be used to advantage during the coming year.

In No. 1 Right Section the working places are being rapidly worked out and little coal will be left in such section by the end of 1944, unless some provision is made for the working of pillars.

It is desirable that the stone drive section be opened up as early as possible, as it will constitute the future main workings of the mine. The coal in this section appears to be of particularly good quality and a considerable area of country has been prospected and proved by boring in front of the workings. Boring is still in progress. A shaft from the surface connecting with this section was completed during the year.

In No. 4 Left Section it was proposed to introduce scraper loaders for use while splitting pillars, but they had not been installed at the end of the year.

Stockton Open Cut.

On an area west of the main tunnel, bores had cut two seams of coal at a shallow depth where it appeared that opencut operations would produce coal quickly and cheaply. A 37 R.B. electric dragline with a 1 cubic yard bucket was secured from the Big Bell Mines and two 10 R.B. ⅜ yard shovels, one electric and one diesel, were also rented. Open cut operations were commenced in the early winter months and some trouble was experienced with wet weather and boggy ground. Progress was not as fast as anticipated and up till the end of the year, only a small quantity of coal had been produced. An appreciable production is anticipated from this source during the current year and in future.

A sluicing plant from Greenbushes was also installed at the opposite end of the area to that on which the power shovels were working, but progress was severely hampered by the presence of a thick seam of laterite, which was not apparent in the bore holes. As it was necessary to bore and shoot this rock, remove it by dragline and truck it away, progress was slow, more especially as the dragline was engaged elsewhere for long periods, thus rendering the sluicing plant inoperative until it was available. It is unfortunate that these operations were started in an unsuitable area, as, given comparatively soft ground, such method would rapidly remove the overburden and dispose of the spoil very cheaply.

Cardiff Mine.

The position at this mine is far from satisfactory. The number of working places, owing to the encroachment of the big fault at the bottom of the workings, has been successively reduced from 52 in 1941 to 36 in 1942 and 12 at the end of 1943. There are actually 12 more places in No. 9 Section, but work in such section was stopped with the introduction during the year of scraper loaders for the purpose of working coal from the top of the seam.

The seam in this mine is wide and over an extensive area an average of 5 feet of coal has been left in the roof. A start has been made to extract this coal and load it into skips by means of scraper loaders.

Griffin Mine.

There are 46 working places available at this mine compared with 47 in the previous year. A fault coming in on the northern boundary was responsible for the loss of five or six places, but such loss has been partially compensated by a connection in the stone drive section with No. 6 Section in the old portion of the mine where several places were ready to work.

The steepness of the seam, combined with the presence of excessive water in the stone drive section and the lower portion of 10 left slants has hampered development work, but it is now the intention of the management to introduce mobile scraper loaders into dip places. By these means it is hoped that the development of the mine may be pushed ahead.

Wyvern Colliery.

This is a new colliery opened during the year to work the top, or 12 foot, seam on the Griffin leases. It was ready for production at the end of the year.

The method of coal extraction to be followed at this mine consists of "grunching" the coal (shooting out of the solid) and filling out by means of mobile scraper loaders. The first machine has already been introduced and is working satisfactorily. The output is approximately 25 tons per shift, employing three men, who also empty the coal into a bin at the surface.

When the first panel is set out, the coal will be loaded on to a 30in. belt and conveyed to the surface.

The Company is making an effort to equip and operate this mine on modern lines, closely following the advice of Mr. R. P. Jack, executive officer of the Commonwealth Coal Commission.

A large output from this mine can be confidently expected, but deliveries of essential equipment and shortage of manpower are making it difficult to reach full production as rapidly as could be desired.

Conclusion.

It is pleasing to be able to record that Collie has been comparatively free from industrial troubles.

An increased demand for coal has made increased production very necessary. To achieve this result, opencut mining operations have been started and the Wyvern Mine is being opened up. In order to obtain the maximum increase in production with the minimum addition of manpower, labour-saving machinery is being introduced as rapidly as the present war conditions permit.

A Western Australian Coal Committee was appointed in July, 1942, by the Commonwealth Coal Commission to ration and distribute all native coal and all coal imported into the State and has functioned since that date. The members of the Committee are: R. C. Wilson, State Mining Engineer (Chairman); F. C. Edmondson, General Manager, City of Perth Electricity and Gas Department; H. L. Morgan, Branch Manager, Melbourne Steamship Company, Limited; and P. C. Raynor, Deputy Assistant Secretary for Railways.

MINERALS OTHER THAN GOLD AND COAL.

Activity in the search for and production of strategic and economic minerals increased during the year under review, and much time has been spent by Departmental officers on investigations connected with the production of such minerals and in consultation with producers.

The total value of mineral production other than gold and coal during the year was £186,377, compared with £160,508 during the previous year.

Alunite.—Plant construction was practically completed at the Lake Campion project at the end of the year, and potash production is expected to commence early during the current year.

Antimony.—Sales of antimonial concentrates from the Wiluna Gold Mines, Limited, amounted to 1,127 tons valued at £41,676. It is reported that all the antimonial ore from this mine has now been mined and concentrated, and stacked pending sale.

Production from the Blue Spec Mine at Nullagine has not yet commenced, but it is expected that the mine will be in operation towards the middle of the current year.

Arsenic.—The sole producer of this commodity was again Wiluna Gold Mines, Limited, whose output for the year was 2,283 tons, valued at £47,943.

Asbestos.—Total asbestos production reported for the year was as follows:—

Variety.	Tons.	Value. £
Crocidolite	181.55 (short)	10,090
Chrysotile	52.85 (short)	2,798
Anthophyllite	8.68 (long)	87

Crocidolite.—Australian Blue Asbestos, Limited, a subsidiary of the Colonial Sugar Refining Company, Limited, early in the year exercised an option held over the L. G. Hancock Company's holdings and plant in Wittenoom Gorge, and has been making preparations for large-scale operations.

A boarding-house, with refrigeration plant, etc., was erected for the employees and a site for workers' homes was cleared. Building, however, was held up pending the approval of plans and arrival of material.

The steel frame for the power house was erected and a 105 h.p. Ruston Hornsby alternator set installed. Foundations were laid down for other power units.

A large steel frame for the mill building and various foundations for machinery were completed.

Two buildings were completed for use as store and office.

A good road from the mouth of the gorge to the plant site is in course of construction by the Main Roads Board.

Little actual mining was carried out during the year. A track was cut in the side of the gorge to the site of the proposed adit, a portal cleaned down and some 30 feet of test drive put in. At the end of the track

nearest the plant a small steel sharpening shop was erected, supplied with air from a portable compressor nearby.

The mill under construction is designed to crush 1,000 tons of rock per month, working one shift, and the eventual fibre production is estimated at some 350 tons per month. Provision has been made for the duplication of some sections of the mill, notably the crushing section.

A small production of fibre was maintained with the Hancock Company's old plant.

The Asbestos, Molybdenum and Tungsten Company's leases and plant at Yampire Gorge were auctioned early in the year and purchased by De Bernales interests. Plant reconditioning and construction and mine development with a view to large-scale production are in progress and it is understood that a satisfactory market is assured for the product.

Chrysotile.—The production of chrysotile asbestos was higher than it had been for some considerable period. This was principally due to private efforts made to organise the production of individual operators, so that a regular supply of fibre might be maintained and contracts entered into with consumers in this State and in the Eastern States.

A contract was entered into for the supply of 400 tons of high grade asbestos at the rate of 25 tons per month for defence purposes. As supplies were not coming forward with any regularity, or in the desired quantity, an application for assistance was made to this Department with the object of organising a transport system and helping individual producers to increase and regulate their output.

Inspector Adams, District Inspector of Mines at Cue, was asked to examine the prospects on the field and submit a report on the proposals, which were estimated to cost approximately £5,000.

Mr. Adams made what may be termed a preliminary reconnaissance of the field and submitted an instructive and constructive report in which he outlines a method by which a regular production of chrysotile fibre of all grades may be obtained and which is attached as an appendix to this report.

The salient points to be gathered from such report are:—

(1) There are strong indications that asbestos exists in the area under survey in sufficient quantity to justify an attempt to exploit it on a commercial scale, constituting an industry which might possibly be expanded eventually to a degree which will enable it to supply at least Australian requirements of chrysotile asbestos.

(2) The deposits, though small compared with Canadian deposits, are comparatively rich and so distributed that they may be worked economically as independent groups of mines, with either a complete dressing plant for each group or a partial plant for each group and a final processing plant, centrally situated, to treat the fibre to the degree required by consumers. The second alternative might be preferable as it would ensure a consistent and standard product.

(3) No important quantities of fibre can be produced by a continuation of "gouging" methods as practised by present individual operators.

(4) Preliminary estimates of the equipment and development of a nuclear establishment of three small groups indicate the possibility of the production of some 3,000 tons of all grades of fibre per annum with a reasonable margin of profit. Mr. Adams's rough estimate of cost of plant and development to bring the mines into such production is £25,000.

(5) Transport problems will not present any insuperable difficulties, but some road building will be necessary.

(6) The provision of suitable labour will constitute the greatest problem in connection with the proposal, especially in the initial stages. Housing and the provision of social amenities will have to be undertaken. In introducing labour into the North-West area it will be found that an appreciable proportion of the personnel involved will find climate and conditions repugnant and will not remain on the job. Fares and expenses on this account must be allowed for.

Mr. Adams's estimate deals, of course, with actual development and plant expenses only, but it is necessary also to consider the provision of reserve stocks of fibre at a centre suitable for distribution to consumers. In such manner only can a constant supply be maintained in the event of a stoppage for any of a multitude of reasons, such as floods, fires, accidents, strikes, etc. Assuming Mr. Adams's estimates to be reasonably correct, it would probably be wise to double it to allow for such stock-piling, bringing the amount of capital required for the project to approximately £50,000.

This proposal seems admirably suited for consideration as part of the Post-War Reconstruction programme, although, if it is favourably considered, preliminary work should be taken in hand immediately with the object of absorbing the maximum amount of labour after the war.

Settlement of the North-West is of vital importance in Post-War Reconstruction, and this industry, if placed on its feet, will benefit both this State and the Commonwealth by producing a valuable article of commerce as well as playing a major part in the development of the North-West Division.

There would appear to be a definite possibility that this State might eventually be in a position to supply the whole asbestos requirements of Australia with Hamersley Range crocidolite, North-West chrysotile and South-West anthophyllite.

It should be borne in mind that there is no standardised equipment for an asbestos treatment plant, so that a certain amount of experimental work is necessary before a satisfactory plant can be designed and put into operation. Possibly the most economical approach to the proposal would be to concentrate on one mine until the standard of treatment is decided.

Anthophyllite.—This class of asbestos is widely distributed in the State, but the best fibre examined to date is from the Bindi Bindi deposit, which is conveniently situated 125 miles from Perth, one-quarter mile from a main road and two miles from a railway siding.

The 8.65 tons of anthophyllite reported as produced in 1943 was from this deposit, where it was gouged out from surface workings in two or three weeks by two old prospectors, to supply a small order from the Eastern States.

A private company carried out some investigation and development on the deposit, and made inquiries which indicated a fairly firm market for this material in the Eastern States.

Investigations, although incomplete, suggested the existence of a large body of good slip fibre of a long, rather weak staple, suitable for filters, lagging and insulation, and also of a certain amount of cross fibre material, occurring in bunchy aggregates, which is very strong and silky. The amount of this latter material is unknown, but it should prove to be a good spinning fibre.

Enquiries in the Eastern States led to the belief that an immediate market existed for some 500 tons per annum, with possibilities of post war expansion. Towards the end of the year, however, it appeared that there was some doubt as to the stability of such market, and production was held up pending further enquiries.

Prices.—It has proved rather difficult to ascertain firm prices for any class of asbestos in Australia. Prices appear to be a matter of arrangement between producer and consumer.

American prices per short ton for chrysotile in November, 1943, were as follows:—

Crude No. 1	$650–$750	=	£A200 12 0–231 7 7
Crude No. 2	$165–$385	=	£A51 5 10–118 10 4
Spinning Fibres	$124–$233	=	£A38 3 5– 71 14 6
Shingle Stock	$62·50–$65	=	£A19 14 9– 20 10 4

South African prices for crocidolite in July, 1943, f.o.b. nearest port were:—

Designation	Length fibre.	Prices per short ton. £ Sterling.	£A
S ..	¼in.—½in.	31	38 15 0
A ..	½in.—¾in.	40	50 0 0
B ..	¾in.—1¼in.	55	68 15 0
C ..	1¼in.—1¾in.	80	96 0 0
D ..	Over 1¾in.	100	125 0 0

The Australian value for good anthophyllite asbestos was indicated at about £16 per long ton.

Generally speaking there would appear to be the basis of a sound asbestos industry in this State, provided that a firm market can be established and continuity of supply maintained.

Bentonite.—Bentonite was produced at Marchagee, on the Midland line to the extent of 159 tons, valued at £227 10s.

Beryl.—Until quite recently the only known use for beryl was as a gemstone, emerald and aquamarine being the favourite varieties. Of recent years, however, the metal beryllium has become increasingly important in industrial alloys, and has been hailed in some technical journals as a "wonder metal" and "the glamour child of metallurgy."

Its principal use is for the production of copper base alloys in which the beryllium content varies from 0·3 to 2·5 per cent. The form in which the metal is made available to the industry is a 4 per cent. beryllium-copper master alloy.

Properties of hardness, high fatigue strength and elastic limit possessed by these alloys make them particularly valuable for the manufacture of springs. They also possess relatively high electrical conductivity. They resist corrosion and wear and also galling when in contact with steel surfaces. They are used largely in the manufacture of component parts for aircrafts, ships, tanks, guns, shells, electric motors, tools, radio, telephone, telegraph and other electric instruments and are consequently of high strategic importance.

Intensive researches are being carried out with the object of providing other beryllium alloys in addition to those with copper, and some beryllium-aluminium alloys have proved of great interest under test, indicating that they may show outstanding superiority over other alloys for special important applications.

Apart from the uses which have been and are being found for the metal itself, the oxide, or beryllia, is a very valuable material in industry. It is a particularly useful refractory, being very strong, hard and resistant to abrupt changes in temperature. Its melting point is 2,750° C—some 500° higher than that of alumina—and not only has it the characteristic of high electric resistance at elevated temperatures, but appears to have the property of conferring such characteristic to a composition of other oxides with which it is combined. When finally divided, in spite of its high thermal conductivity, it is an excellent heat insulator for high temperature furnaces, and especially for high-frequency electric furnaces.

In addition to its value as a refractory material, beryllium oxide is also the most important fluorescent material used in the fluorescent lamp industry in the U.S.A. It is claimed that 1 lb. of beryllium oxide is sufficient for more than 4,000 fluorescent lamps and that the annual quantity consumed in such industry approximates 10,000 lb.

Further uses for this material are found in the manufacture of X-ray screens, cathode ray tubes and television equipment.

It will be readily seen why beryllium has attained such a high priority as a strategic necessity in war-time and that the demand for it after the cessation of hostilities is unlikely to fall. It is, indeed, more probable that further uses will be discovered and that the demand will increase.

Occurrence.

A number of minerals containing beryllium occur in nature, among which are the following:—

Name.	*Composition.*	*% BeO.*
Beryl	$Be_3Al_2(SiO_3)_6$	14·0
Bertrandite	$H_2Be_4Si_2O_9$	42·1
Beryllonite	$NaBePO_4$	19·8
Chrysoberyl	$BeAl_2O_4$	19·8
Euclase	$Be(AlOH)SiO_4$	17·3
Gadolinite	$Be_2Fe(YO)_2(SiO_4)_2$ ...	10·7
Hambergite	$Be(OH)BO_3$	29·9
Herderite	$(CaF)BePO_4$	18·8
Phenacite	Be_2SiO_4	45·55

Of these minerals beryl is by far the most common and is, therefore, in spite of its relatively low beryllium content, regarded as the principal, if not the only, source of commercial supply. It occurs as a constituent of many pegmatite dykes and, in common with practically all minor constituents of pegmatites, such occurrence consists of isolated crystals, or pockety aggregations of crystals, more or less erratically distributed throughout the dyke. On account of the sporadic nature of its occurrence, it is unusual to find beryl in sufficient quantity to warrant mining operations for itself alone at the prevailing market price, and it is generally regarded as a by-product in the mining of such commodities as felspar, mica, tantalite and other pegmatite minerals. Some 400 or 500 tons of beryl were collected in this manner over several years during mining operations for tantalite at Wodgina in the Pilbara Goldfield. Although the market for beryl at the time it was mined was extremely limited and the price offered too low to cover transport charges, it was collected and stacked in a separate dump. This long-sighted policy was repaid when beryl became a strategic necessity and the price was increased fourfold.

The pegmatites at Yinnietharra, on the Gascoyne River, are apparently comparatively rich in beryl, and appreciable quantities are being picked up on the surface, where it has been freely scattered during the weathering of the dykes. One drawback to this method of production is that, although beryl in its crystalline form or in one of its characteristic green or blue colours is easily enough recognisable, yet in its more bleached and broken forms it is often quite indistinguishable from pieces of quartz and felspar.

It is possible that, should the Yinnietharra mica mines remain in operation, a more or less regular supply of beryl might be obtained as a by-product.

Assays of parcels of beryl from this area to date have been consistently high. Of 40 tons picked up, the average assay of representative samples of parcels aggregating 38.6 tons was 13.19 per cent.

As the extent of the areas of detrital rubble from which these parcels were gathered is considerable, it is very desirable to find a practicable method of distinguishing the beryl from the fragments of quartz and felspar which much of it outwardly resembles.

Two possible methods present themselves for consideration:—

(1) Devising a quick chemical or physical test by which beryl may be recognised, thus facilitating hand picking.

(2) The perfection of a flotation method for the separation of the beryl from the associated minerals. Such a method is said to have been devised on a laboratory scale (Minerals Year Book, 1938, p. 673). One great difficulty in the Yinnietharra or similar area of working a flotation process, would be shortage of water, which is required in large quantities for most flotation processes.

It has been claimed that beryllium is about ten times more abundant in nature than tin. On account of its low specific gravity, however, which is roughly identical with that of quartz and felspar, and the fact that beryl is a comparatively easily alterable mineral, it is not found concentrated in alluvial deposits, but tends rather to disperse after the weathering and breaking up of the pegmatite dyke in which it occurs.

It is obvious, therefore, that the mining of beryl is attended with difficulties which are not reflected in the price obtained for the mineral. The sporadic nature of its occurrence *in situ* means that a large tonnage of rock must be broken to obtain comparatively small quantities of beryl, and there is little chance of finding large accumulations in detrital pegmatite.

The price paid for parcels sent to America from this State in recent months is $7 per short ton unit of BeO, which means $91 or £A.28 (approximately) per short ton for 13 per cent. material. It is interesting to note that while America is offering Australia $7 per unit, f.o.b. capital port, for this commodity, the price paid f.o.b. mines in U.S.A. is $10 per unit.

The price of beryllium as a beryllium copper alloy has for some years been stationary at $23 per lb. of contained Be, but this has recently been reduced to $15 per lb.

At $7 per unit BeO, the contained Be metal in the ore, is purchased at $1 (approximately) per lb. There appears, therefore, to be plenty of scope for improvement in metallurgical practice, which would allow for a rise in the price of the raw material and a reduction in the price of the prepared metal to the consumer.

Production of beryl for the year totalled 547·8 long tons, valued at £16,009, as follows:—

Yinnietharra.—40·63 long tons, averaging 13·1 per cent. BeO, valued at £1,265 10s. 8d.

Wodgina.—507·07 long tons, averaging 12 per cent. BeO, valued at £14,741 12s. 4d.

Mundaring.—·1 ton, valued at £2.

The Yinnietharra and Mundaring products were purchased by Broken Hill Proprietary, Limited, the price being 49s. per long ton unit, f.o.b. Fremantle.

The Wodgina product was purchased by the Department of Supply and Shipping and shipped to America, the price being $7 per short ton unit of BeO.

Bismuth.—The only production of bismuth concentrate during the year was from Yinnietharra and consisted of ·25 ton of an estimated value of £137.

Clays (excluding Bentonite).—The total production for the year, from various localities, was 2,111·75 tons, valued at £1,386.

Copper.—The only copper production reported to this Department for the year was ·33 tons of metallic copper, valued at £33, reported by the Westralian Tailings Treatment Company, Limited, at Mt. Sir Samuel.

In addition to the above, about 22 cwt. of copper bullion, assaying 97 per cent. Cu and 60 dwt. gold per short ton, was produced as the result of experimental work with a small water-jacketed blast furnace installed at Ravensthorpe by this Department, under the supervision of Mr. A. C. McDonald, Senior Research Metallurgist at the Kalgoorlie School of Mines.

As a result of this work the treatment locally of the medium grade gold bearing copper ores of the Ravensthorpe district has been made possible, and it is anticipated that regular, if comparatively small, production from this source will take place in future.

It is not intended to deal at any length in this report with such experimental work, as it will doubtless be a feature of the Report of the Director of the School of Mines.

Diatomaceous Earth.—Operations at the Peel Estate resulted in the production of 40 tons of diatomaceous earth, valued at £640.

Felspar.—The quarry at Londonderry, in the Coolgardie Goldfield, produced 2,289 tons, valued at £6,867, averaging just under 50 tons per working week. About one ton of felspar is won to two tons of reject material.

A belt type mechanical loader was given a trial during the year, but was not successful on account of the large size of the broken material.

Test holes at the bottom of the quarry indicated a better class of felspar than that mined to date.

Investigations during the year indicate the possibility of the production of other pegmatite minerals, such as beryl, lithium minerals and tantalo-columbite from this quarry.

The only other locality from which felspar was reported during the year was Balingup, where 24½ tons were mined, valued at £57.

Glass Sand.—There was a production of 340 tons of glass sand from the Wanneroo district, valued at £305.

Glauconite.—In the Gingin area 98 tons of glauconite was recovered from 491 tons of green sand. The estimated value of the glauconite was £2,450.

Graphite.—The production of 11 tons of graphite ore, valued at £55, was reported from Donnelly River.

There have been a considerable number of enquiries during the year in relation to this mineral, and several deposits have been tested.

Early in the year the Commonwealth Government intimated that a reasonable market existed for graphite in Australia, but this Department was advised later that Government assistance had been granted to open a mine in South Australia which, it is estimated, would provide sufficient of this material to satisfy Australian requirements.

Work on the Donnelly River deposits by Minerals Development (W.A.), Limited, indicates the existence of payable graphite in that area, provided that a market for the product is assured.

At Munglinup, on the Young River, between Ravensthorpe and Esperance, Perth Modelling Works undertook some development on the promising deposits in that area, with gratifying results. Samples of this ore were beneficiated by the Kalgoorlie School of Mines Laboratory and a very satisfactory return of extremely high grade flake graphite was obtained.

Both of these companies are seeking a regular market for their product and are prepared to instal plants if warranted.

Gypsum.—Production from the lake country at Baandee and Woollundra totalled 835 tons, valued at £880.

Iron.—Construction of the charcoal iron smelter at Wundowie was undertaken during the year. Some considerable progress was made, notwithstanding the shortage of manpower and materials, and it is thought possible that production may commence in 1945.

It is estimated that this plant, when completed, will produce 10,000 tons of high grade pig iron per year, while the economics of the project are largely bound up in the production and sale of the by-products of the wood distillation plant—chiefly acetic acid.

The production was reported of 84 tons of iron ore from Koolyanobbing, valued at £128.

Kyanite.—There was no production of kyanite for the year, but Mr. J. H. Smith, of Bridgetown, reported an occurrence, on which he had pegged, situated about 11 miles north-west of Manjimup.

Unlike a previous occurrence recently discovered at Smithfield, which consisted principally of more or less isolated boulders, this occurrence is apparently a rather extensive outcrop of massive kyanite rock. A preliminary sample was submitted to the Government Mineralogist and Analyst, who determined it to contain 90 per cent. kyanite: It is thought that this discovery may be of some considerable economic importance.

Mica.—Owing to a shortage of high class strategic mica and following favourable reports on investigations made during the previous year, a Commonwealth party commenced operations at Yinnietharra during the year for the exploitation of the mica deposits. As the shortage was principally confined to the clear quality mica, it was decided to open up the deposit which investigations had indicated would produce most of that class.

Compressor and power plant were installed, with the necessary housing, also huts were erected for accommodation for men, mess room, office, change room, etc. Approximately 25 men are employed.

Transport was arranged from Mullewa, a distance of about 370 miles from the mine.

It was decided to open cut the pegmatite dyke in which the mica occurrences exist, and a ramp was constructed at right angles to the line of dyke, connecting with an inclined cut, designed to intersect the hanging wall of the dyke at a depth of 15 feet.

A rich pocket of mica was struck at this point, but, as the ground was highly decomposed, the books were badly strained and cracked by the expansion of the felspars during decomposition and further damaged by interlaminal inclusions of secondary silica. A fair number of the books also contained flaws due to faulty crystallisation. In consequence of this the yield of sheet mica did not realise expectations. The quality of the mica, however, was particularly good and it was confidently anticipated that a much better yield would be obtained when the zone of extreme oxidation was passed. Several very good books were met with in the floor at this horizon.

In view of the fact that no experienced mica cutters were available, it was decided to split and thumb-trim the mica on the mine and to send the thumb-trimmed product to the Melbourne store of the Department of Supply and Shipping, where girls were being trained to do this work. It was considered that the value of the scrap mica thus produced would possibly pay for the extra freight incurred.

Up till the end of the year, 285 lbs. of cut mica, valued at £138, and 13,623 lbs. of thumb-trimmed sheets were produced and sent to Melbourne.

The results from the thumb-trimmed material were disappointing. The mine superintendent, after a test, estimated a yield of 24 per cent. of sheet mica from his shipments, but returns from Melbourne were only a little over 10 per cent., and the total value of the thumb-trimmed output was assessed at £577.

As mica trimming is a tedious and rather expert business and it is possible to waste a large proportion of the output by inexpert cutting, it is hoped that a better yield will be obtained as the cutters gain experience.

In February, 1943, a Prices Regulation Order, regulating the price of mica to be paid to producers, was brought out by the Prices Commissioner. The prices for the various grades and qualities were fixed as follows:—

Grade.	To Cut a Minimum Rectangle of	Price per lb.			
		Clear.	Commercial Clear.	Stained.	Spotted.
		s. d.	s. d.	s. d.	s. d.
Special	100 sq. inches	....	....	19 0	17 0
Large	24 sq. inches	....	....	13 8	13 0
Large	20 sq. inches	24 6	18 0	....	....
Medium	14 sq. inches	....	....	8 5	8 0
Medium	10 sq. inches	15 0	11 6	....	....
Strip	5 in. x 1 in.	8 9	7 0	5 0	4 9
Small	6 sq. inches	4 0	3 6	2 2	2 0
Washer	1½ sq. inches	2 9	2 6	1 8	1 6

As these prices were considerably below world parity, a protest against them was made by this Department in the interests of the producers, resulting in a general rise of 25 per cent. A further protest was made and a further rise of approximately 75 per cent. on the original prices resulted.

Finally in November a new Prices Regulations Order was brought out, giving alternative prices for Australian grading as above and also for the Indian or Standard grading. These prices represent a big advance on those in the original order and must be considered satisfactory.

The present prices are as follows:—

AUSTRALIAN GRADING.

Grade.	To Cut a Minimum Rectangle of	Price per lb.			
		Clear.	Commercial Clear.	Stained.	Spotted.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Special	80 sq. inches	....	....	1 16 0	1 11 6
	60 sq. inches	5 8 0	4 1 0	....	....
Large	24 sq. inches	....	....	1 8 4	1 7 0
	20 sq. inches	3 12 0	2 17 0	....	....
Medium	12 sq. inches	....	....	0 18 0	0 14 6
	10 sq. inches	2 3 3	1 14 3	....	....
Strip	5 in. x 1 in.	1 4 3	0 19 4	0 8 0	0 7 3
Small	6 sq. inches	0 12 6	0 10 10	0 5 4	0 4 6
Washer	1½ sq. inches	0 10 4	0 6 9	0 3 1	0 2 8

STANDARD GRADING.

Grade.	To cut a minumun rectangle of—	Price per lb.			
		Clear and Slightly Stained.	Fair Stained.	Good Stained.	Stained.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Special	48 square inches	5 8 0	4 1 0	1 16 0	1 11 6
A1	36 ,, ,,	3 12 0	2 18 6	1 11 6	1 7 0
1	24 ,, ,,	2 18 6	2 5 0	1 7 0	1 2 6
2	15 ,, ,,	2 9 6	1 17 9	1 0 9	0 16 3
3	10 ,, ,,	1 16 0	1 7 0	0 13 6	0 8 3
4	6 ,, ,,	1 6 0	0 18 0	0 8 3	0 4 6
5	3 ,, ,,	0 13 6	0 8 6	0 4 0	0 2 9
6	1½ ,, ,,	0 9 0	0 6 9	0 2 9	0 1 9
4, 5, and 6	Mixed, Sickle trimmed	0 14 10	0 10 0	0 4 6	0 2 9
4, 5, and 6	Mixed, Thumb trimmed	0 3 8	0 2 6	0 1 3	0 0 9

Since these favourable prices were published there has been a general re-awakening of interest in mica and numerous samples (mostly valueless) have been sent in for report.

Some specimens from Napier Range, Northampton district, Yandanooka and Israelite Bay have yielded small sheets of commercial mica, and reports to that effect have been sent to enquirers.

Monazite.—Samples of monazite sands from the Marble Bar district were forwarded for valuation, but no reliable information could be obtained regarding a market for this commodity. The samples gave a satisfactory assay and reports indicate that appreciable quantities of the material are available at Cooglegong.

Pyrites.—Pyrites was produced at Norseman Gold Mines throughout the year, the output totalling 10,189 tons valued at £19,078. This Company, in conformity with the policy of the Federal Government has made the development of the pyrites project, for the time being, at least, its major objective, and operations on gold have been restricted to a point where present continuance is, perhaps, only warranted by the necessity for retaining an adequate organisation to establish and maintain the production of pyrites on an economic basis.

The pyrites is required to replace imported sulphur in the manufacture of sulphuric acid, which is used in large quantities in the production of superphosphate. Early in 1943, it was decided by the Federal Government that the whole of the Western Australian requirements of pyrites should be obtained from the Company's Iron King Mine. Even on the basis of the present low superphosphate quota, this will involve the mining of at least 50,000 tons of sulphide ore annually, and the Company was requested to proceed with the necessary work to ensure this production by the end of 1943.

A programme was prepared and approved, involving capital expenditure approximating £30,000, covering the

necessary underground development work and the purchase and installation of additional mining, transport and treatment plant.

A satisfactory estimate of the reserves of pyrites ore will not be practicable until development is further advanced.

The development programme involved the completion of the Red, White and Blue shaft to the No. 4 level, driving north and south on Nos. 3 and 4 levels, sinking a three-compartment shaft to the No. 4 level, extensive stope preparation and a quantity of subsidiary work. The principal features completed at the end of the year are as follows:—

The Red, White and Blue shaft was sunk a further 111 feet, to a depth of 435 feet on the dip of the lode. This shaft was commenced during the previous year to prospect the sulphide zone, and its single compartment would have been adequate for pulling the small output then proposed, although not for the larger tonnage now indicated. It has, however, enabled the company to forge ahead with Nos. 3 and 4 levels pending the sinking of the new main shaft and it will also be necessary for ventilation and to provide an alternative exit to the mine.

At No. 3 level, drives north and south of the Red, White and Blue shaft were extended to 550 feet and 396 feet respectively. Except for a short distance at the shaft, the drives were in the lode.

At No. 4 level, at the 31st October, drives had been advanced 250 feet north and 151 feet south of the Red, White and Blue shaft in a footwall lode disclosed by diamond drilling. The north drive has since connected with the new main shaft.

The new main shaft, a vertical one of three compartments, was commenced 350 feet north of the Red, White and Blue shaft. At the 31st October it was down 204 feet, connecting with No. 3 level at 194 feet. It has since connected with the No. 4 level at 268 feet and sinking is continuing to provide for the necessary ore bin and sump.

Additional diamond drilling and other investigations indicate that the lode, or series of lodes, extends north and south, for a considerably greater distance than the 3,300 feet originally estimated. The full width has only been exposed in a few places during mining operations to date, but indications are that a substantial proportion of the lode already developed will be wider than 15 feet and that it extends in some places to over 40 feet.

An estimate of the grade of the ore is not practicable until the full width has been opened up and sampled more extensively, but most of the ore exposed to date contains from 30 per cent. to 40 per cent. sulphur. In some places it consists of practically pure pyrite, assaying nearly 50 per cent. sulphur, but in others inclusions of country rock bring the grade down to less than 30 per cent.

Quartz Crystals.—An extensive search was made throughout the State for quartz crystals. An attractive price ranging from 15s. to £3 per lb., according to quality, was offered for suitable crystals, but although a large number of localities were tried and samples sent in, only two or three of the latter were of any value.

Red Oxide.—The total reported production of this mineral for the year was 397·35 tons, of which 382 tons, valued at £3,820, came from Ophthalmia Range, while the remaining 15·35 tons, valued at £46, originated at Mt. Monger.

Silver.—The total production of silver reported was 118,803 fine ounces, valued at £15,375. This was entirely produced as a by-product of gold.

Soapstone.—Some block soapstone was produced early in the year from Bridgetown, but details have not been reported to this Department.

The price offered for this product, together with the fact that further exploration and development was required to open up a new quarry, indicated that the project would not prove an economic success and operations ceased early in the year.

Talc.—The production of 73 tons of talc, valued at £170, from Mt. Monger is interesting. Some high-grade talc came from this deposit, which fact is not reflected in the reported value. It is thought that this property, which is also a gold mine, might later develop into a producer of talc of good quality in commercial quantities.

Tantalite.—An urgent call for tantalite from America, for industries connected with the war effort, was responsible for the Commonwealth Government taking over and re-equipping the mines of Tantalite, Limited, at Wodgina and Strelley during the year. As the previous output of these mines was insufficient to supply present demands, the plant was designed for a considerably greater capacity than previously. At the end of the year some production was in progress at Strelley, while the construction of the main plant at Wodgina was well under way. No consignments had been shipped before the close of the year.

An appreciable supply of this valuable mineral, however, was obtained at Greenbushes as a result of the activities of Messrs. Freeman and Collett, who have for the past few years been interested in tin production from that area.

A tribute was taken by Freeman and Collett on Mineral Claim 1, which is held by Tantalite, Limited. A fair quantity of high grade lump tantalite had been won from this area on both sides of the main Greenbushes-Bridgetown road in past years. The tributers were successful in obtaining a few hundredweight of lumps of high grade tantalite around the old workings, which were despatched to Brisbane by plane and thence by special air transport to America. An urgent call came for another 4 cwt. of this material, and it was considered that this quantity could be exceeded by tunnelling under the main bitumen road, where there appeared to be a run of tantalite-bearing material about 15 feet wide which had been worked up to both sides of the road. The portion under the road was therefore virgin ground. Permission having been obtained to mine under the road, hand operations were commenced which proved the width of the tantalite bearing material to be 60 feet instead of the 15 feet anticipated and eventually the road was worked for this length with the result that about 35 cwt. of high grade tantalite was obtained in lumps weighing from a fraction of an ounce up to 35 lb. in weight. One parcel consisting of one short ton of this material, after cleaning, assayed 74·32 per cent. Ta_2O_5, while another parcel of 579 lb. assayed 77·5 per cent. Ta_2O_5.

These results made it perfectly obvious that an area to the east of the road workings on which lump tantalite had been obtained in the past from a number of shallow shafts, samples from the dumps of which all showed payable tantalite by panning, would provide appreciable quantities of tantalite if put through a sluice box.

Great difficulty being met with in endeavouring to locate a suitable plant for excavating and carting the material to the sluice boxes, the co-operation of the Main Roads Board was sought and obtained and a gang of men with scoops, tractors and trucks sent to the site. Two sluice boxes were prepared, one in Floyd's Gully, about ¼ mile from the excavation, the operation of which was dependent on good winter rains, and one at Westralia Gully, about one mile away, where there is an ample supply of water which has to be pumped. It was estimated that at least 300 cubic yards per day could be treated at these two sluice boxes, but unfortunately the winter was one of the dryest on record, which meant that Floyd's Gully could only be operated part-time. About 7,000 cubic yards of wash dirt were put over the two boxes when the boiler powering operations at Westralia Gully broke down and was found to be past repair. As there was no chance of immediate resumption, it was necessary to release the Main Roads plant.

The average tantalite yield from the 7,000 cubic yards treated was about 1 lb. per cubic yard. A parcel of 1,311 lb., assaying 68 per cent. Ta_2O_5 was sent to America, but the remaining concentrate contained an appreciable percentage of tin oxide, which is penalised as an impurity. A parcel of about 2½ short tons of this material was sent to Sydney for magnetic separation of the tin prior to shipment.

Further supplies of low grade tantalite were obtained as a by-product of tin sluicing operations at the Vulcan Tin mines at Greenbushes. For some time past Messrs. Freeman and Collett have been operating a small sluicing plant on a big decomposed lode on Mineral Claim 4, the resulting concentrates being sent to Messrs. O. T. Lempriere and Co. Pty., Ltd., for magnetic separation of the tantalite and sale of the resulting tin concentrate. The magnetic product, consisting of tantalo-columbite, was known to contain less than 40 per cent. Ta_2O_5, which was too low grade to be acceptable for sale as tantalite. In July, however, the American authorities indicated that any material containing 30 per cent. Ta_2O_5 would be acceptable, and an assay of this magnetic product was made, proving it to contain 37 per cent. Ta_2O_5. A parcel containing 5,548 lb. was therefore forwarded to America in September, followed later by another of 1,568 lb. This was accompanied by a further parcel of 717 lb., owned by Lempriere and Co., presumably a result of previous separation from tin concentrates purchased from Greenbushes.

Later information received has shown that, although the magnetic product of Lemprieres' treatment is a clean tantalite concentrate, the recovery of tantalite is by no means satisfactory, being only about 56 per cent. of the tantalite content of the mixed concentrate. This is thought to be largely due to the fact that some of the tantalite minerals, such as microlite (calcium tantalate), simpsonite (aluminium tantalate) and stibio-tantalite (antimony tantalate) are non-magnetic and exist in larger proportions than was previously recognised. Investigations will be put in hand early with the object of endeavouring to devise a method by which a satisfactory separation might be effected.

Should such investigation prove successful, there would appear to be every likelihood of a large output of tantalite from Greenbushes as a by-product from tin mining. In the past, several promising tin propositions ceased operations because the tantalite content of the concentrate became so high as to make the tin content unpayable.

Following is a list of shipments ex Greenbushes for the year.

Weight Lbs.	% Ta_2O_5	Value £A	Destination.	Remarks.
		£ s. d.		
106	59·13	34 5 9	U.S.A.	Penalty for SnO_2 and TiO_2 £6 16 3.
579	77·50	638 17 8	Melbourne	
1,998	74·32	2,012 8 6	U.S.A.	
15	73·50	14 14 11	Tasmania	
335	71·18	307 0 7	U.S.A.	Estimated value.
1,311	68·30	1,069 7 7	U.S.A.	Estimated value.
6,265	35·33	1,143 16 4	U.S.A.	
1,568	37·90	338 19 11	U.S.A.	Estimated value.
4,966	....	....	Sydney	Tin-tantalite concentrate value not yet assessed.

Thus, ignoring the last item, the total exports of Greenbushes tantalite for the year amounted to 12,177 lbs., valued at £5,559 11s. 3d.

In addition to the above exports ex Greenbushes, a production of 1,935 lbs. of an estimated value of £780 was reported from Wodgina, although no exports from such district were made for the year.

Prices prior to July varied from $1.20 (7s. 4½d. approx.) per lb. of contained Ta_2O_5 for 40 per cent. concentrate to $2.55 (15s. 8d.) per lb. for 70 per cent. concentrate.

After July 1st, the following prices were fixed. The lower purchasing price for producers of small quantities was fixed to compensate the Commonwealth Government for high assay charges, freight, handling, etc.

% Ta_2O_5.	Price per lb. Contained Ta_2O_5.		Price per lb. Concentrate.	Purchasing Price per lb. Ta_2O_5 (for Small Producers).
	$	s. d.	s. d.	s. d.
30	1·30	8 0	2 5·065	6 7
31	1·37	8 6	2 7·377	7 0
32	1·44	8 11	2 10·044	7 4
33	1·51	9 4	3 0·814	7 9
34	1·58	9 9	3 3·688	8 2
35	1·65	10 2	3 6·666	8 7
36	1·72	10 7	3 9·747	9 0
37	1·79	11 0	4 0·933	9 5
38	1·86	11 6	4 4·220	9 9
39	1·93	11 11	4 7·611	10 2
40	2·00	12 4	4 11·106	10 7
41	2·07	12 10	5 2·704	11 0
42	2·14	13 4	5 6·405	11 4
43	2·21	13 9	5 10·210	11 9
44	2·28	14 2	6 2·118	12 2
45	2·35	14 7	6 6·130	12 7
46	2·42	15 0	6 10·245	13 0
47	2·49	15 5	7 2·464	13 4
48	2·56	15 10	7 6·786	13 9
49	2·63	16 3	7 11·211	14 2
50	2·70	16 8	8 3·741	14 7
51	2·77	17 1	8 8·373	15 0
52	2·84	17 6	9 1·109	15 4
53	2·91	18 0	9 5·949	15 9
54	2·98	18 5	9 10·891	16 2
55	3·05	18 10	10 3·937	16 7
56	3·12	19 3	10 9·087	17 0
57	3·19	19 8	11 2·341	17 4
58	3·26	20 1	11 7·697	17 9
59	3·33	20 6	12 1·157	18 1
60	3·40	21 0	12 6·720	18 6
61	3·47	21 5	13 0·387	18 11
62	3·54	21 10	13 6·157	19 4
63	3·61	22 3	14 0·031	19 8
64	3·68	22 8	14 6·008	20 1
65	3·75	23 1	15 0·088	20 6
66	3·82	23 7	15 6·272	20 11
67	3·89	24 0	16 0·560	21 4
68	3·96	24 5	16 6·950	21 8
69	4·03	24 10	17 1·455	22 1
70	4·10	25 4	17 8·042	22 6
71	4·17	25 9	18 2·744	22 11
72	4·24	26 2	18 9·548	23 3
73	4·31	26 7	19 4·456	23 8
74	4·38	27 0	19 11·467	24 1
75	4·45	27 5	20 6·582	24 6
76	4·52	27 11	21 1·800	24 11
77	4·59	28 4	21 9·122	25 3
78	4·66	28 9	22 4·558	25 8
79	4·73	29 2	23 0·097	26 1
80	4·80	29 7	23 7·739	26 6

Penalties:

Price per lb. Ta_2O_5 reduced by 2 cents for each 1% below 60% Ta_2O_5 plus Cb_2O_5.

Price per lb. Ta_2O_5 reduced by 1 cent for each 1% in excess of 6% SnO_2 and TiO_2.

Price per lb. Ta_2O_5 reduced by 3½ cents for each 1% in excess of 3% SnO_2.

Price per lb. Ta_2O_5 reduced by 3½ cents for each 1% in excess of 3% TiO_2.

Tin.

The total production of tin reported for the year amounted to 8·72 tons valued at £1,833, derived as follows:—

Locality.	Tons (long).	Value.
		£
Greenbushes (Vulcan) ..	3·38	615
Marble Bar District ..	4·60	1,022
Kathleen Valley	·14	52
Mt. Dockrell (Kimberley Goldfield)	·60	143

The *Vulcan Tin Mine* at Greenbushes worked by Messrs. Freeman and Collett was closed down early in the year on account of the capacity of the plant being too small for the work required. It is proposed to instal a larger plant at a later date.

Greenbushes Tin, Limited, got together a 10in. sluicing plant with Departmental assistance to work an area, proved by boring to contain some 700,000 cubic yards of material averaging 1·3 lbs. of SnO_2 per cubic yard.

This plant was assembled and installed ready to commence production when it was requisitioned to undertake operations at Collie for the sluicing of overburden in open cutting operations at that centre. The power portion of the plant and the sluice boxes now form part of a plant which is being assembled for tantalite production.

Marble Bar District.—The production from this area is derived from the operations of small producers.

Kathleen Valley, Lawlers District, East Murchison Goldfield.

The small production from this area was the result of a trial parcel broken from a tin bearing lode and treated at the Coolgardie State Battery. The lode has not yet been opened up sufficiently to judge its future prospects.

Tungsten.

The following production of tungsten minerals was recorded during the year.

SCHEELITE.

Locality.	Quantity Concentrate. lbs.	WO_3	Estimated Value. £
North Coolgardie Goldfield—			
Comet Vale	266	58·2	24
Coolgardie Goldfield—			
Higginsville	7,280	65·0	1,157
Coolgardie	2,374	65·7	383
Yilgarn Goldfield—			
Edna May Amalgamated	658	23·9	41
Yalgoo Goldfield—			
Noongal	6,692	64·6	1,050
Dundas Goldfield—			
Norseman	158	33·0	9
WOLFRAM.			
Yalgoo Goldfield—			
Mt. Gibson	175	40·0	18
Total	17,603		£2,683

At Comet Vale, Goldfields Australian Development, Limited, carried out a fair amount of development on the scheelite deposit, railing the ore to Coolgardie State Battery for concentration. The return was not sufficiently attractive and the venture was therefore abandoned.

Norseman Gold Mines, Limited, undertook underground exploratory work on the scheelite leases at Higginsville and produced about 3¼ long tons of scheelite concentrate assaying 65% WO_3. Results were somewhat disappointing as little additional ore was located and the lode was narrow and patchy. In view of this fact and the policy of the Federal Government of concentrating on a few large Eastern States deposits, underground work was suspended in April after 700 short tons of ore had been mined and railed to Norseman for treatment.

The small production from Edna May Amalgamated was the result of experimental and preliminary work only. During the year a plant for the recovery of tungsten minerals from current and accumulated tailings was erected and commenced operations. It is estimated that from 70 to 100 tons of concentrates will be obtained from this source.

The production of approximately three long tons of scheelite concentrate at Noongal was from a surface show worked by Nevill Bros. This deposit was worked for the greater part of the year, but owing to the increased cost of production entailed by working at some depth, and the difficulty of obtaining quick returns, the project was abandoned.

Vermiculite.

Production for the year was 342·8 tons valued at £2,056 16s. from the Young River deposit, worked by Perth Modelling Works, and 20 tons from Yellowdine, valued at £60. This production is nearly double that of the previous year and indicates the gradual increase in the use of this mineral. The occurrence at Young River is said to be erratic and no reliable estimates of ore reserves can be made at the present stage of development, but it is considered that reasonably large supplies are available.

CONCLUDING REMARKS.

The progressive deterioration of the gold mining industry as shown in the statistics accompanying this report was very much what was anticipated. The temporary withdrawal of such mines as Big Bell, Hannan's North, Evanston, Consolidated Gold Areas and Burbidge from the ranks of active producers is much to be regretted, but quite unavoidable in the absence of manpower to operate them. The average number of men employed has dropped from 15,216 in 1939 to 5,079 in 1943.

The high output per man employed, averaging 403·8 tons of ore and 104·7 fine ounces of gold, speaks well for the efficiency of the mines still operating, especially in view of the fact that the average value of the ore treated was the record low figure for the State of 5·19 dwt. per ton.

Coal production for 1943 was 50,000 tons behind the 1942 production. Everything points, however, to a much improved production during the coming year. The output from the Open Cut seems likely to reach a figure comparable with that of any one of our coal mines. The output from the Wyvern Mine should steadily increase and there should also be the general benefit of the introduction of mechanised methods into the mines.

A great amount of time has been spent by Departmental officers on the fostering of the mineral industry and it would appear that there is a likelihood of continuous production in the near future of such minerals as asbestos, alunite products (potash and alumina), beryl, copper, iron, mica, pyrites, tantalite, tin, vermiculite and possibly graphite, in addition to those minerals which are already in steady production. On this account the section on Minerals Other than Gold and Coal in this report has been given more prominence and treated in greater detail than in previous years.

I shall now conclude my report with a few remarks somewhat personal in character.

I shall be taking my final leave before retirement as from the end of July, 1944. This, therefore, will be my last Annual Report.

I wish to take this opportunity of recording my regret that my long association with the Mines Department, which has been for me a very happy one, is drawing to a close. I have received much kindness, consideration and assistance from all officers of the Department, from the Hon. Minister and the Under Secretary downwards.

Particularly do I regret the necessity to sever any connection with the Assistant State Mining Engineer, the Inspectors of Mines and all members of my staff, whose work has been most creditable to themselves and the Mines Department.

I have been fortunate enough to have been State Mining Engineer during a period of great progressive gold mining culminating, unfortunately, in the World War. These war conditions are at present affecting the gold mining industry most adversely, but failing a serious decline in the price of gold, a revival after the war can be confidently anticipated.

R. C. WILSON,
State Mining Engineer.

APPENDIX No 1.

CHRYSOTILE ASBESTOS.

(C. F. ADAMS, B.E., F.S.A.M.S., DISTRICT INSPECTOR OF MINES, CUE.)

Chrysotile is commonly considered to be an alteration product of serpentine. It is crystalline and its silky nature when "teased" is due to perfect crystal cleavages parallel to the prism faces.

In the massive form high grade chrysotile, as found in the North-West portion of this State, is pale green and transparent, and when fiberised presents a white fluffy appearance.

In all deposits that I have seen there occur with the high class material other varieties which up to the present have not been marketable because of their inferior quality. Locally a variety of names is used to designate these types, such as "black seams," "woody," "needly," "limey," and "dead fibre." The inferiority of these fibres is due to their brittleness and comparative lack of strength rather than to their lack of length. In fact, I have often noticed that the black seams seem to carry a much higher proportion of longer and straighter fibre.

The local terms mentioned above can be reduced to two, "limey seams" and "black seams." "Limey fibre" in the massive state is white to pale green in appearance, but is opaque and brittle and consequently has less strength than the high grade. Where such fibre is found, thin stringers of lime can often be seen in surface workings, running into the lode. Apparently lime in solution has penetrated into the fibrous structure and been redeposited. This type of fibre seems to be definitely confined in most cases to within a few feet of the surface.

"Black seams" in the massive state are actually a very dark green in colour, and translucent, but brittle and lacking in strength. This condition is probably caused by an infiltration and redeposition of iron oxide within the structure of the fibre. Such fibre persists in patches of the greatest depths to which any of the mines have so far been worked (about 160 feet below outcrop at Nunyerri).

MINES VISITED.

In the event of any attempt to organise the industry in the North-West, the project for the present would have to be divided into two separate units, one in the Marble Bar district, and the other in the Roebourne district, in each of which there are groups of mines reasonably close together, thus facilitating transport and ore treatment, which will be dealt with in more detail later.

MARBLE BAR DISTRICT.

The Lionel Mine.

This mine was worked by a company some years ago, and is situated about 20 miles by road approximately north of Nullagine and 60 miles south-east of Marble Bar. Access could not be gained to the underground workings, which have fallen in, due to the gouging of pillars for fibre by prospectors since the mine was abandoned by the company.

The company operated a treatment plant on the mine, leaving behind crushed dumps to the extent of some 1,500 tons on the north end of the lease and about 50 tons on the south end. Other uncrushed dumps at various shaft collars and open cuts indicate the presence of fibre over a length of some 800 feet. Indications are that up to 20 tons of fibre from ⅛in. to ¼in. could probably be obtained by screening crushed dumps, but it is likely that it would contain a small proportion of the dead fibres. The mine is only four miles off the main Marble Bar-Nullagine road in rough, hilly country.

Tambourah Group.

This group consists of three mines, which are situated 11 miles north by road from Tambourah and 95 miles south-west of Marble Bar and about 130 miles somewhat east of south of Port Hedland. The mines themselves are within two miles of one another and are called Piesse's Luck, the Fibre Queen and the Olivene.

Piesse's Luck.

On this mine there are apparently four fibre carrying channels on which pot holes of varying size have been worked. The biggest of these is some 40 feet deep by about the same length, and they occur spasmodically along the length of the lode, indicating that the fibre occurs in shoots.

The channels appear to be all parallel and have been pot holed over a length of some 1,000 feet, with about 150 feet between the inside and outside channels across the strike. Altogether there are some dozen of these holes, in all of which short fibre can be seen. The mine is in hilly country and roads into it from Dead Bullock Well are in bad condition.

The Fibre Queen.

This mine is about six miles by road from Piesse's Luck, but can be reached by walking a little more than a mile over intervening hills. It has been worked in several places by a series of shafts and pot holes, the deepest of which is about 30 feet. The fibre has been worked over a length of about 500 feet. The mine is situated in some foothills and a reasonable track exists to within a quarter of a mile of the workings.

The Olivene.

This show has a shaft and some drive on it in which a seam of very good fibre was worked. We were unable to get down the shaft since there were no ladders in it, but I went down it about four years ago when it was being worked by Mr. McLeod. From memory I would say that the shaft is about 50 feet deep, from which there was about 25 feet of drive at about the 30-ft. horizon and a small winze sunk from the end of this drive. The winze was then full of water, but in it could be seen a seam of very good fibre of about one inch in length. Apart from this work a small amount of gouging has been done on a nearby hill. So far the fibre has been worked in places over a length of about 200 feet.

Soanesville.

We were unable to get into this mine because it is in extremely rough country and nobody has been into it for years. The road to it, which was always bad, is now said to be impassable to a wheeled vehicle. The mine was worked by a company some years ago and it is said that £100,000 was spent there and that it was worked to a depth of 140 feet. Some of the finest fibre ever produced came from here and the common opinion is that a heavy make of water forced the abandonment of the mine. I am told by Mr. McLeod that there is some ground blocked out ready for stoping on the bottom level.

ROEBOURNE DISTRICT.

The Sherlock Mine.

The mine is about 30 miles somewhat north of east of Roebourne, and is situated in the coastal plain along which the main Roebourne-Port Hedland road runs, and this road is in good order. A shaft has been sunk and a considerable amount of work done on several seams over a length of some 1,200 feet. There are no ladders in the shaft and water level in the mine is about 30 feet below the level of the plain, so that nothing could be seen of underground workings. More work has been done in this mine than on any of the others that we visited. The seams overlap along the strike and from the considerable amount of short and dead fibre in dumps, I would say that a fair quantity of high grade fibre had been mined. The shaft is equipped with a small set of poppet legs and a three-throw pump head, but apart from these items there is little other gear on the lease of which further use could be made.

Nunyerri.

This mine is about 60 miles south-east of Roebourne, but the shortest road into it via Croydon Station is about 90 miles. From the main Roebourne to Roy Hill road another track goes into Nunyerri, and by this route the distance is about 150 miles. The last 20 miles of both of these tracks are exceedingly rough, as the mine is situated in rough, hilly country. The mine is at present being worked by King and Stein, with Government assistance, and in the past was worked by a company who did considerable development work, of which use is now being made. The old company drove two adits, one about 45 feet below the outcrop and the other about 110 feet below outcrop level. The ground above the 45-ft. adit has been stoped out and has now collapsed, but there is still some fibre left between the 45- and 110-ft. levels. Stein has sunk two winzes from the 110-ft. level, 102 feet apart. One of these is 47 feet below the level and the other is 40 feet below. From the 47-ft. winze, which is on the north end of the mine, a drive has been driven back for a distance of 25 feet towards the other winze, with the object of eventually breaking into it. In the end of the north winze for its whole depth the fibre can be seen going further north and it can be seen in the back of the drive. For some time past only Stein and his brother have been working the mine. On the surface the nucleus of a small treatment plant has been erected, consisting of a cracker feeding into a set of rolls, but as yet no mechanical screens are used. By passing the crude ore through the cracker and then three times through the rolls and hand screening top and second grade fibre can be taken out, but the work is slow and laborious. This treatment plant has been erected from the grant made by the Government and besides this plant there is a small compressor set capable of working a rock drill, which plant is Stein's property.

Indications are that from the block now in process of development up to 100 tons of fibre of all grades might be got, and a further quantity, which is hard to estimate because entry to old workings cannot at present be made, should come from the ground between the two adits.

Marshall's.

This show is situated about six miles south-west by road of the town of Roebourne and is on the top of a steep hill. Two shoots of fibre about 12 feet apart have been worked, one for a length of about 200 feet and the other about 150 feet. The deepest portion is about 40 feet and both shoots seem to have been worked more regularly than usual over their whole lengths. A local syndicate backed a group of working miners, and it is said that they made a small profit. Around the town of Roebourne, about five miles out, there runs a semicircular belt of fibre-bearing country for several miles, and in this belt fibre of sorts can be got in patches almost anywhere. We examined about a dozen pot holes in this belt to the east of the town and three to the south-east. Marshall's show is also in the same belt. The holes mentioned above were quite small, in most cases only a few feet below the surface, with one or two going to 30 feet for short lengths. These shows apparently have no names and represent gouging by prospectors when prices and markets were right.

The shows mentioned above, in both the Marble Bar and Roebourne districts are ones in which some work has been done. Mr. Piesse states that there are other known fibre occurrences in the districts which have not been worked because on the surface they showed no long fibre which would attract a prospector, and it is only when fibre can be seen to be long on the surface that the prospector will gouge it out.

Mr. Bligh, of Tambourah, also states that he knows of another show, and a prospector named McKay told us in Marble Bar that he had recently located a new deposit about 20 miles east of Cooglegong, and that it could be traced on the surface for three-quarters of a mile. We offered to go out with him, but he was waiting for his partner, and stated that he could not find his way into the show again without some difficulty.

The above information concerning shows visited recently is not meant to be complete. Further details can probably be got by reference to Mines Department Bulletins and files.

The fibre occurs in bands of serpentine rock which are enclosed in basic rocks of Precambrian age. In all the mines seen by me in the north-west of the State, referred to later in this report, the serpentine band is quite narrow, and pinches and bulges forming lenses. Only on rare occasions do these lenses exceed four feet in width and the average of all mines seen would be nearer two feet. Besides pinching, these lenses are often misplaced by faults, and it was also noticed that on occasion they split into two divergent channels. Within the lenses of serpentine the fibrous chrysotile occurs as an alteration product.

The question arises as to what proportion of fibre to rock will be got from mining operations and what proportion of the total fibre won will fall into the various grades, and many wild statements have been made in this connection.

Firstly it should be noted that all of the chrysotile bearing serpentines dip almost vertically and, seeing that they are so narrow, open cutting can only be done economically and safely to a comparatively shallow depth, so that right from the start of any mine, even on a small scale, provision has to be made for underground mining methods. No opening of less than three feet width can conveniently be worked by underground methods, and it is desirable, if possible, not to work narrower than five feet. In any channel I would say from observation it is not safe to estimate on more than a total of three inches of fibres of all lengths. If we, therefore, have to mine three feet wide, the fibre won amounts to 8·3 per cent. of the rock broken. At this stage it is of interest to note that the blue fibres of the Hamersley Ranges, which are now being tackled in a big way by Australian Blue Asbestos Limited, are estimated to average only 3·3 per cent. of the total rock broken. The difference in the two figures is mainly due to the fact that the blue fibres are horizontal and must be mined in such a way as to leave sufficient head room.

I estimate that every 100 tons of fibre taken from the mines will fall approximately into the following gradings:—

Top	¾in. and upwards	7	short tons.
Seconds ..	½in. to ¾in.	15	„ „
Thirds ..	¼in. to ½in.	25	„ „
Fourths ..	⅛in. to ¼in.	38	„ „
Less than ⅛in.	left in tails	18	„ „

Now, if we get 100 tons of fibre, and this is 8.3 per cent. of rock broken, then the above amounts of fibre come from breaking 1,200 short tons of rock, and to supply a contract calling for 25 short tons* of top grade fibre per month means that 4,300 tons of ground per month will have to be broken.

It is my opinion that, in any series of systematic underground mining operations, returns will have to be based on figures of this order, which is vastly different from the claims made by some people. Naturally, if a prospector sees a seam of 1in. fibre on the surface and it is 10 feet long, he can gouge a ton or two of tops by taking out a hole a few feet deep, and considerably improve on the figures as stated. This is how the bulk of the small holes in the Roebourne district has been worked, but, as I have pointed out, the present proposal means that systematic underground work will have to be undertaken immediately to supply the contract, because the lodes are so narrow.

Marketing and Prices of Fibre.

Till recently the marketing of the fibre has been the greatest problem associated with the business for the reason that markets were in the hands of one of the strongest combines in the world. The average consumer needs large quantities of the shorter grades of fibre and small and spasmodic quantities of tops. Large and cheaply mined deposits exist in Canada and South Africa, which are capable of supplying the world's demands of fibre in peace time, and can carry large reserves of fibre stored for marketing. From these deposits only a fraction of a per cent. of fibre produced is tops, so that the proportion of high grade from our deposits is

* This report was written in connection with a proposal to supply 25 short tons per month of top grade fibre to an Eastern States consumer for defence purposes.

several times greater, which partly offsets our higher mining costs. In normal times the position was that any prospector or syndicate gouging a few tons of tops could always sell it at a price, but it was hopeless to try and compete with overseas shorts which could be landed here cheaper than we could supply them. Tops and seconds were the only lines with which we had any chance of competing, and then only on a guaranteed market. A local producer seeking a certain market from a consumer on a long term basis, was cold-shouldered because the consumer feared that the producer would not be able to keep up supplies over a period of time. To give a local producer a market the consumer would have to break with the combine, and if the producer let him down he would then have to go back to the combine, who would be likely to give him a rough handling. Before a producer can guarantee regular supplies, even in small quantity from the comparatively small mines of this State, he must spend a considerable amount of money, which he is unwilling to do before he is certain of a long term market for his product. Thus we have a perfect deadlock.

At present, with a war on our hands, the demand for fibre is imperative, and its source immaterial, and, as imports are limited, as much as possible must be produced here. It should be the object of those interested to use the existing set of conditions to overcome past limitations as far as possible, and establish the industry in this State on a long term basis no matter how small the scale. To accomplish this we must attempt to get contracts on a fairly long term basis. Even if one small contract on a three year basis could be got, a start would have to be made. To get this levers would have to be used in high places, and we in turn would have to be prepared to make certain guarantees. Until some such definite understanding is arrived at, further large expenditure by any party that expects to make a profit out of asbestos is not warranted. With regard to prices, it should be remembered that of all strategic minerals, asbestos has probably shown the smallest price increase due to war conditions. The average increase for all grades is probably considerably below 50 per cent. on pre-war prices. Thus it is to be expected that the fall in prices after the war will be less proportionately than for other minerals.

My knowledge of marketing and prices is secondhand, but I have been given certain prices by Mr. Hancock, who has been buying and selling both white and blue fibre for many years. He is now prepared to buy white fibre at the following prices:—

Tops, ¾in. and upwards	..	£160 per short ton.
Seconds, ½in. to ¾in.	..	£100 „ „ „
Thirds, ¼in. to ½in.	..	£50 „ „ „
Fourths, ⅛in. to ¼in.	..	£25 „ „ „

These prices are cash for material delivered to Dalgety and Company's store in Roebourne and Mr. Hancock states that he resells at 20 per cent. higher.

We can now further examine the position in the light of Hancock's prices.

The breaking of some 1,200 short tons of rock in underground operations will yield somewhat as follows:—

Grade.	Short Tons.	Roebourne Price per Ton. £	Totals. £
Tops	7	160	1,120
Seconds ..	15	100	1,500
Thirds ..	25	50	1,250
Fourths ..	38	25	950
In tails ..	15	—	—
	100		£4,820

This means that the gross value of the ore is 80s. 2d. per short ton.

Transport.

The difficulties of transport in these times do not need to be stressed, but they are alleviated to some extent by the fact that in the districts in which it is proposed to operate, petrol has to date been available in adequate quantity. Fuel oil is also available and so are tyres to essential users.

There are already in the districts several transport organisations.

The Marble Bar area is served by Smith and Dods of Nullagine and Campbell and Company of Meekatharra. Smith and Dods run a big diesel truck capable of handling a 20 ton load with trailer and, operating between Roy Hill and Meekatharra, have been charging only 2½d. per ton mile, which is said to be the cheapest in the Commonwealth. I think that this price will be raised somewhat if such has not already been done.

Campbell and Company charge 9d. per mile with petrol trucks carting to Meekatharra. The other alternative is to cart to Marble Bar by truck, thence by rail to Port Hedland, thence by sea to Fremantle.

The Lionel is at present the only mine which would use one of these organisations.

In the Port Hedland district, which would serve the Tambourah Group, L. Taplin operates a transport service with petrol trucks at 9d. per ton mile.

In the Roebourne district Barrett and Radley charge 7½d. per ton mile, with two diesel trucks and one petrol truck and would be able to serve Nunyerri, Sherlock and mines close to the town of Roebourne.

Cartage from the various mines by existing services works out as follows:—

Mine.	Carter.	Road. £ s. d.	Freight Rail. £	Sea. £ s. d.	Total. £ s. d.
Tambourah....	Taplin	5 5 0	....	3 3 0	8 8 0
Nunyerri	B & R	5 10 0	....	3 3 0	8 13 0
Sherlock	B & R	1 10 0	....	3 3 0	4 13 0
Marshalls	B & R	0 10 0	....	3 3 0	3 13 0
Lionel	Marble Bar	2 10 0	3	3 3 0	8 13 0
Lionel	S & D	7 0 0	2	....	9 0 0

Sea freight includes insurance, wharfage, agency fees, etc., but not freight from Fremantle wharf. From Lionel the fibre, if taken overland, would be landed in Perth. It is not claimed that above figures are strictly accurate, but they are sufficiently comparative for our purpose.

These existing services are now largely engaged in carting to other strategic mineral projects, such as Blue Spec, Wodgina and Australian Blue Asbestos, and have plenty of loading to handle at present, while these projects are building up their plants, but their loading is likely to have fallen off by the time that we would want them. In the initial stages our loading requirements would be quite small, and I think that the establishment of a transport unit immediately as proposed is premature, although it is admitted that sea freights are somewhat sporadic. The main difficulty with the sea freights at present is not that there are no boats running, but that local shipping has difficulty in getting priority for its freights, which should not occur in this case.

On Hancock's figures the prices received by the producer for the various grades of fibre, landed at North-West ports, works out thus:—

Grade.	Tambourah. £ s. d.	Nunyerri. £ s. d.	Sherlock. £ s. d.	Marshalls. £ s. d.	Lionel. £ s. d.
Tops	154 15 0	154 10 0	158 10 0	159 10 0	154 10 0
Seconds	94 15 0	94 10 0	98 10 0	99 10 0	94 10 0
Thirds ...	44 15 0	44 10 0	48 10 0	49 10 0	44 10 0
Fourths	19 15 0	19 10 0	23 10 0	24 10 0	19 10 0

If at the various mines we break 1,200 short tons of rock from which we get 100 tons of fibre, 85 tons of which are marketable, freight costs come out as below from mine to North-West port for total fibre shipped:—

Mine.	Total Cost. £ s. d.	Cost per Ton. s. d.
Tambourah ..	446 5 0	7 5
Nunyerri	467 10 0	7 10
Sherlock	127 10 0	2 2
Marshalls	42 10 0	0 9
Lionel	467 10 0	7 10

These figures are for milled fibre, which should contain impurities varying from almost nothing in tops to perhaps 5 per cent. in fourths.

Two things are obvious, firstly, that mines close to Roebourne, such as Sherlock and Marshall's show considerable saving in transport; secondly, it is economically impossible to ship crude ore which contains, say, 50 per cent. of all grades of fibre, and it must be borne in mind that the contrast presented above will be further accentuated when freights from North-West ports to Fremantle are added.

Ultimately it will be the freight costs which will determine the economics of shipping lower grades of fibres, rather than mining costs, for it must be remembered that, in systematic underground operations, except in rare cases, we must mine short fibre to get the better grades which are usually intimately mixed with it. Also we must mill it to separate the long fibres from it, so that, once mined and milled, freights determine whether it will be dumped or sent away.

When considering freights in the North-West, the weather factor must always be taken into account. Generally speaking, regular transport cannot be relied on during the months of January, February and March, when heavy sub-tropical rains fall. These rains are likely to have a greater effect on overland transport to Meekatharra since the distance is much greater and the bulk of the country is flat and bogs easily. Transport to North-West ports would probably be more reliable because the distances are shorter and the country more hilly and rocky. In general, maintenance on roads is high but the local Road Boards keep their main roads in good order.

Roads serving Roebourne and Sherlock mines are usually quite good, while the last 20 miles into Nunyerri is exceedingly rough, and roads from the Tambourah group to Hedland are fair, but right near the mines new roads will have to be made.

In connection with freight it should be also remembered that supplies have to be freighted into a mine, so that mines close to Roebourne have a big advantage here.

MINING COSTS.

These are always difficult to estimate, particularly in the case of groups of small mines.

Considering Nunyerri as a case in point, this Department will have advanced about £800 to partially develop a block of ore below the bottom adit. When mined 3 feet wide this block will yield about 1,000 tons. Thus, partial development is costing about 16s. per ton. We have had to sink no shafts and drive no adits, but were in a position to start straight in on productive ore, which was one of the major reasons for granting the loan. To allow for shaft sinking and other development work we should about double the above figure, which gives 32s. per ton to develop. Then to mine the block will cost some 8s. per ton and to this must be added costs for running and depreciation on all mining plant and overhead, which would absorb another 10s., giving total costs as 50s. per ton. This is expensive, but small scale operations always are.

If working costs at Nunyerri are 50s. they would be about the same at Roebourne, Tambourah and Lionel, and about 48s. per ton at Sherlock and Marshalls.

MILLING.

From freight costs, it is plain that the shipping of crude ore is uneconomical, and the question arises as to how far the ore is to be treated at the mine and what subsequent treatment will be needed in Perth before marketing. This question will largely be decided by two rough samples taken during the inspection.

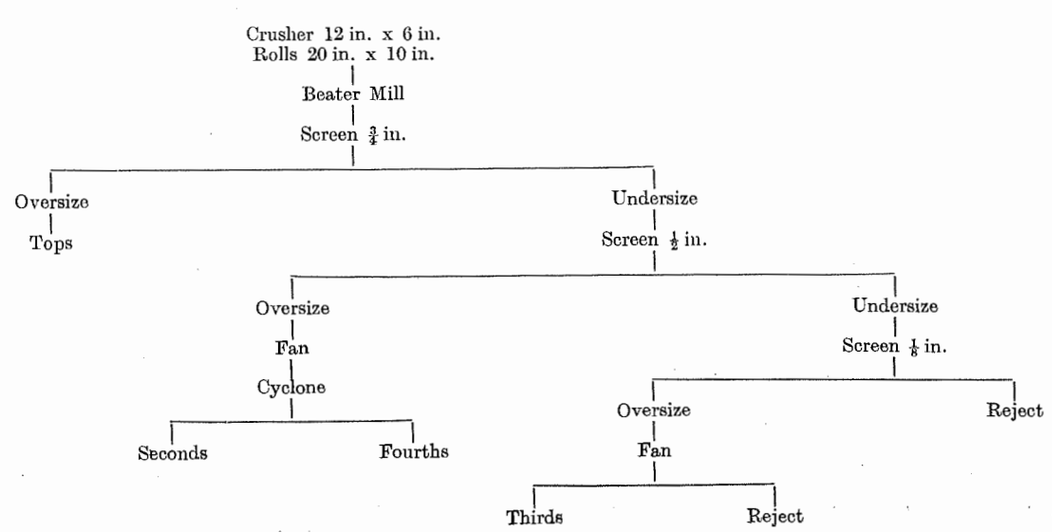
The milling of the white fibre presents certain differences to the milling of the blue, on which to date more work has been done, so that more information is available. The blue fibres are associated with hard but brittle silicious rocks which impose much wear on crackers and particularly on rolls. The brittle gangue breaks free from the fibre and can easily be screened out, but is likely to cut a proportion of the fibre in the rolls. On the other hand, the serpentine associated with the white fibres is comparatively soft, rather "doughy," so that it tends to be squeezed into the fibre and does not break so free. This action takes place in the rolls rather than the cracker.

The rolls appear to be the crux of any asbestos plant. With blue fibre and hard gangue they must be constantly dressed to give an even product, since in continuous operation they groove in a matter of days, allowing too coarse a product to pass. With the softer serpentine this grooving should be much less.

As the plant at Nunyerri, which consists of a cracker feeding to a set of rolls, all temporarily rigged, and hand screens, we made some tests which produced the two samples referred to.

They represent rough seconds and thirds and the ore put through to get them had had the tops hand cobbed out of it. It was found that the crude ore, which averaged about one-third fibre of all grades, had to be passed three times through the rolls before the seconds sample could be hand screened out of it. The material that passed through the screens after three rollings was then rerolled three times. This produced the sample of thirds after screening through a smaller screen, but also released more seconds. Thus rolling by itself is not sufficient to quickly release fibre from serpentine for the reason explained above, which is that the rolls tend to squeeze the serpentine into the fibre. This difficulty is usually overcome by the use of a "beater" mill, which has a large number of loose arms on a shaft which revolves at a medium speed. This mill is quite efficient on blue fibre, and besides separating gangue and fibre, it also fiberises the latter, thus enabling it to be picked up by suction. From the beater mill the material drops on to a bank of shaking screens and the various products are sucked off pneumatically. The size of screens depends on market demands.

About the simplest form of mill that could be used with reasonable efficiency would be as outlined below:—



The object of this plant is roughly to grade the fibre and reduce the gangue to a minimum to save transport costs rather than to produce first class marketable products. It could be driven by a 20 h.p. engine, which could also be used to drive the compressor or to supply air underground in the case of a mine which was unable to produce enough ore to keep the mill going full time. Such a plant would handle up to 10 tons of crude ore per eight hour shift, and this ore would average about one half fibre of all grades.

The basis of such a plant already exists at Nunyerri. They have cracker, rolls and two fans, and to complete the plant require a beater mill, bank of three screens and a cyclone. The last three would probably have to be manufactured to a design and would probably cost £250.

Transport to the mine and erection costs would absorb £100 and the re-arrangement of existing gear about £150, making a total of £500, to put a workable mill on the mine.

Milling Costs.—As stated before, the mining of 1,200 short tons of rock will produce 100 tons of fibre of all grades and the crude ore sent to the mill is roughly half fibre of all grades, which means that we must mill 200 tons of crudes to release 100 tons of fibre, 85 tons of which is marketable.

If we set milling costs, in small quantities, at the high figure of £1 per ton of crudes, this means 3s. 4d. per ton of ore mined. If we allow 3s. 4d. per ton for Nunyerri, Lionel and Tambourah, costs for Sherlock and Marshalls would be about 3s.

The plant as outlined is light and semi-portable. To produce 25 tons of tops per month, on figures as quoted above, we must mine 4,300 short tons of ore and mill 715 tons of crude ore. Total marketable production will be:—

Tops, 25 short tons; Seconds, 53 short tons; Thirds, 89 short tons; Fourths, 136 short tons.

Working one shift daily the small plant would crush about 220 tons per month, not allowing for stoppages. We would, therefore, have to have three such plants which would have to work two shifts to cope with the above production.

The question of mill design will have to be fully discussed in the event of any operations taking place, and the design of a fully portable mill should be gone into for use in the Roebourne area.

LABOUR.

This is the biggest obstacle in the way of the proposal. Even in peace time labour is scarce in the North-West and of second rate quality, for the reason that picture shows, hotels and other means of relaxation are few and far between. At present there are in the area three major projects gearing up to produce strategic minerals, two of them with the backing of the Commonwealth Government. All of these mines are suffering an acute labour shortage, and have more or less given up hope of getting any reasonably good labour till after the war. It might be argued that manpower will direct men to work in various places, but such has never been done successfully to my knowledge. Some people hold hopes that men can be got from the Army on the grounds of the recent announcement of the release of 2,000 men per month. I know of only one man who has been released and is now working asbestos. As far as I can see it is not safe to bank on any men from this source. If we do get labour into the North-West for this project, we have to compete with Australian Blue Asbestos, whose lowest paid employee now draws £10 per week, including 13 hours overtime, and who are about to erect workers' houses at a cost of £700 each. An instance of the type of labour available is the 16 year old boy who last week rode a bicycle away from A.B.A. and £10 per week for no good reason at all.

If we must mine 4,300 short tons of rock to satisfy a demand for 25 tons of top grade fibre per month, we are going to need a large number of men. A single mine of this size would need at least 150 men with all mechanical aids available, and more in the case of production from a number of mines.

If, then, men are to be got and held, provision for living quarters will have to be made for them in the case of Nunyerri, Tambourah, Lionel and Sherlock, but any men working on Marshalls could live in Roebourne, which gives this show a big advantage since the provision of quarters is a direct charge on mining costs.

There is not to my knowledge a single man in the North-West who has not got a job, and the chance of many others when he wants them.

A tabulation of comparative costs for various mines is set out below:—

Mine.	Costs per Short Ton of Ore.				Gross Value.	Margin per ton.
	Mining.	Milling.	Freights.	Total.		
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Nunyerri	50 0	3 4	7 10	61 2	80 2	19 0
Piesse's Luck	50 0	3 4	7 5	60 9	80 2	19 5
Fibre Queen	50 0	3 4	7 5	60 9	80 2	19 5
Olivene	50 0	3 4	7 5	60 9	80 2	19 5
Sherlock	48 0	3 0	2 2	53 5	80 2	26 9
Marshalls	48 0	3 0	0 9	51 9	80 2	28 5
Lionel	50 0	3 4	7 10	61 2	80 2	19 0

The above margin should be available to the producer on fibre landed at North-West ports on Hancock's prices.

It is apparent that mines close to Roebourne have a considerable advantage in costs over those further away, and it is also clear that to make a useful profit the operations should be carried out on as large a scale as the mines will stand.

ORGANISATION.

In the initial stage of operations it would pay us to concentrate on Piesse's Luck and the Fibre Queen at Tambourah, Nunyerri and Marshalls and leave Sherlock and Lionel for the reasons set out below.

Sherlock.—The mine, though shallow, is under water, which is said to be heavy, and it contains much dead fibre. Incidentally, the question of what depth these serpentine chrysotile bodies will live to is often asked. I consider that they will live to depths of several hundred feet at least and that at this depth, there is a possibility of the dead fibres improving and becoming marketable. In the event of the establishment of a white fibre industry, this will one day have to be proved or disproved and in my opinion Sherlock is the place to do this work. The deepest mine so far is Nunyerri, which is about 160 feet below outcrop.

The Olivine.—Though fibre here is high grade below water, little work has been done and the ratio of fibre to tons mined is likely to be lower than in Piesse's Luck and Fibre Queen and therefore costs higher.

Lionel.—Isolation from other mines is against this show for the present and it is always expensive work to start on a mine which has partly caved in.

MINES TO WHICH ATTENTION SHOULD BE CONFINED IN THE INITIAL STAGES.

Piesse's Luck and Fibre Queen.—There are so far no big mines in the North-West comparable with Canadian ones, as those so far worked are a different type of deposit, but Piesse's Luck, with its four channels, gives promise of being worked on some sort of scale.

These channels run from one hill to another with a sharp valley between, which is about 75 feet below the outcrop at the top of the hill. The cheapest way to work this show would be to sink a shaft in the valley in a position convenient for the exploration of the four channels. The fact that the shaft is in the valley will mean that on driving under both hills, we get the maximum amount of backs for the minimum development.

Fibre Queen would also need a shaft and drives and will be considered together with Piesse's Luck because all plant can be made to serve both mines. It is obvious that, with labour shortage, mechanical means will have to be used as much as possible.

Minimum mining plant required to serve both shows:—

	£
Compressor 300 c.f.m.	500
Diesel engine, 75 h.p.	1,000
Two rock drills, steel, etc.	500
Blacksmith's shop	200
Buildings	1,000
Freight, erection, etc.	500
Tools, pipes, ladders, etc.	500
Two sets hoisting equipment	500
	£4,700

Preliminary Development.

Piesse's Luck.	£	Fibre Queen.	£
Shaft, 100ft.	400	100ft.	400
Crosscut, 150ft.	450	50ft.	150
Drive, 500ft.	1,500	300ft.	900
	£2,350		£1,450

The total expenditure for the group £8,500 on above figures.

Nunyerri.—This is the only mine from which small quantities of fibre can be produced almost immediately. About 75 feet of drive remains to be completed to block out about 100 tons of fibre below the bottom adit. As there are only two men working, who are trying to mine as well as erect plant, work here is slow and labour is required immediately. Another six men could be used right away and more as the mine expands. With six more men plant could be erected and the ore blocked out and mined in about four months. Further expenditure as follows would have to be incurred:—

Equipment.	£	Further Development.	£
Fan, etc., for secondary ventilation	50	Drive, 300ft.	900
Air hoist for hauling	100	Winze, 100ft.	400
Treatment plant	250		£1,300
Ore bin	50		
Buildings	1,000		
Freight, erection, etc.	500		
	£1,850		

Total, £3,150.

Marshall's.—This show is likely to produce the lowest mining costs of the lot. The shoots as worked are short, but have been worked over the largest continuous length of any seam, and being so close together are easily served by the same shaft. As the show is on the top of a steep hill with valleys on either side, a shaft in one of the valleys would open a large amount of backs if driven from, as in the case of Piesse's Luck. Indications are that the fibre continues to the hills on either side of the valleys. It would be my first choice, partly for the reasons stated above, and also because, being so close to town, such labour as is available would be less likely to leave and no provision need be made for housing them at the mine. Also costs will be much lower.

Equipment.

	£
Compressor, 150 c. ft.	300
Two Rock Drills, etc.	350
Diesel Engine, 40 h.p.	600
Blacksmith's shop	200
Buildings	200
Tools, pipes, ladders, etc.	300
Hoisting equipment	250
Freight, erection, etc.	300
	£2,500

Development.

	£
Shaft, 100 ft.	400
Crosscut, 40 ft.	120
Drive, 300 ft.	900
	£1,420

Total for Marshall's, £3,920.

Total mining expenditure to put shows on a reasonable footing is therefore—

	£
Tambourah	8,500
Nunyerri	3,150
Marshall's	3,920
Total	£15,570

For the sum indicated above we will have a fair chance of producing fibre on something like the required basis. It includes provision for one treatment plant, but eventually two more will be required, which might cost some £2,000 each, bringing the total expenditure to £19,570, and provision should be made for contingencies and such things as a motor vehicle to allow the man in charge to keep in touch with all shows. As I see it, unless new shows are found, the time has passed when a few prospectors could root out fibre from potholes on the surface. On all shows that we saw, this work had already been well and truly done, so that the proposition now becomes one of straight out mining, for which the figure presented should be some sort of guide. Anyone going into the business on the basis as proposed should be prepared for an expenditure of £25,000. This figure might be reduced by acquiring the machinery indicated second-hand, but we will be lucky to get it at all. The diverting of idle machinery over which the Department has Bills of Sale would also reduce the actual cash expenditure.

This report can be briefly summarised as follows:—

1. Every attempt must be made to assure a labour supply. Until the labour question is settled, nothing can be done beyond what has already been done, that is, gouge out a few bags of fibre here and there.

2. Attempt to get some long-term promises from consumers.

3. Spend as high a proportion as possible of any money on development as indicated.

4. Abandon for the present the transport scheme as proposed.

5. For the present expenditure on treatment plant beyond that required for Nunyerri is not warranted. The design of the plant is not yet fixed and some experimentation will have to be done. Seeing that Nunyerri has a partial plant which can be completed comparatively cheaply, such should be done and the completed plant used as a testing ground for subsequent plant design.

Finally, I do not claim any great degree of accuracy for any of the figures set out herein. I have quoted them and gone to some length with this report, with the idea that those who have been misled will realise that the production of fibre on the scale proposed requires expenditure of much hard cash, and is not a matter of collecting a few prospectors here and there and throwing them a few shillings now and again.

I conclude that the job can be done roughly as outlined and at a profit, provided that money is available and that points 1, 2 and 3 set out above can be favourably settled.

APPENDIX No. 2.

Coal Mines Regulation Act, 1902-1926.

ANNUAL REPORT OF THE BOARD OF EXAMINERS FOR MINE MANAGERS, UNDER-MANAGERS, AND OVERMEN.

Office of the State Mining Engineer,
Mines Department,
Perth, 10th May, 1944.

The Under Secretary for Mines.

Sir,—We submit herewith, for the information of the Hon. Minister for Mines, the Annual Report of the Board of Examiners for the year 1943.

Examinations for Certificates.

May Examination:

Two candidates submitted themselves for the Second Class Examination in May. At the meeting of the Board on the 21st May, it was decided to issue Second Class Certificates of Competency to both of the candidates.

October Examination:

Examination for First and Second Class Certificates were advertised to be held in October, but no candidates were forthcoming and no meeting of the Board was held in that month.

Copies of the papers set for the examination during the year are attached to this report. These papers were exchanged with kindred boards in England and the Eastern States.

We have the honour, etc.,

RICHARD C. WILSON,
State Mining Engineer,
(Chairman.)

F. G. FORMAN,
Government Geologist.
(Member.)

JAMES GILLESPIE,
Inspector of Mines, Collie.
(Member.)

Western Australia.

Department of Mines.

Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER-MANAGER OR OVERMAN.

Subject: Arithmetic.

Wednesday, 12th May, 1943: 9 a.m. to 11 a.m.

Possible Marks.	
15	(1) Assuming that $a = 11.26$ and $b = 12.47$, find (1) a^2, (2) b^2, (3) $\sqrt{a^2 + b^2}$. Your answer to be correct to two decimal places.
14	(2) A wagon of capacity 420 cubic feet held 10 tons of coal, one of capacity 720 cubic feet held 16 tons and one of capacity 1,190 cubic feet held 29 tons. Find the average number of cubic feet required for one ton.
14	(3) If 187 yards of steel rope weigh 956 lbs., what length will weigh one ton?
14	(4) A contractor employs three men, A, B, and C, to do a piece of work. A works all the time the work is carried on, B works two-thirds, and C three-fifths of the time. If C receives 27s., what should B receive? If the contractor is paid £6, find his profit.
14	(5) The thickness of a seam uniformly diminishes. At a point "A" it has a thickness of 4 feet and it is known that the thickness at "B" 2,200 yards from "A" is only 15 inches. If the seam cannot be profitably worked at thickness of less than two feet, at what distance from "A" should work be stopped?
15	(6) At a certain colliery two-thirds of the men were in favour of a check weighman, but on a vote being taken 25 of those refused to vote, while 60 more who were previously in favour voted against his appointment. This left both sides equal. How many men were employed in the colliery?
14	(7) The output of a mine in 1940 was x tons. In 1941 it was increased by 10% and in 1942 it was again increased by 10%. If the output in 1942 was 64,000 tons, find x.
100	

Western Australia.

Department of Mines.

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER-MANAGER OR OVERMAN.

Subject: Coal Mines Regulation Act, 1902-1926.

Wednesday, 12th May, 1943: 11 a.m. to 1 p.m.

Possible Marks.	
22	(1) What are the duties laid upon an Under-Manager by the Coal Mines Regulation Act, 1902-1926?
21	(2) State clearly what section 54 of the Coal Mines Regulation Act, 1902-1926, refers to.
22	(3) What does the Act say in regard to accidents?
21	(4) Under what part of the Act are Ambulance and Medical requisites mentioned and why?
22	(5) What is said in regard to horse traffic under Part VI of Schedule.
21	(6) What does Rule 32 of Schedule allude to?
21	(7) Give a summary of definitions of section 4 of the Coal Mines Regulation Act.
150	

Western Australia.

Department of Mines.

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER-MANAGER OR OVERMAN.

Subject: Roadways.

Wednesday, 12th May, 1943: 2 p.m. to 5 p.m.

Possible Marks.	
25	(1) Skip derailments in underground haulage roadways are often the cause of serious accidents. State clearly the chief causes of skip derailments and the steps you would take to avoid accidents from this cause.
25	(2) Describe a good capel for a steel wire rope say 1¼ inches in diameter, and the sequence of operation of capping the rope.
25	(3) Calculate the horse power of the locomotive required to haul a set of 10 skips, having a gross weight of five tons each, along a level road at a speed of eight miles per hour. The tractive resistance is 20 lbs. per ton and the efficiency of locomotive (0.6).

Possible Marks.	
25	(4) Describe clearly in your own language the chief causes of deterioration and failures of wire ropes used for haulage.
25	(5) The bars and covering timbers in a main roadway are crushed and support a considerable thickness of finely broken ground. Explain in detail how you would replace the timber and at the same time keep the road open for traffic during the coal pulling shift.
25	(6) Describe with sketches: (1) Endless rope, (2) Main and tail, and (3) Direct haulage systems. State under what conditions you would install each system.
150	

Western Australia.

Department of Mines.

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER-MANAGER OR OVERMAN.

Subject: Mining of Coal.

Thursday, 13th May, 1943; 10 a.m. to 1 p.m.

Possible Marks	
33	(1) Explain the method of widening a rectangular shaft which is lined with timber.
34	(2) A working place is approaching old workings containing water at a pressure of 150 lb. per square inch. How would you proceed and what method would you adopt to keep the water under control when tapped?
33	(3) Pillars 55 yards square have been formed in the first working of a seam 6 feet thick. State how you would extract the coal in such pillars. Deseribe with aid of sketches, the trackwork, layout, systematic timbering, etc.
33	(4) How would you drive a cross-measure drift 15 feet wide and 7 feet high by 300 yards long dipping one-in-six? Describe how you would carry out the work and state the appliances you would recommend for expeditious driving.
34	(5) The brake horse-power of an electric haulage is 75. The mechanical efficiency of haulage gear is 0.75 and efficiency of motor is 0.88. What will be the current taken if voltage is 450 at starting switch?
33	(6) Describe by aid of sketches to the best of your ability a scraper loader. Give the sequence of operations you would adopt in getting coal and loading it by a scraper loader from two dip headings each 15 feet wide and 8 feet high into skips of 25 cwt. capacity. Grade of seam one-in-thirty.
200	

Western Australia.

Department of Mines.

The Coal Mines Regulation Act, 1902-1926.

EXAMINATION FOR SECOND CLASS CERTIFICATE OF COMPETENCY AS UNDER-MANAGER OR OVERMAN.

Subject: Ventilation and Dangerous Gases.

Thursday, 13th May, 1943; 2 p.m. to 5 p.m.

Possible Marks	
25	(1) What are the gases usually met with in coal mines? How is each gas most readily tested?
25	(2) Describe clearly what is meant by "motive column," "equivalent orifice," "co-efficient of friction" and "fan drift water gauge."
25	(3) To what extent can the workmen assist in reducing the risk of spontaneous combustion? What indications should they be able to detect in event of spontaneous heating commencing? What gases are given off in the various stages of heating?
25	(4) Sketch and describe a hygrometer, also a barometer. State clearly what both instruments are used for and what causes the mercury to vary in length in each instrument.
25	(5) The quantity of air passing in a circular down cast shaft is 56,320 cubic feet per minute at a velocity of 280 feet per minute. Calculate the diameter of the shaft. Assuming the diameter of the shaft is increased by one foot, what quantity of air per minute would pass at the same velocity?
25	(6) Discuss the effect of heat and humidity on underground mine workmen.
25	(7) By means of sketches describe arrangements with a surface fan how the direction of the flow of air can be reversed without delay.
25	(8) Ventilate the accompanying plan having due regard to haulage. Place regulators, air-crossings, doors and screens in their respective positions.
200	

APPENDIX No. 3

Mines Department,
Kalgoorlie, 1st March, 1944.

The Chairman,
Board of Examiners for Underground Supervisors,
Perth.

REPORT ON ACTIVITIES OF BOARD OF EXAMINERS FOR UNDERGROUND SUPERVISORS FOR 1943.

I beg to submit the undermentioned report on the operations of the Board of Examiners for Underground Supervisors during the year ended 31st December, 1943.

A total number of 42 candidates sat for examinations, 27 in Kalgoorlie, 2 in Norseman, 11 in Wiluna, 1 in Agnew, and 1 in Southern Cross. Of these 34 were granted certificates.

Examinations were held as applications were received, as was done last year, and oral examinations were conducted at Wiluna by Dr. Moore and Inspector of Mines Adams, of Cue, at Agnew by Inspector of Mines Verran, and at Norseman and Kalgoorlie by Senior Inspector Winzar and Dr. Moore.

There were no Certificates of Service, duplicate Certificates of Service or duplicate Certificates of Competency issued during the year.

Following are the names of persons to whom Certificates were granted:—

Underground Supervisors' Certificates of Competency, 1943.

537—AINSWORTH, Leander.
545—ADAMSON, Daniel Grant.
538—BOURNE, William Uriah.
546—BANKS, William Henry.
562—BIRD, Edward Henry.
534—CULLEY, Laurence Frank.
539—CONNOLLY, John.
547—CHAPMAN, George Malcolm.
548—COTTERELL, Leslie Lewis.
540—DING, Leslie William.
549—DAVIES, Roland Oliver.
541—GALL, Peter.
542—HILLE, Victor Stanley.
550—HERNAMAN, William Thomas.
551—HOLTHOUSE, Gerald Gavin.
552—IRVING, James Richard Farley.
532—JERMYN, Eric Michael.
553—KING, Thomas Edward.
529—LEE, Geoffrey Selwyn.
536—LITTLEWOOD, Arthur William.
554—MARTIN, Gilbert Frederick.
555—MOIR, Arthur McAlister.
533—O'BRIEN, Thomas Neil.
556—OLDFIELD, Leslie.
535—PAGE, Edward Harry.
543—PAVLINOVICH, Joseph Anthony.
544—ROSE, Harold John.
557—SELKIRK, Lochiel Alexander.
558—TURNER, John Reginald.
530—WILLIAMS, Stanley.
531—WHALLEY, Robert Burn.
559—WALSH, Arthur Thomas.
560—WARD, Alfred Thomas.
561—WILSON, George.

(Sgd.) BRON FARISS,
Secretary to Board of Examiners for Underground Supervisors.

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Division III.

Report of the Superintendent of State Batteries.

The Under Secretary for Mines.

I have the honour to report for the information of the Hon. Minister, on the operations of State Batteries for the year ending December 31st, 1943.

No easement in the manpower position, and recruiting of a number of our prospectors by the few remaining outback mines, has drained the back country of our original suppliers of ore.

In addition, a very dry year and the heavier incidence of the tyre and petrol restrictions as original tyres have worn out and vehicles falling into disrepair, have added to the difficulties of the remaining ore getters.

Lack of transport and increased prices are added burdens which will increase as the war continues.

Every endeavour has been made to keep the industry alive and practically all plants have been available for crushing reasonable accumulations of ore by transferring staff and teams from plant to plant as required, but the steep fall in tonnage has not been arrested and only 19,074 tons were crushed, and 27,577 tons cyanided as against 40,396.5 and 40,107 tons respectively in 1942.

The tonnage milled is the lowest since 1928 when 16,274 tons were treated.

The only bright feature in the year's operations was the enhanced yield per ton due in a great measure, to elimination of the larger low grade propositions which require more manpower.

The average value of the ore crushed rose from 14 dwts. 21.4 grains in 1942, to 19 dwts. 4 grs. and is the highest since 1913. The estimated value of gold produced was £180,768.

DETAILS OF PRODUCTION.

Three hundred and thirty-four parcels averaging 57.11 tons and aggregating 19,074 tons were crushed at 14 batteries as against 827 parcels and 40,396.5 tons in 1942.

The estimated value is as follows:—

	Fine ozs.	Value.	Premium.	Total.
By Amalgamation	13,187·16	56,019·06	72,236·57	128,255·63
„ Cyanidation	5,404·12	22,947·72	29,566·15	52,513·87
	18,591·38	78,166·78	101,802·72	180,769·50

Production for 1942 was 27,309.30 ozs. worth £265,611.

VALUE PER TON.

The estimated average fine gold value per ton by amalgamation was 13 dwts. 19.8 grs. and the average value of tailing produced was 5 dwts. 7.8 grs. giving an average head value of 19 dwts. 3.6 grs., an increase of 4 dwts. 6.2 grs. above the 1942 average.

The highest yields per ton were, Meekatharra 31 dwts. 7 grs., Cue 28 dwts. 18 grs., Ora Banda 27 dwts. 9 grs., Norseman 25 dwts. 14 grs., and Sandstone 23 dwts. 3 grs. Schedule two shows details at all batteries.

ESTIMATED PERCENTAGE RECOVERY.

The whole of the tailing was not treated, and a small percentage of refractory copper tailing was segregated as untreatable, but applying the average extraction of 78 per cent. obtained at our cyanide plants, for the year, to the average value of tailing produced, we obtain the following result:—

Head Value	19 dwts.	4·00 grs.	% Rec.
Recovery by Amalgamation	13 „	19·80 „	72·13
Recovery by Tailing at 78% of 5 dwts. 7·8 grs.	4 „	3·68 „	21·67
Total Recovery	17 „	23·48 „	93·80

RECEIPTS AND EXPENDITURE.

Receipts from all sources totalled £32,986 18s. 10d. and expenditure £41,516 3s. 9d. showing a working loss of £8,529 4s. 11d.

Milling costs rose from 17s. 9.8d. in 1942 to 22s. 4.7d., and tailing treatment costs from 12s. 8.3d. to 14s. 4d.

A comparative synopsis of revenue and expenditure is given later in this report.

MILLING.

Excluding leased plants at Darlot, Linden and Sir Samuel, one 20 stamp, 7-10 stamp and 9-5 stamp mills were available for public crushing, but no ore was crushed at Yalgoo or Yarri.

Three hundred and thirty-four parcels averaging 57.11 tons and aggregating 19,074 were treated as against 827 parcels of 48.85 tons in the previous year.

Kalgoorlie with 4,145.75 tons, Payne's Find, 2,601.50, Cue 2,239.25 and Meekatharra 2,078.28 were the only batteries exceeding 2,000 tons.

As was to be expected, overhead expenses, mill management and administration were very high though the staff has been considerably curtailed. Repairs and renewals cost 2s. 4d. per ton; a high figure due to inferior labour, especially untrained engine-drivers and the deterioration which takes place when plants are idle for lengthy periods.

Details of expenditure and revenue for this section are on Schedule 5.

METALLIFEROUS ORES.

Tungsten.

Six parcels of tungsten ore were treated at our Coolgardie concentrating plant aggregating 207.5 tons, including two small wolfram parcels from Mt. Gibson district.

Two thousand nine hundred and eighty-four pounds of concentrate were produced, containing 1,775 lb. of WO_3 worth £443 15s. at 5s. per lb.

Results were disappointing with the exception of a parcel from P.A. 5641, Coolgardie.

Thirty-four tons yielded 1,800 lb. of concentrate containing 1,202 lb. WO_3 worth approximately £300 and there is an appreciable quantity of middling to be retreated in a subsequent crushing.

TIN.

One small tin parcel of 7¾ tons of tin ore was treated from a few shallow prospecting holes in a new find at Kathleen Valley.

The yield was 384 lb. of concentrates containing 257 lb. of tin worth approximately £39.

Although the estimated head value of the parcel was 2 per cent. tin, the proposition is apparently not attractive, as no further work has been done at the time of writing.

Details are as follows:—

TUNGSTEN.

No. of Crushing.	Tenement.	Tons Crushed.	Concentrate.	WO_3.	Estimated Value at 5s. per lb.
			lbs.	lbs.	
5195	P.A. 2248Z	97	266	160	....
5917	P.A. 2248Z	28·25	364	136	....
5929	P.A. 2248Z	27·75	117	78	....
5916	P.A. 2325Y	6·75	175	70	....
5918	P.A. 2325Y	13·75	262	129	....
5952	P.A. 5641	34	1,800	1,202	....
....	....	207·5	2,984	1,775	£433 15 0

TIN.

No. of Crushing.	Tenement.	Tons Crushed.	Concentrate.	Sn.	£
5930	1	7¾	384	257	39

TAILING TREATMENT.

Thirteen tailing plants were in operation and handled 27,577 tons for a recovery of 5,404.12 fine ozs. valued at £52,513.

The small tonnages handled provided lengthy treatment, and extraction was slightly better than for previous year. The cost of treatment was very high at 14s. 4d. per ton as against 12s. 8.13d. in 1942, and 8s. 11.1d. in 1939. The labour cost has increased and transport and away from home allowance on smaller rounds has had a marked influence on expenditure per ton. Revenue at 17s. 0.8d. per ton was a good deal higher than for the two previous years due to final clean ups of accumulations at certain batteries when parts of banks containing old accumulations were accounted for.

The £1,050 interest charged by the Treasury on the funds provided for the purchase of tailing represents a reduction of approximately 8d. per ton in revenue.

The working surplus was £3,758 2s. 6d.

Details of cost of treatment are on Schedule 6.

CARTAGE SUBSIDIES.

These subsidies paid to most privately owned crushing plants as well as at State Batteries, dropped with the declining tonnage.

Subsidies amounting to £983 1s. 9d. on 2,302 tons were all that were paid on ore crushed at State Batteries as against £2,317 1s. and 6,127 tons respectively in 1940.

At private plants the figures show a steeper drop. 588 tons claimed subsidies totalling £209 11s. 7d. In 1942, the figures were 2,177 tons and £871 15s. 11d. The total figures were 2,890 tons and £1,192 13s. 4d. as against 8,304 tons and £3,188 16s. 9d. respectively in 1942.

These figures reflect the shrinkage in outback activity and especially the transport difficulty. The cost of carting has increased, but the main trouble is the lack of transport, not the cost of it.

GENERAL LOAN FUND EXPENDITURE.

The following were the only items charged to General Loan Fund:

	£ s. d.
Alterations to ore dressing plant, Coolgardie	40 6 0
Payne's Find reconstruction	4 18 3
Alterations portable conveyor	102 11 10
	147 16 3

HEAD OFFICE EXPENDITURE.

	1942. £	1943. £
Salaries	3,107 18 3	2,764 2 11
Inspection	146 8 6	—
Pay Roll Tax	952 13 6	606 3 5
War Damage Insurance	539 14 4	530 0 0
Workers' Compensation ..	1,622 1 10	1,062 9 8
Postage	69 12 6	14 4 6
Travelling Expenses ..	241 19 5	97 4 7
Sundries	99 15 5	49 1 7
	£6,780 4 0	£5,123 6 8

Salaries included that of the Inspector, and travelling expenses on inspection have been reduced by £291 3s. 4d. Workers' Compensation premiums are based on the wages paid in 1942.

On the total tonnage cyanided and milled, of 46,868.25 tons the cost per ton under the above heading is 2s. 2d.

Comparative Synopsis of Results at State Batteries for 12 *months ending* 31*st December*, 1942 *and* 1943.

	1942.			1943.		
	Tons.	Expenditure per ton.	Revenue per ton.	Tons.	Expenditure per ton.	Revenue per ton.
		s. d.	s. d.		s. d.	s. d.
Milling	40,396·5	17 9·8	9 11·7	19,074·0	22 4·7	9 9·7
Tailing	40,107·0	12 8·3	15 4·78	27,577·0	14 4·0	17 0·8

Receipts and Expenditure.

	Tons.	Expenditure.	Revenue.	Profit.	Loss.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.
Milling	19,074	21,606 11 11	9,318 8 4	...	12,288 3 7
Tailing	27,577	19,769 11 5	23,527 13 11	3,758 2 6	...
Ore Dressing	215·25	140 0 5	140 16 7	16 2	...
	46,866·25	41,516 3 9	32,986 18 10	3,758 18 8	12,288 3 7
Less Profit	...	...	...	...	3,758 18 8
Net Working Cost	...	...	...	...	£8,259 4 11

Output Since Inception.

	£
Production at Par:	
By Amalgamation	7,341,279.46
„ Tailing Treatment	1,806,276.68
	£9,147,556.14
Gold Premium:	
By Amalgamation	2,259,066.37
„ Tailing Treatment	720,271.60
	£2,979,337.97
Total Australian Currency	12,126,894.11
Estimated value of tin produced ..	94,406.16
Total value of Gold and Tin ..	£12,221,300.27

STAFF.

Little staff movement was necessary, and no new appointments were made.

Manager E. Speering was transferred from the Meekatharra circuit to Sandstone and was relieved by Manager F. Breustedt from Cue, Manager Eyres taking his place whilst still retaining Boogardie. Inspector Bissett's services were loaned to Head Office, and Erection Officer McLean to Tantalite Ltd., Wodgina.

GENERAL REMARKS.

The Manpower Office called up a large number of the remaining older aliens on the Goldfields for civil construction work and this action had a marked effect on the tonnage of ore crushed, and further accentuated the already acute shortage of suitable labour for our tailing plants, resulting in intermittent running and increased handling costs.

Despite the very much reduced output, we had great difficulty in obtaining the small supply of skilled labour required and the cost of milling was adversely affected by more frequent stoppages.

Want of skilled attention to plants running continuously is reflected in the increased cost of maintenance and repairs.

Stores were adequate but firewood was difficult to get and the cost showed a decided rise in most districts.

Unless conditions improve within a reasonable period, the outback districts will be deserted to an even greater degree than in 1928.

Each year sees the passing of many of our old experienced prospectors who take with them knowledge and experience which has been responsible for the discovery of practically all the working mines, and those remaining are finding the existing shortage of tobacco and other commodities, poor transport, etc., just too much for their old shoulders to bear, and are drifting to the city.

Unfortunately, they have no younger understudies, and even if the war is over in a comparatively short time, the dearth of good prospectors will be a severe blow to the hopes of further fresh gold discoveries.

The working of abandoned and existing shows at a depth now possible with modern power plants, pumps and small rock drilling equipment will open up an avenue for the production of gold as soon as men are available.

For some years, a very large proportion of the tonnage crushed at State batteries has come from such a source and with very handsome returns to the owners in many cases.

In conclusion, I would like to express my appreciation of the assistance and good work done under trying conditions by the Head Office and Goldfields staff.

D. F. BROWNE,
Superintendent of State Batteries.

SCHEDULE No. 1.

Return showing Tons Crushed, Gold Yield by Amalgamation, Average per Ton in Shillings, and Total Value without Premium for Year ended 31st December, 1943.

Battery.	Tons Crushed.	Gold Yield Bullion.	Value per Ton in Shillings and Pence.	Total Value without Premium.
		ozs.	s. d.	£
Bamboo Creek	646·50	263·15	29 3·5	947·34
Boogardie	381·00	122·15	23 1·0	439·74
Coolgardie	1,843·25	1,188·45	46 5·1	4,278·42
Cue	2,239·25	2,991·15	96 2·1	10,768·14
Kalgoorlie	4,145·75	2,266·95	39 4·4	8,161·02
Laverton	288·75	167·45	41 9·0	602·82
Marble Bar	1,387·00	742·00	38 5·5	2,671·20
Meekatharra	2,078·25	3,121·00	108 1·5	11,235·60
Mt. Ida	62·50	21·05	24 2·9	75·78
Norseman	1,284·00	1,693·60	94 11·6	6,096·96
Ora Banda	1,124·00	1,006·95	64 6·0	3,625·02
Payne's Find	2,601·50	1,158·20	32 0·6	4,169·52
Peak Hill	350·00	142·55	29 3·9	513·18
Sandstone	642·25	676·20	75 9·7	2,434·32
	19,074·00	15,560·85	58 8·9	56,019·06

SCHEDULE No. 2.

Number of Parcels Treated, Tons Crushed, and Head Value for the Year ended the 31st December, 1943.

No. of Parcels Treated.	Battery.	Tons. Crushed.	Yield by Amalgamation, Bullion.	Yield by Amalgamation, Fine Gold.	Gross Contents of Tailings on 100% (including refractory.)	Total Contents of Ore, Fine Gold.	Average per ton, Fine Gold,	Gross Value per ton, at £4 4s. 11½d. per oz.
			ozs. dwts.	ozs. dwts.	ozs. dwts.	ozs. dwts.	dwts. grs.	£ s. d.
15	Bamboo Creek	646·50	263 3	223 0	263 11	486 11	15 1	3 3 11
12	Boogardie	381·00	122 3	103 11	90 11	194 2	10 5	2 3 4
37	Coolgardie	1,843·25	1,188 9	1,007 4	826 18	1,834 2	19 22	4 4 7
50	Cue	2,239·25	2,991 3	2,535 0	687 0	3,222 0	28 18	6 2 2
58	Kalgoorlie	4,145·75	2,266 19	1,921 5	871 6	2,792 11	13 11	2 17 2
9	Laverton	288·75	167 9	141 18	64 7	206 5	14 7	3 0 8
20	Marble Bar	1,387·00	742 0	628 17	266 2	894 19	12 22	2 14 11
27	Meekatharra	2,078·25	3,121 0	2,645 1	607 12	3,252 13	31 7	6 12 11
2	Mt. Ida	62·50	21 1	17 17	7 10	25 7	8 3	1 14 6
40	Norseman	1,284·00	1,693 12	1,435 6	206 2	1,641 8	25 14	5 8 8
25	Ora Banda	1,124·00	1,006 19	853 8	685 12	1,539 0	27 9	5 16 3
26	Paynes Find	2,601·50	1,158 4	981 12	270 12	1,252 4	9 15	2 0 11
4	Peak Hill	350·00	142 11	120 16	68 19	189 15	10 20	2 6 0
9	Sandstone	642·25	676 4	573 1	169 17	742 18	23 3	4 18 3
334		19,074·00	15,560 17	13,187 16	5,085 19	18,273 15	19 4	4 1 5

Average tons per parcel .... 57·11
Average yield by amalgamation per ton (fine gold) .... 13 dwts. 19·8 grs.
Average value by amalgamation per ton .... £2 18s. 9d.—Australian, £6 14s. 6d.
Average head value of tailings per ton (fine gold) .... 5 dwts. 7·8 grs.
Average value of tailings per ton .... £1 2s. 8d.—Australian, £2 11s. 11d.

SCHEDULE No. 3.

Direct Purchase of Tailings.

Battery.	Tons Purchased.	Amount Paid for Tailings.	Amount Paid A/c. Premium.
		£ s. d.	£ s. d.
Bamboo Creek	337·00	563 19 3	1,026 4 5
Boogardie	295·00	142 17 11	315 14 11
Coolgardie	1,485·00	1,499 17 9	1,492 16 8
Cue	1,979·25	1,946 12 7	2,764 0 2
Kalgoorlie	2,834·75	1,402 4 10	1,916 11 11
Laverton	179·50	87 16 8	56 18 2
Marble Bar	786·50	660 12 6	1,531 2 8
Meekatharra	1,779·00	1,173 14 8	1,195 0 3
Mt. Ida	270·75	87 10 11	50 10 8
Norseman	886·75	210 8 7	551 12 10
Ora Banda	424·50	1,028 15 2	1,764 17 9
Payne's Find	188·50	50 12 2	55 6 11
Peak Hill	147·50	111 12 9	297 17 0
Sandstone	542·00	272 10 5	653 3 11
Wiluna	...	...	259 15 6
Yarri	...	...	18 1 1
	12,136·00	9,239 6 2	13,949 14 10

SCHEDULE No. 4.

Tailings Treatment for 1943.

Battery.	Tonnage.	Yield.	Value.	Premium.	Total.
		fine ozs.	£	£	£
Bamboo Creek	1,316	301·56	1,282·965	1,652·029	2,934·994
Boogardie	829	159·42	677·212	871·292	1,548·504
Coolgardie	2,376	383·56	1,616·669	2,084·370	3,701·039
Cue	3,570	940·71	3,996·158	5,152·789	9,148·947
Kalgoorlie	4,350	772·42	3,281·778	4,231·669	7,513·447
Laverton	...	3·53	15·104	19·475	34·579
Marble Bar	1,295	445·34	1,892·187	2,438·825	4,331·012
Meekatharra	4,039	860·82	3,665·100	4,726·110	8,391·210
Mt. Ida	...	2·94	12·587	16·233	28·820
Norseman	2,310	311·30	1,313·683	1,675·654	2,989·337
Ora Banda	3,740	648·87	2,756·306	3,554·179	6,310·485
Payne's Find	780	94·53	402·604	519·142	921·746
Peak Hill	1,263	176·08	747·950	964·470	1,712·420
Sandstone	774	154·64	656·837	846·962	1,503·799
Wiluna	935	147·23	625·546	806·458	1,432·004
Yarri	...	1·17	5·033	6·491	11·524
	27,577	5,404·12	22,947·719	29,566·148	52,513·867

SCHEDULE No. 5—Milling and Tin.

Statement of Receipts and Expenditure for the Year ended 31st December, 1943.

Battery.	Tonnage Crushed.	Expenditure.									Receipts.		Profit.	Loss.
		Management.	Wages.	Stores.	Total Working Expenditure.	Cost per Ton.	Renewals and Repairs.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.		
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	646·50	66 13 9	397 2 6	115 5 7	579 1 10	17 10·9	5 4 8	124 9 1	708 15 7	21 11·1	341 7 1	10 6·7	....	367 8 6
Boogardie	381·00	80 8 3	127 15 6	83 7 3	291 11 0	15 3·6	10 18 6	82 11 6	385 1 0	20 2·5	191 11 2	10 0·7	....	193 9 10
Coolgardie	1,843·25	405 9 4	784 12 6	313 15 1	1,503 16 11	16 3·8	133 3 4	607 1 10	2,244 2 1	24 4·2	980 3 7	10 7·6	....	1,263 18 6
Cue	2,239·25	275 16 10	659 1 5	664 9 8	1,599 7 11	14 3·4	546 18 4	485 4 1	2,631 10 4	23 6·0	1,250 6 7	11 2·0	....	1,381 3 9
Kalgoorlie....	4,145·75	400 8 11	809 11 10	842 19 7	2,053 0 4	9 10·8	438 1 7	941 15 9	3,432 17 8	16 6·7	1,592 2 0	7 8·2	....	1,840 15 8
Laverton	288·75	55 12 3	143 1 1	69 15 0	268 8 4	18 7·0	92 3 4	127 13 10	488 5 6	33 9·8	168 0 1	11 7·8	....	320 5 5
Linden	....	11 12 1	....	....	11 12 1	....	....	10 7 3	21 19 4	....	28 16 6	....	6 17 2	....
Marble Bar	1,387·00	245 18 11	537 7 6	267 6 4	1,050 12 9	15 1·7	339 0 4	326 14 8	1,716 7 9	24 8·9	640 13 8	9 2·8	....	1,075 14 1
Meekatharra	2,078·25	257 18 0	935 6 7	746 16 8	1,940 1 3	18 8·0	75 7 3	454 10 8	2,469 19 2	23 9·2	1,112 14 0	10 8·4	....	1,357 5 2
Mt. Ida	62·50	19 18 10	131 2 1	....	151 0 11	32 3·8	....	34 13 3	185 14 2	59 5·1	37 3 5	11 10·7	....	148 10 9
Norseman	1,284·00	389 12 11	715 3 10	472 6 10	1,577 3 7	24 6·8	162 15 10	326 8 7	2,066 8 0	32 2·2	715 17 8	11 1·8	....	1,350 10 4
Ora Banda	1,124·00	175 12 4	280 11 2	284 0 8	740 4 2	13 2·0	62 6 10	275 14 4	1,078 5 4	19 2·2	521 16 9	9 3·4	....	556 8 7
Paynes Find	2,601·50	272 8 8	1,042 6 8	471 6 5	1,786 1 9	9 10·6	256 0 9	492 12 3	2,534 14 9	19 5·8	1,253 8 6	9 7·6	....	1,281 6 3
Peak Hill	350·00	43 11 2	240 15 11	64 4 4	348 11 5	19 11·0	47 5 5	126 9 2	522 6 0	29 10·1	106 15 3	6 1·2	....	415 10 9
St. Ives	....	....	15 11 11	....	15 11 11	....	....	....	15 11 11	....	....	....	....	15 11 11
Sandstone	642·25	98 1 8	273 19 5	99 19 6	472 0 7	14 8·3	113 12 9	144 5 11	729 19 3	22 8·7	336 11 2	10 5·8	....	393 8 1
Wiluna	....	....	17 10 0	....	17 10 0	....	....	24 14 8	42 4 8	....	8 5 0	....	....	33 19 8
Yalgoo	....	....	32 10 0	....	32 10 0	....	....	4 16 3	37 6 3	....	1 12 9	....	....	35 13 6
Yarri	....	....	28 7 7	....	28 7 7	....	14 7 3	1 15 2	44 10 0	....	19 7 4	....	....	25 2 8
Head Office	....	....	....	....	....	....	....	....	....	....	11 15 10	....	11 15 10	....
	19,074·00	2,799 3 11	7,171 17 6	4,495 12 11	14,466 14 4	15 2·0	2,279 6 2	4,591 18 3	21,355 18 9	22 4·7	9,318 8 4	9 9·7	18 13 0	12,056 3 5
Coolgardie Ore Dressing Plant	215·25	11 18 11	88 6 7	12 15 5	113 0 11	10 5·9	9 10 3	17 9 3	140 0 5	13 0·0	140 16 7	13 1·0	16 2	....
Golden Pole Sampling	....	....	137 4 11	6 4 6	143 9 5	....	....	107 3 9	250 13 2	....	....	....	....	250 13 2
Total	19,289·25	2,811 2 10	7,397 9 0	4,514 12 10	14,723 4 8	....	2,306 16 5	4,716 11 3	21,746 12 4	....	9,459 4 11	....	19 9 2	12,306 16 7 19 9 2
Total Loss	....	....	....	....	....	....	....	....	....	....	....	....	....	12,287 7 5

SCHEDULE No. 6—Tailing Treatment.

Statement of Receipts and Expenditure for the Year ended 31st December, 1943.

Battery.	Tonnage Treated.	Expenditure.								Receipts.		Profit.	Loss.
		Management.	Wages.	Stores.	Total Working Expenses.	Cost per Ton.	Repairs. and Renewals.	Sundries.	Gross Expenditure.	Cost per Ton.	Receipts.	Receipts per Ton.	
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.	£ s. d.	s. d.	£ s. d.	s. d.	£ s. d.	£ s. d.
Bamboo Creek	1,316	55 6 8	547 10 3	331 6 6	934 3 5	14 2·3	49 3 2	167 11 5	1,150 18 0	17 5·8	743 19 7	11 3·7	....	406 18 5
Boogardie	829	103 7 9	208 15 2	95 5 2	407 8 1	9 9·9	22 0 1	146 9 11	575 18 1	13 10·7	892 13 7	21 6·4	316 15 6	....
Coolgardie	2,376	228 15 9	637 3 11	443 12 6	1,309 12 2	11 0·2	56 19 6	352 9 5	1,719 1 1	14 5·6	1,903 4 5	16 0·2	184 3 4	....
Cue	3,570	171 4 4	758 5 10	473 7 5	1,402 17 7	7 10·3	15 19 2	612 14 0	2,031 10 9	11 4·5	3,281 19 8	18 4·6	1,250 8 11	....
Kalgoorlie	4,350	460 3 8	1,293 14 10	679 7 11	2,433 6 5	11 2·2	17 17 4	708 0 5	3,159 4 2	14 6·3	3,974 18 1	18 3·3	815 13 11	....
Laverton	....	....	1 2 10	....	1 2 10	....	....	2 14 4	3 17 2	....	6 2 0	....	2 4 10	....
Linden	....	22 4 11	23 14 0	....	45 18 11	....	1 1 9	2 0 0	49 0 8	....	....	....	....	49 0 8
Marble Bar	1,295	200 5 1	444 3 10	284 5 0	928 13 11	14 4·1	54 15 10	258 9 11	1,241 19 8	19 2·1	1,454 13 3	22 5·6	212 13 7	....
Meekatharra	4,039	85 19 3	1,122 0 7	597 12 2	1,805 12 0	8 11·2	42 2 11	624 1 4	2,471 16 3	12 2·8	3,862 16 1	19 1·5	1,390 19 10	....
Mt. Ida	....	....	....	....	....	....	....	4 7 6	4 7 6	....	5 1 8	....	0 14 2	....
Norseman	2,310	223 12 7	600 4 3	319 12 5	1,143 9 3	9 10·8	45 15 7	345 16 6	1,535 1 4	13 3·5	1,591 11 4	13 9·4	56 10 0	....
Ora Banda	3,740	319 15 8	873 14 2	698 6 4	1,891 16 2	10 1·4	49 15 1	589 6 2	2,530 17 5	13 6·4	2,937 1 7	15 8·5	406 4 2	....
Payne's Find	780	171 16 2	293 19 7	216 7 2	682 2 11	17 5·8	105 18 11	191 3 9	979 5 7	25 1·3	829 9 9	21 3·2	....	149 15 10
Peak Hill	1,263	191 11 6	409 6 4	267 2 8	868 0 6	13 8·8	41 1 4	238 5 11	1,147 7 9	18 2·0	1,036 12 0	16 5·0	....	110 15 9
Sandstone	774	133 14 9	188 1 7	85 10 1	407 6 5	10 6·3	13 19 4	115 15 8	537 1 5	13 10·5	541 8 1	14 0·0	4 6 8	....
Wiluna	935	100 14 0	200 6 11	90 1 10	391 2 9	8 4·4	61 12 4	177 5 11	630 1 0	13 5·7	464 2 2	9 11·1	....	165 18 10
Yarri	....	....	2 3 7	....	2 3 7	....	....	....	2 3 7	....	2 0 8	....	....	0 2 11
Total	27,577	2,468 12 1	7,604 7 8	4,581 17 2	14,654 16 11	10 7·6	578 2 4	4,536 12 2	19,769 11 5	14 4·0	23,527 13 11	17 0·8	4,640 14 11 882 12 5	882 12 5
Total Profit	....	....	....	....	....	....	....	....	....	....	....	....	£3,758 2 6	....

STATE BATTERY SYSTEM.

Balance Sheet as at 31st December, 1943.

LIABILITIES.	£ s. d.	£ s. d.
Capital Expenditure—		
General Loan Fund	405,932 6 5	
Revenue	93,726 4 5	
Assistance to Gold Mining Industry	28,621 13 5	
Commonwealth Assistance	13,786 8 0	
Sundry Creditors—		
Cash Orders	676 8 4	
Other	1,485 14 4	
Treasury Account	106,293 17 5	
Superannuation	714 9 10	
Interest	636,064 0 0	
Sinking Fund	133,190 14 6	
		1,420,491 16 8
Purchase of Tailings Advance Account	....	21,000 0 0
Sundry Creditors for Tailings Payment	1,070 13 0	
Advance of Premium	649 16 3	
Balance of Premium (Estimated)	4,521 8 8	
		6,241 17 11
		£1,447,733 14 7

ASSETS.	£ s. d.	£ s. d.
Plant and Buildings	95,380 3 10	
Less Depreciation	9,534 3 10	
		85,846 0 0
Stores Account—		
Outstations	....	17,112 8 6
Suspense	....	841 0 3
Sundry Debtors	....	2,948 15 3
Battery Spares	....	737 1 9
Profit and Loss Account	....	1,313,006 10 11
		1,420,491 16 8
Amount Paid for Tailings not Treated (including Premium Advance,	11,131 9 5	
Amount Due but not Paid for Tailings Untreated (including Premium Advance,	1,720 9 3	
		12,851 18 8
Estimated Gold Premium	....	4,521 8 8
Purchase of Tailings Cash Account	....	9,868 10 7
		£1,447,733 14 7

General Working Account for the Year ended 31st December, 1943.

	Milling. £ s. d.	Cyaniding. £ s. d.	Total. £ s. d.		Milling. £ s. d.	Cyaniding. £ s. d.	Total. £ s. d.
To Wages	12,732 7 10	10,625 15 2	23,358 3 0	By Revenue	9,459 4 11	23,527 13 11	32,986 18 10
,, Stores	4,166 18 5	4,503 0 6	8,669 18 11	,, Loss carried down	10,221 5 9	....	10,221 5 9
,, Battery Spares	371 16 4	....	371 16 4				
,, Water	1,418 14 4	678 9 6	2,097 3 10				
,, General Expenses	990 13 9	905 1 3	1,895 15 0				
,, Profit Carried Down	....	6,815 7 6	6,815 7 6				
	19,680 10 8	23,527 13 11	43,208 4 7		19,680 10 8	23,527 13 11	43,208 4 7

Profit and Loss Account.

	Milling. £ s. d.	Cyaniding. £ s. d.	Total. £ s. d.		Milling. £ s. d.	Cyaniding. £ s. d.	Total. £ s. d.
To Loss brought down	10,221 5 9	....	10,221 5 9	By Profit brought down	....	6,815 7 6	6,815 7 6
,, Administration	2,066 1 8	3,057 5 0	5,123 6 8	,, Gross Loss carried down	12,287 7 5	....	12,287 7 5
,, Gross Profit carried down	....	3,758 2 6	3,758 2 6				
	£12,287 7 5	£6,815 7 6	£19,102 14 11		12,287 7 5	6,815 7 6	19,102 14 11

General Profit and Loss Account.

	£ s. d.	£ s. d.		£ s. d.
To Gross Loss Milling	12,287 7 5		By Net Loss carried down	40,012 7 5
Less Gross Profit Cyaniding	3,758 2 6			
		8,529 4 11		
,, Interest	....	20,282 0 0		
,, Sinking Fund	....	1,413 0 0		
,, Depreciation	....	9,534 3 10		
,, Superannuation	....	253 18 8		
		£40,012 7 5		£40,012 7 5
,, Balance brought forward	....	1,272,994 3 6		
,, Balance brought down	....	40,012 7 5	,, Balance carried down	1,313,006 10 11
		£1,313,006 10 11		£1,313,006 10 11

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Division IV.

Annual Progress Report of the Geological Survey of Western Australia for the Year ended 31st December, 1943.

The Under Secretary for Mines.

I have the honour to submit for the information of the Honourable the Minister for Mines, my report on the operations of the Geological Survey for the year 1943.

STAFF.

Mr. H. A. Ellis returned to duty with the Geological Survey on the 20th September, having been placed on the reserve of officers from the second A.I.F. Mr. Ellis was on military duty for over three years, having enlisted on 14th August, 1940.

The professional staff at the end of the year consisted of the following officers:—

Government Geologist—F. G. Forman, B.Sc.

Geologists—H. A. Ellis, B.Sc., A.O.S.M.; R. A. Hobson, B.Sc. (Hons.); R. S. Matheson, B.Sc.; K. R. Miles, D.Sc., F.G.S.

On the 29th March, Mr. G. B. Everard commenced duty as semi-technical assistant. His duties include the registration and proper keeping of the rock and mineral collection, the keeping of the rock and mineral indices up to date, the cutting of rock sections for petrological examinations, the handling of specimens to and from the collection for the use of the professional officers, and the care of the technical library. No assistance had been available for work of this nature since the transfer to another Department of Mr. Outtrim in 1940, and the present appointment has helped considerably to save the time of professional officers, and add to the efficiency of their work.

The office work continues to be conducted by a typist, a junior clerk and a messenger.

ACTIVITIES OF PROFESSIONAL STAFF.

F. G. Forman, B.Sc., Government Geologist.

At the beginning of the year, I was engaged with a representative of the British Phosphate Commission, Mr. J. C. Dulfer, on a survey of the phosphate deposits of the Abrolhos Islands, west of Geraldton. This work was commenced on the 15th December, 1942, and was completed on the 14th January, 1943. From the 5th to 26th February, I accompanied Mr. Dulfer on a survey of the phosphate deposits of the Recherche Archipelago, near Esperance, and from the 11th to 17th March, I accompanied him on an inspection of the reputed phosphate deposits near the mouth of the Murchison River.

I was engaged on office work almost continuously for the months of April to July. During this period, I made six brief visits to Greenbushes in connection with tantalite prospecting and mining operations.

From the 30th August to the 22nd September, I was in the field, investigating water supply problems for the Army. Another short trip to assist the Army in a water supply problem was made on the 7th October.

From the 26th to 31st October, I made a visit to the Blue Spec Gold-Antimony Mine, east of Nullagine in the Pilbara district, to advise on the water supply at that centre.

From the 8th to 18th November, I accompanied Mr. Hobson to the Mount Margaret Goldfield in order to review the field work carried out by Mr. Hobson and suspended owing to war conditions late in 1941.

H. A. Ellis, B.Sc., A.O.S.M.

Mr. Ellis returned to duty at the Geological Survey on the 20th September, and before the end of the month, made an inspection trip to Greenbushes connected with tantalite development on M.C. 1.

During October, Mr. Ellis investigated the occurrence of lithium-bearing minerals in the Coolgardie-Londonderry district. Field work occupied his time from the 7th to 31st October, during which period he also investigated the occurrence of talc and soapstone at Mount Monger.

During November, Mr. Ellis was occupied in preparing reports on his field work during October and in inspection work on the columbite-tin lode on M.C. 9 at Greenbushes. Mr. Ellis also assembled information on the graphite deposits at Donnelly River, Kendenup, Munglinup River and Young River, and towards the end of the month commenced field work on these deposits.

Mr. Ellis was in the field until 21st December, examining the graphite occurrences mentioned above, vermiculite deposits at the Young River, and an occurrence of spodumene near Ravensthorpe.

R. A. Hobson, B.Sc. (Hons.).

Mr. Hobson was in Head Office continually from January to April. During this period he prepared reports on the work done by him at Greenbushes during 1942, and completed his maps of that area. During this period, Mr. Hobson also completed reports on the sampling of lakes for alunite near Baladjie and Mount Palmer, and also prepared final estimates of the quantity and quality of iron ore likely to be available from the Koolyanobbing iron ore deposits.

During May, Mr. Hobson was engaged at Greenbushes on the examination of an area in the vicinity of Dredging Claim 95 and Mineral Claim 48, and also in carrying out a preliminary sampling of sundry areas throughout the Greenbushes Tinfield. He returned to Head Office on the 24th July, and was then engaged until early in October preparing reports and maps dealing with his work at Greenbushes.

In November, Mr. Hobson accompanied me on a review of field work carried out by him during 1941 in the Mount Margaret Goldfield.

From the 6th to 17th December, Mr. Hobson made an examination of the Ora Banda Amalgamated Gold Mines at Grant's Patch.

Throughout the year, Mr. Hobson attended to routine office duties during my absences on field inspections.

R. S. Matheson, B.Sc.

In January, Mr. Matheson investigated the tungsten deposits at Callie Soak and the molybdenite deposits at Mount Mulgine in connection with applications for financial assistance. Whilst in the Callie Soak area, Mr. Matheson made brief visits to Poona, Coodardy Tin Leases and the Big Bell Gold Mine.

During the early part of February, Mr. Matheson was absent from work on sick leave.

From the 18th February to 7th April, he was engaged on the compilation of a bulletin describing the mica deposits of Western Australia. From the 8th

April to 15th May, Mr. Matheson was engaged in the mapping and sampling of phosphate deposits in the Dandaragan district. His work on the Mica Bulletin was completed towards the end of May.

In June and July, Mr. Matheson was at Head Office, completing reports on work carried out by him at Greenbushes during 1942, and assisting the preparation of the Annual Progress Report for 1941 and 1942. During this period he also accompanied a representative of the British Phosphate Commission on a tour of inspection of the Dandaragan phosphate deposits.

During August, Mr. Matheson was engaged at Head Office in the compilation of general information to be included in the forthcoming bulletin dealing with the mining groups of the North Yilgarn Goldfield. He also organised a card index system for the recording of mineral prices and specifications which has proved of distinct value to the work of the branch.

In September, Mr. Matheson accompanied Dr. H. G. Raggatt, Commonwealth Geological Adviser on inspection trips to the Dandaragan phosphate deposits and the anthophyllite asbestos deposits at Bindi Bindi.

Mr. Matheson made another trip to Dandaragan in October with representatives of the British Phosphate Commission.

Early in November, Mr. Matheson made preparations for the mining of a trial parcel of phosphate nodules from Cook's deposit at Dandaragan. He supervised the obtaining of this material which occupied his time from the 16th November to 7th December.

The remainder of the year was occupied by Mr. Matheson in compiling a report on the work done by him at Dandaragan and on a visit to the Cresco Fertiliser Works where the trial parcel from Dandaragan was being treated.

K. R. Miles, D.Sc., F.G.S.

During the early part of January, Dr. Miles was engaged in logging and taking representative samples of bore core obtained during the drilling of the ore body of the Whim Well Copper Mine, Whim Creek, by the Commonwealth Copper and Bauxite Commission in 1942. On the conclusion of this work he commenced the preparation of a bulletin on the tantalite deposits of Western Australia.

On 2nd March, Dr. Miles left Perth to make an inspection and assess the possibilities of the scheelite deposits at Coolgardie (Londonderry), Higginsville, Comet Vale and Westonia. He took with him the Department's Mineralight Ultra Violet Ray Lamp which proved of considerable assistance to the men operating these deposits. Whilst in the district he investigated a deposit of lepidolite at Tantalite Hill, Londonderry.

After returning to Perth on 18th March he was engaged at Headquarters until early in June on various duties, including the preparation of a report on the scheelite deposits, notes and plans for the tantalite bulletin and a report on the petrography of rocks from the Greenbushes Tinfield.

From 9th to 16th June, Dr. Miles was engaged in sampling the salt lakes of the Campion district in connection with the proposed alumina treatment plant. After completion of his reports he was engaged until the end of July on petrological work—in connection with rocks from Greenbushes, the Mt. Margaret Goldfield and the South Coast.

From 5th August to 1st September he was engaged in a survey of the moulding sand deposits in the metropolitan area, in company with Mr. H. A. Stephens of the Council for Scientific and Industrial Research. During the course of this work the bentonitic clay deposits of Marchagee were examined and sampled.

From September until the end of the year, Dr. Miles was engaged at Head Office on multifarious duties, including completion of the tantalite bulletin, preparation of a report on the moulding sands investigation, and various departmental reports on microscopic mineralogy and petrology, including during October a report on the constitution of phosphate nodules from Dandaragan.

Reports based on the year's field work are published herewith, with some exceptions, as follow:—

A number of reports prepared by Messrs. Hobson and Matheson describing the work on the Greenbushes Tinfield are not published because of their length and the fact that they will be included in a comprehensive bulletin dealing with the Greenbushes Tinfield, which is now in course of preparation.

Various reports dealing with phosphate deposits are also withheld pending the compilation of a report covering all the phosphate deposits of the State.

Other reports not published were prepared for purely departmental information or for the Department of the Army.

I wish to record my appreciation of the loyal work of all members of the staff throughout the year.

F. G. FORMAN,
Government Geologist.

ALLUVIAL TANTALITE, MINERAL CLAIM 1—GREENBUSHES.

By F. G. Forman, B.Sc.

On the 14th and 15th of May I made an inspection of mining operations on M.C. 1., Greenbushes, where Messrs. Collett and Freeman are recovering alluvial tantalite from an area covered by the road reserve.

High grade lode tantalite has been obtained in the past from a short but rich shoot of ore on M.C. 1 about 60 feet from the western side of the main Greenbushes-Bridgetown road. Alluvial tantalite shed from the lode has also been worked on either side of the road reserve, but alluvial ground within the reserve has, until now, been left intact. The recent urgent request from Professor Greenwood for the supply of high grade tantalite resulted in an offer from Collett and Freeman, who hold M.C. 1 on tribute from Tantalite, Ltd., to mine the alluvial ground beneath the road reserve, and this operation is now in progress.

Mining operations consist of working out the alluvial material in drives supported by timber beneath the road surface. The alluvial wash varies from two to three feet in thickness and lies on an uneven surface; the bottom of the wash at the S.E. corner of the block of ground being at a depth of about 12 feet whilst the wash at the present N.W. corner of the workings has risen to such a shallow depth as to necessitate the breaking of the road surface to enable the wash to be removed. Alluvium has been exposed in the direction of the length of the road for a distance of 60 feet without the full width of the gutter being found.

At the time of inspection about one-third of the available ground had been worked for a recovery of 11 cwt. of tantalite lumps weighing from a few ounces up to 24½ lb. Many lumps of between two to 10 lb. weight have been recovered and make up a very large proportion of the total. There is every indication that when the block of ground is worked out a total of well over one ton of high grade tantalite will be recovered.

The lump tantalite so far obtained was hand picked from the wash and arrangements are being made for the fine material to be sluiced. No information is available regarding the grade of the fine wash.

The lump tantalite so far recovered has not yet been assayed. Judging, however, from the results of earlier working of the alluvial on either side of the main road a Ta_2O_5 content of 66 per cent. or over is confidently expected.

Judging by the large size of tantalite lumps and their extremely angular shape it seems clear that the lode from which they were shed must be very close to where they are now found. It is also obvious that portion of the tantalite being recovered was derived

from the short, rich shoot, 60 feet west of the road mentioned earlier in this report, but the contour of the bottom of the present alluvial workings suggests the likelihood of some of the tantalite coming from a yet undiscovered shoot to the north of the known one. In view of the present urgent demand for high grade tantalite, I recommend that prospecting operations to try and locate a possible new shoot be carried out. The likely area was pointed out during the present inspection to both Mr. J. H. Collett and his manager, Mr. H. Paterson. The provision of £200 for this prospecting should be made immediately in order that the work may be done while the present operations are in progress. On completion of the present programme the men now being employed will be moved to other urgent operations on M.C. 6 and the Vulcan Tin Mine, M.C. 4.

———

WATER SUPPLY AT THE BLUE SPEC GOLD-ANTIMONY MINE, NULLAGINE, PILBARA DIVISION.

By F. G. Forman. B.Sc.

A visit was made to the Blue Spec Mine between the 20th and 23rd October to investigate the possibility of obtaining additional water supplies at this mine. Mr. J. L. Dillon, manager of the Blue Spec Mine extended to me every courtesy and provided transport facilities between Marble Bar and the mine and during the actual investigation.

The Blue Spec Mine is located in hilly country, which is made up of steeply dipping and tightly folded slates, quartzites and grits of the Pre-Cambrian Mosquito Creek Series.

These rocks have an extremely low inherent porosity, and underground water supplies are, therefore, dependent on water which fills joints, faults and shears traversing them. As a general rule these features are impossible to detect by a surface examination and therefore, the obtaining of an adequate water supply in any one well or bore is largely a matter of chance. The workings at the 300ft. level of the Blue Spec Mine are in dense slaty rock and although the rocks are well jointed and sheared the workings are practically dry. On the other hand the domestic supply well, situated about 1,000 yards south-east of the mine, is in rock made up of alternate layers of slates and grits, which are well jointed, and from which a small supply of 1,500 gallons per day is at present being obtained.

Existing Bores and Wells.

Middle Creek, along the western bank of which all the existing water supplies are located, flows across a wide flat occupying a break in the east-west trending hills lying to the south of the mine. The country rocks underlying this flat have a strike parallel to the general trend of the hills and dip steeply towards the south at angles of from 70° to 90°.

The existing bores and wells indicate that water supplies of the order of 1,500 gallons per day are all that can be expected from any one source. Details of the various supplies are as follows:—

No. 1 Bore is about two miles from the mine, is 243 feet deep and is said to yield 1,500 gallons per day of brackish water.

No. 2 Bore, known as Lister Bore, is situated one mile south of the mine, has a depth of 226 feet and a water level at 186 feet. This bore is said to yield 1,500 gallons per day. After standing, the bore can be pumped at the rate of 120 gallons per hour, but the supply rapidly falls off to the above steady amount.

No. 3 Bore is at present in progress. It is situated about 100 yards west of the No. 2 Bore and is at present 251 feet deep with no water.

An abandoned bore a few hundred yards east of No. 1 Bore is 182 feet deep and is stated by Mr. Peterson to be capable of yielding 80 gallons per hour. It is reported that this bore was abandoned because of the crookedness of the hole.

An abandoned dry bore 120 feet deep is situated about 100 yards north of No. 2 Bore. This bore was abandoned when the contractors struck country, which in their opinion, was too hard to drill.

The domestic supply well is situated about 1,000 yards south-east of the mine. It is 194 feet deep and has a 40 feet crosscut at the bottom. The supply from this well is reported to be 1,500 gallons per day, the water level being at 140 feet. Mr. Peterson who had charge of the sinking of the well, reports that the water supply is derived from numerous small seepages which come in through narrow joints and contact planes between the rock types.

All the above sources are connected by pipe line to the main service tank at the Blue Spec Mine. The estimated total supply per day being 4,500 gallons.

Middle Creek Government Well is situated close to to the western bank of Middle Creek about two miles south of the mine. The supply is said by Mr. Dillon to be very small.

Recommendations.

To obtain the additional supplies required to bring the present supply of 4,500 gallons per day up to 20,000 gallons per day, the total quantity estimated by Mr. Dillon would require the sinking of probably seven or eight additional bores. There can be no guarantee that every bore would obtain a supply and where difficulty is experienced in striking water each bore should be continued to at least 300 feet before abandonment. With a contract price of 30s. per foot, the price paid for previous bores, it will be seen that a boring programme, if successful, would cost at least £2,100 leaving out of consideration the cost of additional pumping equipment.

It is recommended that a first effort to augment supplies should be made by additional crosscutting in the domestic well. A further 100 feet of crosscutting in either direction across the strike of the country should give an added yield equivalent to that obtainable from at least two new bores, and there is also an excellent chance of opening up more open country, which would yield considerably greater supplies. One hundred feet of 6 x 4 crosscut should not cost more than £800, and in addition to exploring the possibility of obtaining a really heavy supply of water it would, combined with the existing 40ft. crosscut, provide a storage capacity of 20,000 gallons.

Further useful exploratory work could be carried out very cheaply by crosscutting with a diamond drill from the bottom of the new main shaft at the mine. The best direction of this work would be to the north in order to test the country under the flat to the north of the mine. This I understand has already been proposed by Mr. Carroll.

A suggestion mentioned to me by Mr. Dillon, to develop a water supply by pumping from sand soaks in the Nullagine River near the junction of Five Mile Creek and distant about six miles from the mine, should be considered only as a last resort on the score of expense. Before being seriously considered it would be essential to test the permanency of the soak supplies by heavy pumping tests at the end of the dry season.

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A SPODUMENE DEPOSIT, RAVENSTHORPE, W.A.

(Approx. Lat. 33° 35′ S., Approx. Long. 120° 02′ E.)

By H. A. Ellis, B.Sc., A.O.S.M.

Locality.

The spodumene occurs as a constituent of a pegmatite dyke outcropping in the bed and western bank of one of the tributaries of the headwaters of Cattlin Creek, about four chains east from a point on the Ravensthorpe-Newdegate road, 1·3 miles north of the Ravensthorpe Post Office. The strongest development of spodumene is in the creek bed approximately 10 chains S.E. from the N.W. corner of Water Reserve 17.

Ravensthorpe is approximately 30 miles by road from the disused small vessel port of Hopetoun on the south coast, and 81 miles by road from the railhead at Newdegate (306 miles by rail from Perth).

The deposit was inspected on December 16th, 1943.

Geology.

Medium to coarse grained blocky amphibolites outcropping strongly in the east bank of the creek have been intruded by a medium grained pegmatite dyke striking N.W. and about four chains wide where it junctions at the S.E. end with the blocky amphibolites in the creek bed. More or less horizontally disposed tongues of pegmatite from three feet to ½ inch thick can be seen intruding the amphibolites on the eastern bank in a series of nearly horizontal master joints. Occasionally the S.E. contact of the dyke can be observed dipping at from 90° to 15° and occasionally flatter to the east.

The Spodumene Occurrence.

Fresh apple-green coloured spodumene crystals varying in size from 18 inches x 6 inches x 4 inches maximum dimensions, down to crystals ¼ inch maximum dimension, occur in the extremely fresh pegmatite in patches of varying density of spodumene concentration and with no particular orientation. Some patches of dyke contain up to 20 per cent. by volume (estimated) of spodumene, others up to 10 per cent., while considerable areas of exposed pegmatite contain no visible spodumene. The best patch seen would be about one sq. chain in area containing about 20 per cent. by volume of spodumene.

The spodumene bearing portion of the dyke considered of possible economic importance is the strip approximately four chains wide at the eastern end, and about two chains long (N.W. along the strike) in the creek bed and on the western bank.

The pegmatite over this area consists principally of quartz, albite felspar, muscovite mica and spodumene with beryl, columbite and black tourmaline as very minor accessory minerals. A pink tourmaline is reported to occur here; specimens were seen in the possession of local inhabitants but none was observed in the pegmatite.

It was reported locally to the writer that concentrates obtained from material broken from an outcrop of this dyke further to the N.W. from the spodumene deposit, were examined by the Government Mineralogist and contained cassiterite, columbite, lepidolite mica and amblygonite.

A remarkable feature of the pegmatite is its freshness, consequently rendering mining operations costly right from the surface. The even grain size—more like a very coarse grained granite than pegmatite—is also noteworthy when compared with the usual large scale crystalline development found in most pegmatites carrying minerals of economic importance.

The deposit was not being worked at the time of inspection (December 16th, 1943) but showed signs of having been recently lightly attacked, as evidenced by several wide, shallow excavations and benchings in the vicinity of which there remained possibly ¾ ton of ore.

Estimate of Tonnage.

It is considered desirable to present some estimate of the quantity of spodumene likely to be contained in that portion of the dyke in which spodumene can be seen to be present in the outcrop.

The estimate which follows is influenced by the following factors:—

(a) The irregular and unpredictable manner of occurrence of accessory minerals in a pegmatite dyke.

(b) Complete lack of any mining development.

(c) The possibility that the spodumene bearing portion of the dyke may be underlain at no great depth by amphibolite, as suggested by the flatly lying pegmatite intrusions into the amphibolite in the eastern bank of the creek. On account of this possibility a vertical extent of 10 feet only has been assumed in the following computation.

(d) Impracticability without mechanical aid of trench sampling the wide, fresh pegmatite, hence a visual estimate only of the volume of spodumene in the pegmatite was possible.

Area over which pegmatite carries spodumene = 264 x 132 sq. ft.
Depth to which pegmatite is assumed to carry spodumene. = 10 feet.
Volume of spodumene bearing pegmatite .... = 348,480 c. ft.
Using conversion factor of 15 c. ft. per ton then Tonnage of spodumene bearing pegmatite. = 23,232 tons.
Estimated percentage by volume of spodumene in above volume of pegmatite. = 10 per cent.
Volume of spodumene in pegmatite .... = 34,848 c. ft.

$$\text{Weight of spodumene in pegmatite using S.G. of spodumene as } 3\cdot1 = \frac{34{,}848 \times 62\tfrac{1}{2} \times 3\cdot1}{2240}$$

= 3014 tons.

Thus 23,232 tons of spodumene-bearing pegmatite are estimated to contain 3,014 tons of spodumene based on the above assumptions.

Quality of the Spodumene.

A representative sample of the spodumene crystals was collected over the area on which the above computations are based, and has been analysed at the Government Chemical Laboratory with the following results:—

Lithia (Li_2O) = 6.20%. Lab. No. 9383.

General Remarks.

It is essential that the factors quoted in the estimate of tonnage be given due consideration when reviewing the economic possibilities of this deposit. The hardness of the pegmatite and the frequent intimate intergrowth of quartz and felspar with some of the spodumene are not favourable to successful hand picking of the broken ore. The relative high S.G. of spodumene (3·13-3·20) suggests concentration of a crushed ore as being likely to be successful if prices and production costs are favourable to the exploitation of this deposit.

THE YOUNG RIVER VERMICULITE DEPOSITS. YOUNG RIVER, EUCLA DIVISION, W.A.

Approx. Lat. 33° 32′ S., Approx. Long. 121° 00′ E.

By H. A. Ellis, Geological Survey of W.A.

Locality.

These deposits are situated on the eastern bank of the Young River, approximately 64 miles east of Ravensthorpe by road via Dunn's and Munglinup, in approximate latitude 33° 32′ south, and approximate longitude 121° 00′ east. Esperance, the nearest shipping port on the south coast, is 76 miles distant in a general east-south-easterly direction by a moderately good sand plain road.

In the early stages of development the deposits were somewhat difficult of access, but recent road improvements have considerably reduced these difficulties. The easiest approach to the deposits is by the Ravensthorpe-Esperance road, turning north off this road at a point 9·4 miles west of the Young River Crossing —the turn off being some 59 miles from Esperance and approximately 60 miles from Ravensthorpe.

The deposits were first inspected by the writer in June, 1940, and again in December, 1943.

History.

The deposits were found towards the end of 1939 by prospector G. Halbert of Ravensthorpe, who first detected the vermiculite flakes in the soil of mounds built by ants on the soil-covered slopes of the low hills forming the eastern bank of the Young River in this locality. A considerable amount of prospecting in the nature of costeens and shallow shafts was done in early 1940, and by June of that year two deposits of potential economic value were opened up in a small way. Much difficulty was encountered at this time in securing an assured market for the vermiculite, and even to-day (January, 1944), the supply exceeds the demand. The deposits are embodied in Mineral Claims Nos. 204H and 205H each of 24 acres and are being worked by a Perth firm, The Perth Modelling Works.

Physiography.

This part of W.A. is characterised by extensive areas of broadly undulating sand-plain country devoid of large trees, except along the river courses, and covered for the most part with low scrub and mallee. The surface is mostly sandy, with either a clayey or gravelly sub-soil close to the surface. The south trending drainage channels, such as the Oldfield and Young Rivers, are entrenched to depths varying from a few feet up to 50 feet in places in the bottom of very broad valleys (up to 5 miles wide in places) and are, for the most part of the year, a chain of widely separated pools or rock-holes of saline water. The actual stream beds follow a meandering course in the wide valleys, the soil banks occasionally being replaced by rock. The vermiculite locality on the Young River is characterised by a small extent of moderately hilly country adjoining the eastern bank of the river, the more resistant basic rocks of the hills forming the actual banks in places. These hills carry a moderately dense growth of medium sized timber—mostly Yate, of considerable value as mining timber.

Geology.

No systematic geological surveys have as yet been carried out in this part of the State, and only observations made at widely spaced intervals can be quoted in this account of the geology of the area.

Shortly after passing eastwards through the easily recognised "Greenstone Belt" of Ravensthorpe, sand plain country is encountered, and topography and vegetation change rapidly from the sharply dissected, timbered, hilly country of the gold and copper belt, to the broadly undulating, scrub-covered sand plain, with occasional low rounded hills to the south and wide shallow valleys. Infrequent outcrops seen on the road consist of quartz mica schist with numerous thin beds of actinolite and anthophyllite schist alternating rapidly with the mica schist. These beds have a regional strike of approximately east and west and dip at from 50° to 90° to the south. They have been intruded by granite, quartz reefs, and basic rocks, the latter giving rise to useful magnesite deposits in the vicinity of Bandalup Creek.

Still further east, after passing from high level sand plain country just east of No. 1 Rabbit Proof Fence down a very marked topographic slope, and into a large expanse of lower lying sand plain country, occasional bands of gneissic country outcrop, particularly in the vicinity of the Oldfield, Munglinup and Young Rivers. Here the rocks are markedly gneissic with biotite and hornblende, and occasionally garnet, the predominant minerals after quartz and felspar. The strike now is predominantly in the north-east quadrant, with dips more moderate, between 30° and 55° to the south-east.

The relation these rocks bear to the "Greenstone Series" at Ravensthorpe, or the metamorphic sedimentary beds of the Stirling Range, is as yet unknown. On the Munglinup River they contain well defined zones of graphitic schist carrying flake graphite in payable quantities, and on the Young River in the vicinity of the vermiculite deposits, where there are some good exposures, they can be seen to be intruded by basic rocks forming an actinolite—anthophyllite—hornblende complex.

Here, the country rock is mainly biotite gneiss with interbedded hornblende granulite, which is sometimes gneissic and sometimes massive. The regional strike is north-south with a prevailing dip of from 40° to 50° to the east, and both the gneisses and intrusive basic rocks have been intruded by muscovite bearing granite, tourmaline-bearing pegmatite dykes, and quartz reefs.

In the absence of definite proof as to age, the schistose and gneissic series is presumed to be of pre-Cambrian age, and from its general appearance in the field to be formed mainly from metamorphosed sediments.

The Vermiculite Deposits.

Vermiculite is a name given to a group of micaceous minerals, all hydrated silicates, considered to be alteration products, chiefly of the micas. When heated they lose their water of composition, and in so doing swell up or exfoliate to varying degrees. It is this property of exfoliation which gives them their commercial value as insulating material against heat and sound, and according to the degree of exfoliation and the strength of the exfoliated material, the value of the product varies. Some types change colour on heating, and when the finely divided material is used as a pigment or filler in paints, the nature and intensity of the colour are of importance.

Considerable doubt exists as to the mode of origin of the vermiculites, and the writer collected representative material in 1940 with the object of having some chemical investigations made which would throw some light on the mode of origin of these deposits. Unfortunately, the demands of war activities on the available Departmental Chemical Staff have prevented this investigation being carried out.

Field evidence gathered during the examination of these deposits does not support the conception that vermiculite is simply a weathered form of say biotite or phlogopite mica, etc., but that it is a mineral formed under deep-seated hydrothermal metamorphic conditions. This conception is supported by available evidence noted in the examination of a number of other minor occurrences of the mineral in the south-west part of the State carried out by the writer in early 1940.

The evidence favouring a deep-seated origin may be summarised as follows, the characteristic associations being common to deposits some hundreds of miles apart in latitude and longitude:—

(1) The host rock is invariably a highly sheared basic igneous rock consisting of hornblende, actinolite, anthophyllite and usually talc, in varying proportions.

(2) In every case there is evidence of granitic or pegmatitic intrusive rocks in the immediate vicinity of the deposits.

(3) The vermiculite invariably occurs in obvious shears in the basic rock, and is itself frequently intersected by shear planes and often highly foliated.

(4) In every case the biotite or other micas in the highly weathered adjoining granite and gneiss are not of the vermiculite group.

The occurrence of a dark green vermiculite in the heart of fresh microcline felspar boulders from a pegmatite dyke outcropping near the southern end of the Young River deposits is interesting, in so far that this vermiculite could not possibly have had access to atmospheric weathering agencies, being completely surrounded by over 9 inches of remarkably fresh felspar.

The above information concerning the mode of origin of vermiculite has an important economic significance, as the writer is of the opinion that, contrary to a somewhat general geological belief, vermiculite deposits are not confined to the zone of weathering, but continue to depths limited only by the continuity of the host rock and the deformation structures primarily responsible for the formation of the mineral.

The Young River vermiculite zone which has been developed commercially, lies towards the western margin of a complex of basic rocks comprising mainly massive hornblendites with actinolite, anthophyllite and talc bearing facies, which are intrusive into interbedded hornblende granulite and biotite gneiss, striking approximately N. and S. and dipping at from 30° to 55° to the east. The zone is approximately four miles long by about ½ mile in width, is moderately hilly, and carries a medium growth of eucalypts and scrub.

The basic intrusive rocks, frequently massive and coarse-grained, have been sheared in directions mostly confined to the N.W. and S.E. quadrants, the shears dipping sometimes steeply to the north and sometimes steeply to the south, and controlling the occurrence of the vermiculite. The basic intrusive rocks and the gneissic series have been invaded by granite and pegmatite.

Numerous separate vermiculite prospects of varying grain size, colour and exfoliation value have been opened up over a distance of about 1,800 feet along the belt and over a width of approximately 800 feet, in the west-central section of the belt. They all occur in sheer planes of varying length and attitude, none exceeding 100 feet long—the majority being much less than this—in the weathered basic intrusive hornblendite or actinolite-anthophyllite rock.

To date, the demand for the mineral has resulted in the opening up of the two best prospects only, the northern deposit, situated some 1,200 feet north of Halbert's camp, and the southern deposit, located about 450 feet S.S.W. from the camp, both on the eastern bank of the river.

The Northern Deposit.

This deposit is situated on the crest of a flat-topped ridge approximately 1,200 feet north of Halbert's camp, and 400 feet N.E. from the northern end of the N.-S. stretch of the river immediately west of the camp.

The vermiculite occurs in a complex intersecting shear pattern in granular hornblendite and granular actinolite rock, the principal directions of shearing being N. 15° W. dip E. at 75°; and N. 60° W, dip both N.E. and S.W. at from 60° to 80°; forming wedge shaped masses of vermiculite and "horses" of hornblendite. The shear pattern frequently forms lozenge shaped masses resulting in two hanging walls, making mining operations somewhat difficult.

The deposit has been worked over a total length of 75 feet, (following the shears) down to a maximum vertical depth of 45 feet and over a maximum width of 12 feet. The vermiculite lens was 2ft. 6in. wide at the bottom of the deepest workings (December 11th, 1943) and was narrowing in from a width of 12 feet some 20 feet higher up. The lenses appeared to have pinched out at the S.E. end of the workings, but the N.W. face still showed up to 12 feet of vermiculite near the surface.

The gradual conversion of the hornblende into masses of interlocking dark green scaly vermiculite is amply demonstrated in the residual "horses" of hornblendite, and in the wall rocks.

There is a strong outcrop of a pegmatite dyke carrying tourmaline and muscovite mica immediately west of this deposit, and the hornblendites in the vicinity contain numerous octahedra and tabular crystals of magnetite.

Similar shaped magnetite crystals with an indicator zone of reddish iron oxide distributed in the surrounding vermiculite occur in the heart of the vermiculite lenses in the deposit being worked.

The vermiculite is strongly foliated in places, the maximum size of the scales noticed being about 1½ inches by one inch, with by far the largest proportion of the scales under ¼ inch maximum dimensions, forming a compact interlocking mass, easily mined, though liable to form dangerous ground. To date this deposit has produced 420 tons, some of which has been used in Perth and some shipped to the Eastern States.

The following information relative to the treatment of the vermiculite has been supplied by the Managing Director, Perth Modelling Works:—

Weight of ore before exfoliating = 80 lb. per cubic foot.

Weight of ore after exfoliating = 6-8 lb. per cubic foot.

Normally, before exfoliating, the vermiculite is dressed to two sizes, viz.,

(a) —3 + 8 mesh.

(b) —8 + 40 mesh.

These two sizes, when exfoliated, have been found most suitable for the various uses for which the expanded vermiculite is required.

The Southern Deposit.

This was the first deposit worked, and provided the initial bulk parcels of ore on which commercial tests were carried out in an endeavour to establish the value of the deposits.

It is situated on the east bank of a small tributary of the river some 450 feet S.S.E. from Halbert's camp, and about 150 feet S.E. from the southern end of the N.-S. stretch of the rvier immediately west of Halbert's camp.

It is of a similar nature to the northern deposit, occurring in a shear pattern in a green actinolite rock with "horses" of hornblende and actinolite in the vermiculite. The shear pattern has a general strike of N. 65° W. and dips at about 60° to the N.E. The deposit has been worked as an open cut for some 20 feet long by 15 feet wide, by 18 feet deep on the underlay, and although the shears with the accompanying vermiculites have narrowed in considerably at the south-eastern end of the cut, a good face of ore is exposed in the north-western end and in the bottom of the cut.

The following information, relative to the treatment of the vermiculite from this deposit, has been supplied by the managing director of the Perth Modelling Works:—

Weight of ore before exfoliating .. .. = 80 lbs. per cub. ft.

Weight of ore after exfoliating .. .. = 8-10 lbs. per cub. ft.

As in the case of the Northern deposit, this vermiculite is dressed to two sizes before exfoliating, viz:—

(a) —3 + 8 mesh.

(b) —8 + 40 mesh.

Production and Ore Reserves.

The following production figures were supplied by the owner of the deposits, and represent very closely the quantities sold up to the end of 1943.

Northern Deposit	420 tons	(approx.)
Southern Deposit	150 tons	„
Total	570 tons	„

Several small parcels mined for experimental purposes in the early stages of the development of the deposits are not included in the above tonnages.

It is not practicable to compute the ore-reserves available in the two deposits already being worked, on account of insufficient exposures and the extremely irregular manner of occurrence of the mineral in the complex shear patterns in which it occurs.

With a knowledge of the manner of occurrence and from an inspection of the workings as they appeared in December, 1943, and taking into account the quantities already mined from the two deposits the following guess as to remaining ore is made:—

Northern Deposit	300 tons.
Southern Deposit	150 tons.

These guesses are made with respect to ore down to the level of the deepest part of the workings: 45 feet in the Northern deposit and 18 feet in the Southern deposit.

Other Vermiculite Prospects.

Some 18 other vermiculite prospects have been opened up in very shallow shafts or small costeans over an area approximately 1,800 feet long by 800 feet wide.

In many of these the vermiculite is of good expanding quality, but in none of them were the initial dimensions as promising as those of the Northern and Southern deposits, and they have consequently not been opened up to any extent.

The demand for the mineral is not sufficiently strong at present to warrant the further prospecting of these occurrences. One of these deposits, situated about 250 feet S.E. of the Southern deposit, is of interest in that at a depth of about 18 feet the shear carrying the vermiculite bottomed on pegmatite, the felspar of which is a glassy form of albite-oligoclase, resembling petalite in

hand specimens. Several outcrops of pegmatite in the vicinity of some of the other deposits also carry this glassy felspar.

In the absence of any development work on these occurrences, it is not possible to form any estimate of the quantities of vermiculite likely to be obtained from them.

General Remarks.

The Young River vermiculite deposits constitute the best yet found in this State, and with only the two best of the surface prospects yet partially developed, have been able to meet current market demands.

The future development of the deposits depends entirely on the market demand and although at the present time (January, 1944) it is possible to offer only a guess at the ore reserves (450 tons), the potentialities of the area over which vermiculite has been found have not been even partially explored in depth in any instance, and in only two instances has there been any moderate scale surface development.

Attempts to develop in depth any vermiculite deposit would be largely an experiment in the light of our present knowledge of the mode of origin of the mineral, but the writer has confidence that they will live in depth, providing the host rock persists and the shears continue, both factors of strong geological probability.

THE YOUNG RIVER GRAPHITE DEPOSIT, YOUNG RIVER, EUCLA DIVISION, W.A.

(Approx. Lat. 30° 32′ S., Approx. Long. 121° 00′ E.).

By H. A. Ellis, B.Sc., A.O.S.M.

Locality.

This deposit is situated on the eastern side of the Young River, approximately 64 miles east of Ravensthorpe by road via Dunns' and Munglinup, in approx. Lat. 30° 32′ S., and approx. Long. 121° 00′ E. Esperance, the nearest shipping port on the south coast, is 76 miles distant in a general east-south-easterly direction by a moderately good sand plain road.

The deposit is held under P.A. 813H, and is distant about 60 chains south from Halbert's Camp on the vermiculite deposits. The deposit was inspected on December 11, 1943.

Geology.

The graphite occurs in a graphitic schist band interbedded with biotite and hornblende gneisses, and outcrops in one place on flat to undulating scrub-covered country in which outcrops are scarce. The same type of country rock is associated with the vermiculite deposits to the north, and the Munglinup River graphite deposits some 12 miles to the south-west.

A band of graphitic schist had been opened up to a depth of six feet in a wide costean which showed a true width of 10 feet of high grade flake graphite ore with no true hanging-wall encountered. The strike of the beds is N. 45° W. dipping at from 60° to 35° to the N.E. in a curving dip. The footwall is decomposed yellowish coloured biotite gneiss, similar in all respects to the country rock at the Munglinup graphite deposits.

The bed outcrops for 20 feet to the N.W. and can be traced by floaters for a distance of 15 chains to the S.E. Only one opening has been made in the deposit, and on this account no bulk samples were taken.

By comparison with similar sized openings on the Munglinup graphite deposits in which the graphite forms from 20 to 25% by weight of the original ore, it can be stated with confidence that the material from this single opening on the Young River graphite is of similar grade.

Dr. Miles, of this branch, examined specimens of the ore microscopically, and found it to consist of flake graphite and oligoclase felspar with a very small fraction of red rutile fragments.

The ore is moderately hard where exposed, and gives bright surfaces of flake graphite and fresh to kaolinised oligoclase felspar of striking appearance when broken. Small scale, but intense foliation can be detected in hand specimens, and the graphite is presumed to have been formed by the metamorphism of original carbonaceous shale of sedimentary origin.

General Remarks.

In the present stage of development the deposit is obviously a very good graphite prospect only, and no estimate can be made of ore reserves. Only a very small proportion of fine flake graphite can be detected in hand specimens, the bulk of the graphite presenting a bright glistening flaky appearance.

If the market demand is sufficient, then this deposit, which is held in conjunction with the Munglinup River deposits, some 12 miles to the S.W. by the Perth Modelling Works, Perth, would certainly warrant vigorous development.

THE KENDENUP GRAPHITE DEPOSITS, W.A.

Approx. Lat. 34° 32′ S., Approx Long. 117° 37′ E.

By H. A. Ellis, B.Sc., A.O.S.M.

Locality.

These deposits are situated 2·2 miles S., 20° W. airline from the Kendenup Railway Siding (on the Perth-Albany Railway) at a distance of seven chains N. 15° W. from the S.E. corner of Plantagenet Loc. 167. (See Lands Dept. Litho. 445/80.)

Kendenup Railway Siding is 289 miles from Perth and 51 miles from Albany, the nearest port.

The deposits were inspected on December 4th, 1943.

Geology.

At the time of inspection (December 4th, 1943) the deposits were not being developed, and all of the original openings had fallen in; the deepest remaining excavation being four feet only. The workings had been used as a rubbish dump and no information at all about the manner of occurrence of the graphite could be obtained. The adjoining country is broadly undulating with no rock outcrops. Occasional boulders of quartzite and schist found in adjoining cleared land suggest the presence of metamorphic rocks below the soil mantle.

A description of the area and the deposits is contained in G.S.W.A. Bulletin No. 74, pp. 94-99, from which the information about the graphite deposits given below is digested.

The Graphite Deposits.

At a vertical depth of 50 feet a graphite-bearing formation, trending a little north of west and south of east, and presumably dipping vertically, or nearly so, was prospected by tunnelling for a length of 75 feet and a width of 25 feet. Five samples taken from various parts of the drives gave returns of 36·58 per cent., 80·54 per cent., 46·24 per cent., 18·22 per cent., 26·86 per cent., and 12·10 per cent. of graphite in the flake form.

No information is available concerning the widths over which these samples were cut, and no bulk sample of a mineable portion of the ore appears to have been taken.

It is stated in the report that considerable quantities of ore containing 60 per cent. of graphite could be obtained by hand-picking ore broken in the course of development work.

Water and Mining Timber.

The Kalgan River is merely a wide, flat valley in this locality and does not carry water. Ground water sufficient for treatment purposes would probably be found in normal mining operations to 100 feet.

Some mining timber exists on Location 456 nearby but is not plentiful, most of the adjoining country being cleared and cultivated for orchards and mixed farming.

Ore Reserves.

It is impossible to make any estimate of ore reserves on the existing information.

Quality of the Graphite.

No material representative of the mineable portion of the deposit could be obtained, hence no information other than that quoted above with reference to samples can be given.

General Remarks.

Despite the absence of information giving a lead to the widths over which the sample values quoted above were obtained, the deposit can be considered a very good prospect. Available information shows that this deposit contains flake graphite in seams of unstated width in proportions varying from 12·10 per cent. up to 80·54 per cent. This latter value is admitted as having come from a picked sample, *i.e.*, from a specimen.

The graphite ore from this locality could no doubt be successfully concentrated by oil-flotation processes, and if suitable markets can be obtained for the products then the deposit is well worth prospecting.

The author of the report quoted in Bulletin 74 considered the deposits of sedimentary origin, a view supported by the writer.

The development of the prospect should be entirely dependent on the market demand, since from available information insufficient is known about the quality and quantity of ore available from this resource to consider the erection of a treatment plant.

TALC AND SOAPSTONE DEPOSITS.

Mt. Monger—37.5 Miles S.E. of Kalgoorlie, W.A.

By H. A. Ellis, B.Sc., A.O.S.M.

Locality.

Mt. Monger is a gold-mining centre situated some 37 miles S.E. of Kalgoorlie by a good road. It is noted for the wide distribution there of serpentinous rocks and, for W.A., the unusual occurrences of gold in certain talc bearing types of this rock.

The Talc and Soapstone Occurrences.

Definitions:

Talc, in this report, is the name used for the pure or nearly pure hydrous magnesium silicate in all its forms of crystallinity, possessing the standard characteristic properties of this mineral.

Soapstone is the name used for the massive type of partially altered basic and ultrabasic rocks containing varying proportions of fine scaly or granular talc in intimate crystalline intergrowth with residual partially altered ferromagnesian minerals of the parent rock. It is essentially a hydrothermal alteration product of some basic or ultrabasic rock type, and at Mt. Monger, appears to be closely associated with serpentine.

General Distribution.

The distribution of the serpentinous rocks at Mt. Monger is shown in G.S.W.A. Bull. No. 90 on Plates I. and II.

In October, 1943, the writer made a general reconnaissance of the district with the object of determining the relation of the talc and soapstone occurrences to the serpentine rocks mapped by Clarke and described in G.S.W.A. Bull. No. 90, with the following results:—

(1) What is known locally as the "Talc Belt" is confined to the south-western margin of the serpentine belt which extends in a general south-easterly direction towards Mt. Monger Trig. Station from a point approximately one mile west of Creedon's Homestead. (See Plate II., G.S.W.A. Bull. No. 90.)

(2) The portion of this belt in which talc and soapstone are best developed is confined to that portion of it which has a sheared porphyry-serpentine contact on the south-western side, notably in the section which lies from 2½ miles to 4 miles S.E. of Creedon's Homestead, taking in "McCahon's Great Hope" and the old "Lass O'Gowrie" leases.

(3) The best locality at present known for talc and soapstone occurrences of commercial grade is the "Loganberry" Lease, G.M.L. 5961E, pegged to include most of the ground in the original "Lass O'Gowrie" G.M.L. 4803.

The "Loganberry" Lease—G.M.L. 5961E.

This lease is situated about four miles along the track S.E. from Creedon's Homestead in the direction of Mt. Monger Trig. Station. This is the only lease on which commercial grades of soapstone are so far known to occur, and from which small quantities have been mined and sent to Perth.

The ground pegged in this lease takes in most of that previously covered in the old "Lass O'Gowrie" G.M.L. 4803 which was worked for gold in soapstone and serpentine matrix in the early stage of the development of the Mt. Monger field. The talc and soapstone occurrences form part of the actual auriferous shears in the serpentine, and have been mined as either footwall or hanging wall rocks in the normal course of mining, or more frequently as the actual matrix of the gold. In fact, many hundreds of tons of good grade foliated soapstone have no doubt been crushed as gold ore in the course of mining operations on this lease.

SOAPSTONE PRODUCTION TO OCTOBER 31st, 1943.

Quantity.	Nature of Product.	Prices.
19 tons	"Spalls," capable of cutting 12 in. x 12 in. x 6 in. blocks in Perth. (A massive tremolite-talc rock.)	£4 per ton on rail 7 miles west of lease.
3½ tons	"Spalls," capable of cutting 6 in. x 6 in. x 6 in. blocks in Perth. (A massive tremolite-talc rock.)	£2 10s. per ton on rails 7 miles west of lease.
11½ tons	"Spalls," as above, but of inferior quality	£1 17s. 6d. per ton on rails 7 miles west ot lease.
54 tons	"Lump Talc"—suitable for grinding. (This is a foliated soapstone containing a high proportion of talc.)	£1 17s. 6d. per ton on rails 7 miles west of lease.
7 tons	"Lump Talc"—suitable for grinding. (This was a product containing more talc than the 54 ton consignments.)	£3 per ton on rails 7 miles west of lease.

Quality.

No details of the heat resisting properties of the massive soapstones are yet available, but the material from this lease is reported to be of a better quality than that from the Glen Lynn quarry near Bridgetown, the soapstone from which was in demand commercially. The "Loganberry" soapstone certainly has more talc and less unaltered original mineral in its composition than that from Glen Lynn judged by the appearance and feel of the raw material.

The "lump talc" (foliated-soapstone containing a large proportion of talc) grinds to a shade off white in colour and is suitable for all purposes for which French chalk is used. It will be noted that no pure talc suitable for toilet powders, etc., has yet been produced from this lease. (See description below for the occurrence of this mineral.)

The Deposits.

The deposits are not developed, having been worked of necessity in the search for gold. Most of the shafts were inaccessible at the time of inspection (October, 1943) through lack of ladders, but the general description which follows gives a picture of what is at present known concerning these deposits.

In the north-western portion of the lease and embracing the sheared porphyry-serpentine contact, a series of shafts up to 100 feet vertical depth, shallow costeans and trenches, arranged in no definite alignment, have been sunk either on gold shoots in the soapstone-serpentine or with the object of cutting them on the pitch-steep to the south on this field. The main trend of the auriferous

shears is N.-W. with dips of from 30 to 60 degrees to the south-west, though some dip east at the same angles. Occasionally this series of shears is cut by east-west shears dipping from 30° to 60° to the south in which the gold shoots pitch steeply to the west.

Soapstone of various grades, types of which have already been marketed, constitute the rock type containing the gold in many instances, and form the walls of the foliated soapstone shears.

The occurrences are lenticular in shape, pitch steeply to the south, and are invariably foliated on a small or large scale; the higher the proportion of talc in the soapstone the more intense the foliation. The degree of foliation has a distinct bearing on the commercial value of the soapstone when "block" soapstone is under consideration.

What is at present (October, 1943) known about the dimensions of the lenses may be summarised as follows:—

The coarse and medium grained talc-tremolite rock sold so far as potential blocks to cut 12in. x 12in. x 6in. and 6in. x 6in. x 6in., outcrop in one place only. It has been cut in workings from the surface to 100 feet vertical depth. The maximum width so far seen is about two feet and the longest exposure in a drive, 20 feet, with the soapstone still in the face. This class of soapstone usually forms the hanging wall or footwall of an auriferous soapstone shear containing higher grade foliated soapstone.

The material sold as "lump talc" has been encountered over the same vertical depth as the block soapstone varieties, and like the latter is in lenticular masses up to eight feet wide in places, pitching steeply to the south. The maximum length exposed in driving is 18 feet, with the foliated soapstone still in the face but obviously getting narrower. It is in this material that many of the gold shoots occur; in one instance associated with small concentrations of high grade honey coloured and pale green coloured scheelite as bunches and stringers in good quality foliated soapstone. Up to 60 lbs. of scheelite was obtained in one such patch recently (October, 1943).

Talc of high grade, grinding white, in both the scaly and foliated massive forms occurs mainly in the more intensely foliated parts of the higher grade "lump talc" lenses in workings down to 100 feet. It is present in minor amount only, as veins up to 1½ inches thick and irregular shaped masses weighing a few pounds only. No doubt it could be obtained in small but payable quantities by hand picking methods if the main occurrences of potential block soapstone and "lump talc" were being exploited.

Remarks.

Considerable quantities of talc-tremolite rock and high grade soapstone suitable for grinding are available from this lease.

As a potential source of soapstone suitable for the cutting of blocks say 12in. x 12in. x 6in., the deposits have limitations imposed by the relative narrowness of this type of material so far exposed (2ft.) and by the fact that the rocks are foliated to a greater or less extent, a physical defect prominently revealed under heat tests.

Several grades of soapstone consisting of obviously different proportions of talc and tremolite are available, and may prove to be of commercial value when ground.

An added attraction to any development work done on this lease with a view to the production of the various grades of soapstone available, is the fact that the talc and soapstone occurrences are intimately associated with gold and scheelite occurrences, and consequently that work done in developing the talc is automatically systematic prospecting for gold and scheelite.

THE MUNGLINUP GRAPHITE DEPOSITS.

P.A. 802H. Munglinup River, Eucla Division, W.A.
Approx. Lat. 33° 40′ S., Approx. Long. 120° 51′ E.

By H. A. Ellis, B.Sc., A.O.S.M.

Locality.

These deposits are situated about ¼ of a mile east from the eastern bank of the Munglinup River at a point approximately four miles north (upstream) from the Ravensthorpe-Esperance road crossing of the Munglinup River in approximate Lat. 33° 40′ S., and approximate Long. 120° 51′ E. The distance to the port of Esperance is approximately 72 miles by a moderately good sand-plain road, and the distance to the nearest practicable small vessel loading point—the mouth and estuary of the Oldfield River, is about 16 miles air line. There is no constructed road to this latter point. The deposits were inspected in December, 1943.

Geology.

The graphite deposits form portion of a zone of graphite schist which appears to be part of a series of metamorphic rocks consisting now largely of granular hornblende gneiss and garnetiferous hornblende gneiss, with a regional strike of N.-E. and S.-W. and a prevailing dip of about 40° to 45° to the S.E. Field evidence favours the conception that the rocks were all of original sedimentary origin, and that the graphite-bearing seams consist of overlapping lenses of original carbonaceous sediments now altered to graphitic schists of varying degree of graphite content.

The rocks are nearly everywhere highly weathered, with the zone of weathering extending to a vertical depth of at least 50 feet as exposed in the deepest accessible workings.

Evidence exists in the rocks of the surrounding country, notably at the Young River, that these gneisses have been intruded by basic igneous rocks, and that both the gneisses and basic igneous rocks have been intruded by granite and pegmatite dykes.

The gneissic series has not been correlated by field work with any of the known goldfields series, and is presumed in this report to be of Pre-Cambrian age.

The Graphite Deposits.

The graphitic schist zone outcrops in places on undulating scrub-covered country, and is characterised by grey soil with graphitic flakes, magnesite boulders (possibly derived from an original dolomitic content in the altered sediments), and occasional outcrops of graphite-bearing rock of a grey colour. The graphite-bearing zone is bounded by granular hornblende gneiss and garnetiferous gneiss, and also carries thin bands or lenses of these rocks within its borders.

On P.A. 802H the zone was traced in a north-easterly direction for 1200 feet from the most south-westerly outcrops, its extension to the south-west being obscured by flat, soil and scrub-covered country. No doubt the zone continues below this obscuring mantle.

The average outcrop width of the zone over 1200 feet is 109 feet, giving an average true width of 70 feet, allowing for an average dip of 40° to the south-east. Four hundred feet north-east from the most southerly workings the zone has an outcrop width of 300 feet, with a true width of 210 feet, and contains at least four defined graphite concentrations in the nature of seams dipping concordantly with the country rock. These seams are respectively 10 feet, 10 feet, 4½ feet, (bottom not exposed) and 12 feet true width, and contain up to 25 per cent. of flake graphite. (The minus 200 mesh graphite from these seams is in a flake form.)

Three hundred feet south from the above series a graphitic seam seven feet true width, of high graphite content, and continuous with one of the higher of the seams in the zone, has been opened up near its outcrop, and also at a vertical depth of 50 feet in a cross cut driven from a vertical shaft sunk at a distance of 103 feet in the direction of the dip.

The seams are exposed in two separate places at a depth of 50 feet, and the graphite content of the ore-bodies has continued to be consistent with that seen in outcrop portions of the seams.

The potentialities of the zone have not been nearly fully explored yet, particularly with respect to the central portion.

Ore Reserves.

Approximately 27,000 tons of graphite ore could be obtained from an inclined depth of 100 feet down the dip from the seams already sufficiently exposed to warrant a provisional estimate being made, not taking into account the continuation of the ore-bodies to the north-east and south-west beyond the present limits of exploration.

Quality of Ore.

Representative samples of the graphite ore collected during the investigation have not yet undergone treatment, but results of investigations carried out by the Kalgoorlie School of Mines on material collected from the same sample cuts at an earlier date, though not yet in a finalised condition, show that material from the upper seams contains from 23 to 25 per cent. by weight of marketable graphite products distributed by grades as follows:—

Mesh.	Percentage by weight of original ore.	Carbon Content.
+ 80	3-4%	99·6%
— 80 + 200	8%	97%
— 200	12-13%	82%

It is difficult to detect any material difference in the appearance of the ore in the various seams as regards graphite content, and as far as the eye can perceive the majority of the ore exposed and included in the ore-reserve estimate will be found to be of the same high standard as that shown above.

Water and Mining Timber.

Some brackish springs situated about ¼ mile west of the deposits show promise of being able to supply the water necessary for a treatment plant. As yet they are untested as to quality and capacity, but prospects of obtaining useful supplies on development are good, providing the mineral content of the water does not interfere with the properties of the graphite flake after using it in a flotation plant.

Ample mining timber (Yate) is available from a spot about one mile from the deposits.

General Remarks.

The deposits are sufficiently developed to enable the production of graphite ore to be commenced immediately if required. Sufficient experimental work has been done on the ore at the Kalgoorlie School of Mines to enable a flow-sheet to be designed for the successful treatment of the ore, mining conditions are good—a thick, moderately soft ore body suitably disposed for cheap mining—and a high quality graphite is obtainable as a final product. All that is required now is a suitable market for the various grades of graphite which this deposit is capable of supplying, but judging by the fact that this deposit—possessing as it does such strong potentialities as a producer of high grade graphite—is still undeveloped, one is forced to the conclusion that West Australian graphite has not been required up to the present juncture.

RECENT DEVELOPMENTS ON A COLUMBITE AND CASSITERITE LODE M.C. 9, GREENBUSHES, W.A.

By H. A. Ellis, B.Sc., A.O.S.M.

Locality.

M.C. 9 is situated on the eastern side of Bunbury Gully, approximately one mile S.E. of Greenbushes Post Office, along the Greenbushes-Bridgetown road.

History.

At a distance of 270 feet on a true bearing of 50° from the north-eastern corner of W.R. 289, several shallow shafts had been sunk many years ago in decomposed pegmatitic lode material carrying cassiterite and columbite. In October, 1943, owing to the existing strong demand for tantalum-bearing minerals, some attention was given to this area, and the work described below was commenced. An inspection of the area was made on November 20th, 1943.

The Columbite and Cassiterite Lode.

Approximately 25ft. S.W. from the old excavations made in part of the pisolitic laterite capping of the lode formation many years ago, a vertical shaft 35 feet deep has been sunk in typical schistose pegmatite lode formation striking N. 25° W. and dipping S.W. at about 40°. With the exception of the first seven feet which consisted of pisolitic laterite, the shaft is entirely in lode formation, and no definite footwall was exposed in the bottom of the shaft at the time of inspection.

The lode has been driven on for 15 feet to the S.E., and 11 feet to the N.W. from the bottom of the shaft, and at a distance of 27 feet N.W. from the 35ft. shaft another vertical shaft was being sunk and was down 23 feet at the time of inspection (November 20th, 1943). The lode material is typical crumbly, free treating ore common in the shallow workings of all of the weathered pegmatitic lode formations of the Greenbushes field. Exactly similar material was hydraulically sluiced in the Vulcan Cut in Westralian Gully and consisted of quartz, mica, felspar, tourmaline, and irregular concentrations of finely disseminated cassiterite and tantalite or columbite intimately mixed with the pegmatite constituents. The lode formation is strongly schistose, with several prominent bands of mineral-bearing schistose pegmatite.

Values are distributed in varying proportion throughout the depth of the shaft, and the present workings have been made in material averaging approximately 1.7 lbs. of clean mixed concentrates to the cubic yard. The concentrates from samples taken over regular intervals during the sinking of the shaft contained from 25 per cent. to 40 per cent. by weight of columbite and from 40 per cent. to 55 per cent. by weight of cassiterite. The columbite present in the samples contained approximately 49 per cent. of Ta_2O_5 and 34 per cent of Nb_2O_5 as determined by specific gravity assays.

The true width of the lode material penetrated by the 35ft. shaft is about 27 feet, and until a bulk parcel of this type of lode matter has been treated, no satisfactory value per cubic yard can be arrived at.

Remarks.

The lode formation at present exposed (November 20th, 1943) can be considered an excellent prospect containing mixed cassiterite and columbite in payable quantities. Only a very small portion of lode has been prospected, and obviously much more prospecting work is necessary before any idea of the extent and value of the lode can be arrived at.

The width of the lode in one place can be determined by cross-cutting from the bottom of the present 35ft. shaft after doing sufficient driving to stow the material from the cross cut.

The continuation of the lode on the surface can be sought along the strike in a series of costeans.

Until this prospecting work is done no consideration need be given to the erection of a plant designed to treat large quantities of this lode material.

LITHIUM BEARING MINERALS IN THE COOLGARDIE-LONDONDERRY DISTRICTS, W.A.

(Coolgardie Lat. 31°00′ S. approx, Long. 121°12′ E. approx.)

By H. A. Ellis, B.Sc. A.O.S.M.

Summary.

An investigation of the field occurrence of lithium-bearing minerals known to occur in the Coolgardie-Londonderry district was undertaken by the writer in October, 1943.

The minerals and localities investigated were as follows:—

Mineral.	Locality.
Lepidolite mica	Grosmont, Tantalite Hill
Petalite	Londonderry
Amblygonite, Spodumene	Mercer's Find

Enquiries made amongst local mining people and old prospectors failed to discover any other localities where these minerals were known to occur in the district.

The occurrences of amblygonite and spodumene were found to be of mineralogical interest only, and lepidolite mica exists in quantities too small to permit of commercial exploitation.

Petalite, a lithium aluminium silicate containing when pure, practically the same amount of Li_2O as lepidolite mica, was found to occur in considerable quantity in the main felspar quarry, Londonderry.

The conclusion is reached that the petalite from this source is the only lithium-bearing mineral in the district examined offering prospects as a commercial source of lithia salts.

SUMMARY OF APPROXIMATE QUANTITIES AND QUALITIES OF LITHIUM-BEARING ORES—COOLGARDIE-LONDONDERRY DISTRICTS—W.A.

Mineral and Nature of Ore.	Locality.	Ore at Grass (approx. only).	Ore in Sight (approx. only).	Possible Ore (approx. only).	Weight of lithia bearing mineral in ore (approx. only).	Li_2O content (approx. only).	Total.
Lepidolite mica in pegmatite dyke	Grosmont	tons. 3,600	tons. .... *nil*	tons. 34,200	tons. 197 *nil* 1,862	tons. 12 *nil* 111	123
Lepidolite mica lenses massive, scaly in pegmatite dyke, capable of being selectively mined	Tantalite Hill, Londonderry	*nil*	.... *nil*	 450	 450	 17	17
Petalite masses in pegmatite, capable of being selectively mined	Felspar Quarry, Londonderry	1,040	.... 1,000	 37,400	1,040 1,000 37,400	41·6 40·0 1,496·0	1577·6
Amblygonite lenses in pegmatite dyke	Mercer's Find, 3 miles N., 30° W., from Ubini	2 cwt.	*nil*	.... *nil*	.... 2 cwt.	.... not assessed	....
Spodumene crystals in pegmatite dyke	Mercer's Find, 3 miles N., 30° W., from Ubini	*nil*	.... *nil*	.... *nil*	.... *nil*	.... *nil*	....

LEPIDOLITE MICA.

Locality—Grosmont.

Grosmont is an abandoned gold-mining locality situated 10 miles by road S.W. of Coolgardie. On some flat ground about 12 chains N. 30° W. from the old open cut gold workings on the N.W. slope of Grosmont Hill—on the crest of which is an old battery site—M.C. 3 has been pegged to take in several pegmatite dyke outcrops on which work was carried out many years ago.

About five chains slightly west of north from the S.W. corner of M.C. 3 lies the southern end of an open cut made in a pegmatite dyke in the early days of mining in this locality. The cut is at present some 210 feet long by 15 feet wide by 12 feet deep, the sides having collapsed to a considerable extent, particularly on the western wall, the debris filling the bottom of the cut.

As far as can be ascertained from the present collapsed state of the workings, the pegmatite dyke is concordantly intrusive into medium to fine grained amphibolite schist, was about 12 feet thick, striking N. 15° W., dipping from 80° to 85° to the west, and was mined to a vertical depth of perhaps 20 feet.

Pegmatite shows in the north face of the cut, but the outcrop disappears under an alluvial flat. It does not outcrop on higher ground some six chains along the strike to the north. The south face of the cut is in decomposed amphibolite schist and shows the south end of the dyke dipping at a steep angle to the south into the schists.

The dyke is composed mainly of microcline felspar and quartz with lepidolite mica as a minor constituent.

A rough estimate of the percentage by volume of the main constituents is:—

Felspar	50%
Quartz	45%
Lepidolite mica	5%

Biotite mica, beryl and topaz occur as accessory minerals, not in commercial quantities, and the felspar and quartz are not present in large masses. Felspar could be saved, no doubt, in any flotation process designed to treat the pegmatite dyke as a lithium ore.

The lepidolite mica is not confined to any particular part of the dyke and occurs in the following forms:—

(a) Books; largest seen approximately 5in x 2in.—pale violet in colour—books down to ¼in. square nearly all pierced by quartz crystals.

(b) Scaly-granular; as violet coloured masses of small dimensions—up to 3 lb. weight—found in dumps.

(c) Grey-massive; as small concentrations—½ lb. weight—found in dumps.

(d) Violet-massive; similar to grey-massive and as stringers through quartz and felspar up to 1½in. thick.

(e) Foliated-crenulated-violet; scales up to ¾in. diameter—found in dumps.

(f) Scaly-violet; up to ¼in. scales; gelatinous looking in columns—in irregular shaped concentrations—found in dumps.

A green felspar occurs in small concentrations, noticeably near topaz occurrences; while fine, compact, crystalline, unimineral concentrations of grey tourmaline occur between the contact of the pegmatite and amphibolite schist and occasionally as veins up to two inches thick in the country rock, particularly at the southern end of the dyke.

Estimates of Tonnage and Quality.

The following items are of importance in assessing the value of these estimates:—

(1) Exact width of dyke and depth to which mined not ascertainable—estimate of width and depth mined is probably too generous.

(2) Estimate of percentage by volume of lepidolite in the dyke is generous in absence of exact measurements.

(3) Assumption is made that dyke maintains its outcrop dimensions and mineral content to a depth equal to the length of the outcrop.

Factors Used.

(1) S.G. of Lepidolite taken as 2.8.

(2) Based on estimated percentage by volume of constituents of peg. dyke, namely, felspar 50 per cent., quartz 45 per cent., lepidolite mica 5 per cent., 14 cubic feet of peg. dyke weigh 2,240 lb.

Volume of tonnage conversion factor = 14.

Ore at Grass.

The tonnage of broken pegmatite in the dumps containing an estimated volume of five per cent. of lepidolite is determined as follows:—

Volume of cut = 210 x 12 x 20 cubic feet.

= 550,400 cubic feet.

Tonnage = $\frac{50,400 \text{ tons.}}{14}$

= 3,600 tons.

Weight of Lepidolite Mica in Ore at Grass (Dump).

Volume of lepidolite mica in dumps

$= \frac{5}{100} \times \frac{50,400}{1}$ cubic feet.

= 2,520 cubic feet.

Weight of Lepidolite Mica in dumps.

= 2,520 x 62.5 x 2.8 lb.

= 197 tons.

Tonnage of lepidolite mica per vertical foot

$= \frac{197}{20} = 9.8$ tons.

Possible Ore.

Length of known outcrop = 210 feet. Assuming the pegmatite dyke maintains its dimensions and mineral content to a depth equal to the known outcrop length, then the possible ore below the bottom of the open cut is—

$\frac{190 \times 12 \times 210 \text{ tons}}{14}$—containing 5 per cent. by volume of lepidolite mica.

= 34,200 tons.

Weight of Lepidolite Mica in Possible Ore.

= 190 x 9.8 tons = depth x tonnage per vertical foot.

= 1,862 tons.

Resume of Tonnages.

From the above figures it will be seen that approximately 3,600 tons of lepidolite bearing pegmatite (Lithium ore) has already been mined and is lying in the dumps on M.C. 3 Grosmont. This ore is estimated to contain 197 tons of lepidolite mica.

Possible ore to a depth of 210 feet is 34,200 tons of lepidolite bearing pegmatite carrying 1,862 tons of lepidolite mica.

Proved + Possible Lepidolite Mica = 2,059 tons.

Quality.—A bulk sample from the dumps was collected, but at this stage of the investigation has not been submitted for analysis.

A sample of lepidolite mica from this dyke was analysed by the Government Chemical Laboratory many years ago, the results appearing at p. 19, G.S.W.A. Bull. No. 53. The Li_2O content in the sample analysed was 5.97 per cent.

Total tonnage of proved plus possible lepidolite mica available from the pegmatite dyke would contain—

5.97% of 2,059 tons of Li_2O

= 122.9 tons

assuming that all of the lepidolite mica was of the same grade as the sample analysed and reported on in Bull. 53.

Other Pegmatite Occurrences at Grosmont.

About three chains east from the southern end of the main open-cut on M.C. 3, a series of pot holes has been sunk on a pegmatite dyke located from floaters over a length of about three chains along the N.-S. strike. At the northern end, a 20ft. shaft has been sunk in the decomposed amphibolite schist on the footwall of the dyke which here dips 80° to the west, and is about eight feet thick. This dyke contains all of the lepidolite mica types seen in the dumps of the main open-cut, but in a very much smaller proportion.

The dyke may be worth prospecting for higher concentrations of lepidolite mica if the deposit in the main cut was being developed as a source of lepidolite mica.

About five chains S.W. from the south end of the main cut on M.C. 3, a quartz reef containing a concentration of felspar outcrops, and has been opened up to a depth of three feet. Lepidolite mica shows in the dump, but the occurrence is small and of no economic importance.

Locality: Tantalite Hill.

Tantalite Hill is in the Londonderry district where an unsuccessful attempt was made to treat eluvial and pegmatitic material for its columbite and tantalite content. It is situated three miles S.W. (air line) from Londonderry railway siding.

Some small lenses of massive scaly lepidolite mica in a pegmatite dyke were located near the S.E. corner of M.L. 86. These have already been reported on by Dr. Miles of the Geological Survey (File G.S. 28/1943).

A generous estimate of the tonnage available from this deposit is 450 tons of massive scaly lepidolite containing 3.87 per cent. of Li_2O. The writer made an extensive search of the Tantalite Hills area in an endeavour to locate further lepidolite occurrences of value, but without success.

Remarks.

It cannot be too strongly stressed that pegmatite dykes are notorious for their irregular behaviour with respect to both mineral content and dimensions. Consequently, any estimates of tonnage of ore available from a pegmatite dyke, made under the circumstances as outlined above in this report, need to be confirmed by a prospecting campaign before placing any firm value on the deposit.

A successful treatment process for the extraction of the lepidolite mica from the pegmatite dyke is also a factor to be considered in valuing these deposits.

PETALITE.

Locality: Felspar Quarry, Londonderry.

This quarry is situated 4.4 miles by road S.W. from Londonderry Railway Siding, the latter being 10 miles S.S.W. from Coolgardie and 366 miles by rail from Perth. It is 13 miles by a good road from Coolgardie to the quarry.

The quarry has been developed as a source of microcline felspar and has been opened up to a maximum depth of about 70 feet on the western side, and to an average depth of about 50 feet over an area roughly oval in shape about 400 feet long by 270 feet wide (October, 1943).

Approximately 100,000 tons of pegmatite dyke material have been excavated for a return of 23,500 tons of felspar up to August 31st, 1943.

Approximately 80,000 tons of waste products comprising mostly impure felspar, quartz, petalite and its decomposition products have been removed to the dump.

Petalite occurs in masses in the quarry capable of being selectively mined, in large scale pegmatite formation along with microcline felspar and quartz. Some of the petalite masses exposed in the quarry (October, 1943) would contain up to 15 tons of unaltered petalite, and others, whose full dimensions cannot be judged, contain considerably more.

The main concentration of petalite occurs in the western part of the quarry, but it has occurred to a greater or less extent throughout the workings with the exception of the present (October, 1943) north face of the quarry.

Estimates of Tonnage and Quality.

Approximate composition of pegmatite by volume:—

Felspar (all types)	Approx.	35%
Petalite + alteration products likely to contain lithium ..	„	25%
"Hornstone," an albite-chalcedony rock probably completely replacing petalite	„	15%
Quartz	„	25%

Volume to tonnage conversion factor = 15 approx.

Ore at Grass.—Dumped separately (Oct. 1943) approx. 40 tons.

Clean petalite distributed through 80,000 tons of main dump (5% of Vol. of petalite + alteration products). Possibly 1,000 tons.

Ore in sight.—Clean petalite in sight in the quarry (October, 1943). Possibly 1,000 tons.

Possible Ore.

An area of approximately 200 feet by 140 feet on the western side of the quarry where petalite is prominently exposed at present (October, 1943) and using a very conservative figure of 10 per cent. by volume of clean petalite, may give 187 tons of petalite per vertical foot.

Possible ore to a depth of 200 feet below present level of quarry on western side, presuming the volume of petalite to remain constant = 37,400 tons.

Quality.

A bulk sample of clean petalite has been obtained and submitted to the Government Chemical Laboratory for analysis.

Bulk samples of large exposures of the altered petalite have also been submitted. Results of these analyses will not be available for some time yet.

In the absence of results of representative samples, the analyses of the above two types of material given by Dr. Simpson in his description of the petalite occurrence at this quarry in The Journal of the Royal Society of W.A. Vol. XXIV (1937-38) at page 120 may be taken as a guide to the possible economic value of the products as Lithium ores.

The unaltered petalite quoted in this report contains from 3.72% to 4.13% of Li_2O, while the alteration products contain from nil to a maximum of 1.11% of Li_2O.

On account of the low Li_2O content of the altered petalite, estimates of the quantities of this material available in the quarry have not been submitted. The average Li_2O content of the clean petalite available from this quarry may be in the vicinity of 4%.*

Li_2O content of ore at grass (Oct. 1943):

+Ore in sight (Oct. 1943):

= 4% of 2,040 tons = 81 tons.

Li_2O content of

Possible ore:

= 4% of 37,400 tons = 1,496 tons.

Remarks.

The same observations concerning dimensions and mineral occurrences in pegmatite dykes as were made in connection with the Grosmont Lepidolite deposits apply here.

* A chip sample of 30 tons at grass analysed by the Government Chemical Laboratory contained 4.2% Li_2O.

AMBLYGONITE.

Locality—Mercer's Find.

The locality referred to as Mercer's Find at which amblygonite is reported to have occurred in a pegmatite dyke is situated three miles N 30° W. (air line) from Ubini Siding, on the Perth-Kalgoorlie railway. A track leaves the main telegraph line about five chains S.W. from the 12 mile soak (on the telegraph line about 2½ miles due north of Ubini Siding) and proceeds in a general westerly direction for two miles to the old workings.

The amblygonite occurred under circumstances as described by Blatchford at pp. 17-18, G.S.W.A., Bull. 53. The workings have now all collapsed, but a dump of about 2 cwt. of broken amblygonite was found nearby. The composite quartz reef and pegmatite concentrations were carefully examined over the length of the outcrop without locating any further occurrences of amblygonite.

This occurrence has no economic value.

SPODUMENE.

Locality—Mercer's Find.

The reported occurrence of spodumene is of mineralogical interest only—careful search along the outcrop of the composite quartz reef and pegmatitic concentrations revealing no trace of this mineral.

NOTES ON THE FELSPAR QUARRY, LONDONDERRY.

By H. A. Ellis, B.Sc., A.O.S.M.

Inspected October, 1943, by H. A. Ellis in connection with lithium-bearing minerals, Coolgardie Londonderry District. A few points of geological interest came to the writer's notice during this inspection and are set out below:—

From the present state of the workings it would appear that the pegmatite dyke trends in a direction of N. 70° E. approximately, and that the width so far exposed, say at the western edge of the present workings, is in the vicinity of 450 feet.

The northern boundary of the dyke is clearly exposed in the existing northern face of the quarry where it can be seen dipping to the north at an angle of approximately 30° under the fine and medium grained greenstone of the rising country to the north. The limits of the dyke could not be determined in any other direction. An estimate of the approximate composition of the dyke by volume is as follows:—

Quartz	Approximately	25%
Felspar	„	35%
Petalite plus decomposed products	„	25%
"Hornstone" (albite, chalcedony replacement of petalite)	„	15%

Biotite mica, garnet, lepidolite mica, beryl, apatite, columbite occur as very minor accessory minerals.

A sketch plan showing the dimensions of the quarry as at October, 1943, is attached (file 64/18).

Production Figures to the end of August, 1943.

Clear microcline felspar	23,500 tons
Mullock	80,000 tons

Summary of Felspar Production from September, 1936, *to to 31st August,* 1943.

Tonnage felspar produced	23,500 tons
Mullock	80,000 tons

Yearly Output of Felspar.

1936—2,187 tons		1940—3,478 tons	
1937—2,630 „		1941—4,114 „	
1938—3,028 „		1942—3,399 „	
1939—3,271 „		1943—1,293 „	To 31st August.

Average Tonnage Felspar Produced Monthly.

1936—182 tons		1940—290 tons	
1937—220 „		1941—340 „	
1938—255 „		1942—280 „	
1939—273 „		1943—108 „	To 31st August.

Output of Mullock—September, 1936, to August, 1943.

1936— 6,000 tons	1940—17,000 tons
1937—10,000 ,,	1941—12,750 ,,
1938—12,000 ,,	1942— 4,014 ,,
1939—14,000 ,,	1943— 3,828 ,,

Average Tonnage Mullock taken out Monthly.

1936— 500 tons	1940—1,400 tons
1937— 830 tons	1941—1,000 ,,
1938—1,000 ,,	1942— 350 ,,
1939—1,160 ,,	1943— 320 ,,

Average Number of Men Employed.

1936— 8	1940—13
1937— 8	1941—14
1938—10	1942— 6
1939—15	1943— 5

Beryl.

Approximately five tons of beryl had been obtained to date. (See Beryl file.)

Masses of Felspar.

The manager of the quarry informed the writer that one mass of felspar occurring near the eastern end of the present quarry outline contained 1,500 tons of felspar practically free of any impurities. At the present time clear microcline felspar is being mined from the eastern and western parts of the quarry at the rate of approximately 63 tons per week—manpower shortage considerably hampering rate of production.

Future Prospects.

The dyke would appear to have excellent prospects in depth, and in a direction of N. 70° E., towards the smaller albite felspar quarry.

The northern face of the quarry, which shows a capping of greenstone, shows to a marked degree a strong "reaction border" of some 40 feet in thickness, as a result of assimilation of the invaded greenstone.

NOTES ON ORA BANDA AMALGAMATED MINES, N.L., G.M.Ls. 1962W, 1966W, 1967W, 1970W, 2111W, 2119W, 2120W, GRANT'S PATCH, BROAD ARROW GOLDFIELD.

By R. A. Hobson, B.Sc., Hons.

SUMMARY.

The workings controlled by Ora Banda Amalgamated Mines, N.L., are located at Grant's Patch, which is 27 miles north-west of Kalgoorlie. The Company commenced operations in 1936 and, since that date to October, 1943, has produced 52,553·88 fine ounces of gold. The total recorded production from the ground held by the Company is 65,359·95 fine ounces of gold. The workings are divided into two sections and there are two main haulage shafts, 15 chains apart. Ore is carted approximately a quarter mile to the mill.

All ore bodies have formed in narrow shear zones. The country rock is a porphyrite—known locally as "cat" rock, which in the vicinity of the shear zones is quite schistose.

In the workings off Nicholson's No. 1 Main Shaft the ore bodies have formed in shear zones, having the following general strikes: 62°–77°, 87°–90°, 96°–98°, 111°–128°. The principal ore body, which has been worked from the surface to No. 6 level, has a maximum stope length above No. 6 level of 320 feet and an average width of 4–5 feet. Its dip is vertical. Except at the west ends of Nos. 5 and 6 levels, where it has a general strike of from 96°–98°, it has formed in a shear zone striking at 111°–128° and dipping vertically. In the upper levels there has been appreciable production from ore bodies formed in other shear zones.

Only one winze has been sunk below No. 6 level and it is reported that the ore body did not extend below 30 feet in this winze. The winze was full of water at the time of inspection. The reported average values in this winze are 15 dwts. over 36in. There is no geological reason for not testing the ore body by other winzes below No. 6 level.

Water is pumped from the workings off Nicholson's No. 1 Main Shaft at the rate of 32,000 gallons per day.

The principal ore body in the workings off Mackenzie's No. 1 Main Shaft has been worked from the surface to No. 7 level (V.D. 710ft.) and has been practically completely stoped above No. 6 level. It has a maximum stope length of 520 feet above No. 4 level and an average width of 4–5 feet. The ore body has formed in a number of intersecting shear zones, which have the following general strikes: 68°–74°, 85°–90°, 97°–100°, 104°–118°. It will be noticed that these strikes correspond with the strikes of the shear zones in the workings off Nicholson's No. 1 Main Shaft, but it will be seen from Figures 1 and 2 that the dips do not correspond. The pitch of the ore body is vertical and is controlled by the pitch of the intersections of the shears.

The values at No. 7 level—average 5 dwts. over 48 inches—are reported to be lower than can be profitably worked by the company and it is reported that the values have been decreasing with increasing depth in these workings. No geological reason is apparent why the ore body should not be tested below No. 7 level.

These workings are practically dry and about one hour's pumping each morning is all that is necessary.

It is evident that development has lagged behind and very little ore is immediately available for breaking.

INTRODUCTION.

Grant's Patch is located 27 miles north-west of Kalgoorlie. It is connected by formed road to Broad Arrow (14 miles) and to Ora Banda (eight miles) and by telephone to Coolgardie. From production figures it appears that the first find at Grant's Patch was made in 1932.

Ora Banda Amalgamated Mines, N.L., commenced operations in 1936. Prior to 1936 a certain amount of work had been done on the same ground by Ora Banda Mines, N.L. (G.M.Ls. 1962W, 1970W) and also by prospectors (G.M.Ls. 1966W, 1967W and Prospecting Areas). In 1936 the workings were inspected by Forman[1]. Since Forman's inspection an appreciable amount of work has been done. Nicholson's No. 1 Main Shaft has been deepened from 370 feet to 582 feet. Numbers 3 and 4 levels off this shaft have been extended and numbers 5 and 6 levels have been driven. Almost all the known ore above these levels has been stoped. A new shaft—Mackenzie's No. 1 Main Shaft—has been sunk 730 feet. Numbers 2 and 3 levels off this shaft have been extended, and numbers 4, 5, 6 and 7 levels have been driven. Practically all the known ore above number 6 level has been stoped.

The object of the present examination was to ascertain the existing conditions at these workings and more especially at the lower levels. No samples were taken by the writer, who had no assistant and no facilities for sampling. All information regarding values was supplied by the mine manager.

The total recorded production from the ground now held by Ora Banda Amalgamated Mines is given in Table 1. It will be seen from this table that of a total of 65,359·95 fine ounces of gold produced from 1932 to 1943 (October), 52,553·88 fine ounces were produced by Ora Banda Amalgamated Mines N.L. since 1936. The only production not included in this table, which is taken from Mines Department official figures, is that from Prospecting Areas in existence prior to the now existing leases. The table shows that the maximum production of gold was in 1938, when 8,699·86 fine ounces of gold were produced from 18,730 tons of ore milled. The maximum tonnage of ore milled was in 1941 when 24,065 tons of ore were milled for 6,649 fine ounces of gold. The table also shows that the average grade of the ore milled by the existing company has decreased each year.

The mill is situated approximately ¼ mile west of Nicholson's No. 1 Main Shaft, which is about 15 chains west of Mackenzie's No. 1 Main Shaft. From these two main haulage shafts ore is carted to the mill by motor truck. The mill was so placed to avoid any possible contamination of a Government dam situated some two

[1] Forman, F. G., The Ora Banda Amalgamated Gold Mine, Grant's Patch, Broad Arrow Goldfield, *Ann. Prog. Rept. Geol. Survey for* 1936, p. 5.

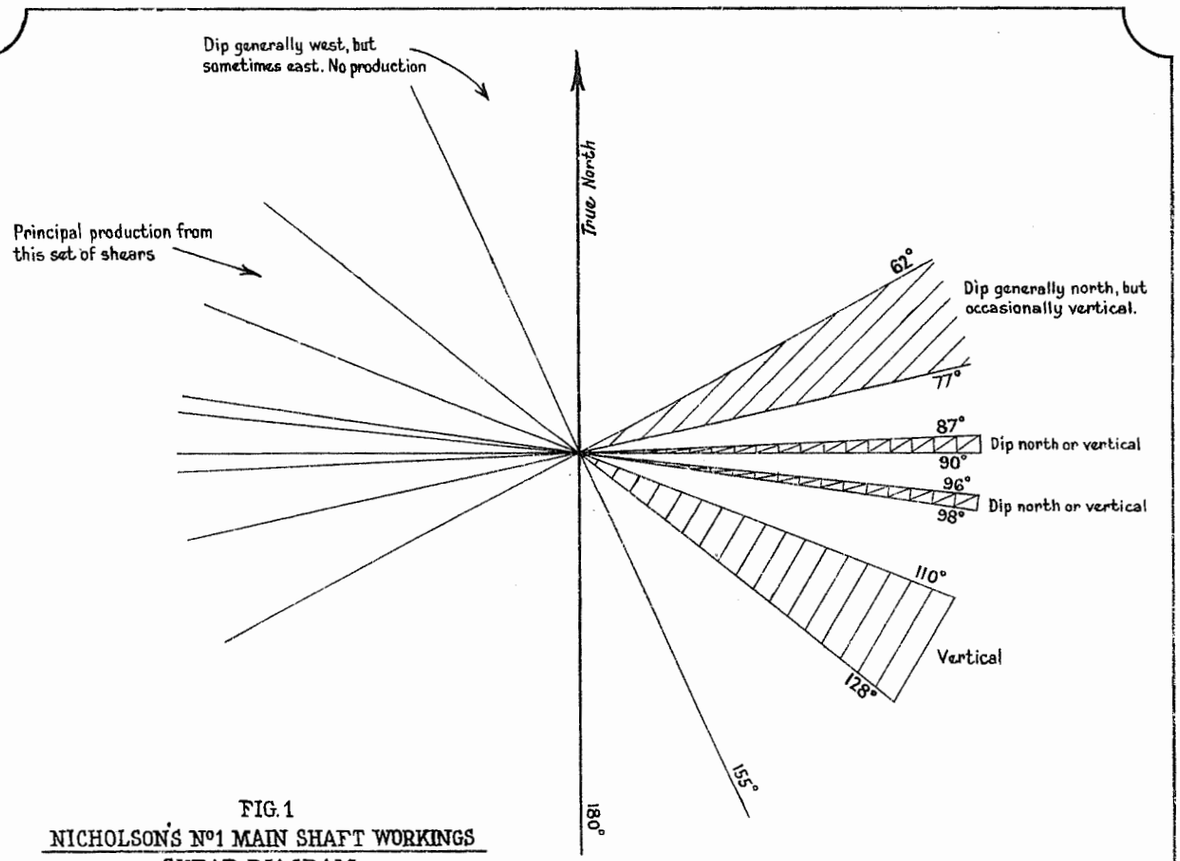

FIG. 1
NICHOLSON'S Nº1 MAIN SHAFT WORKINGS
SHEAR DIAGRAM

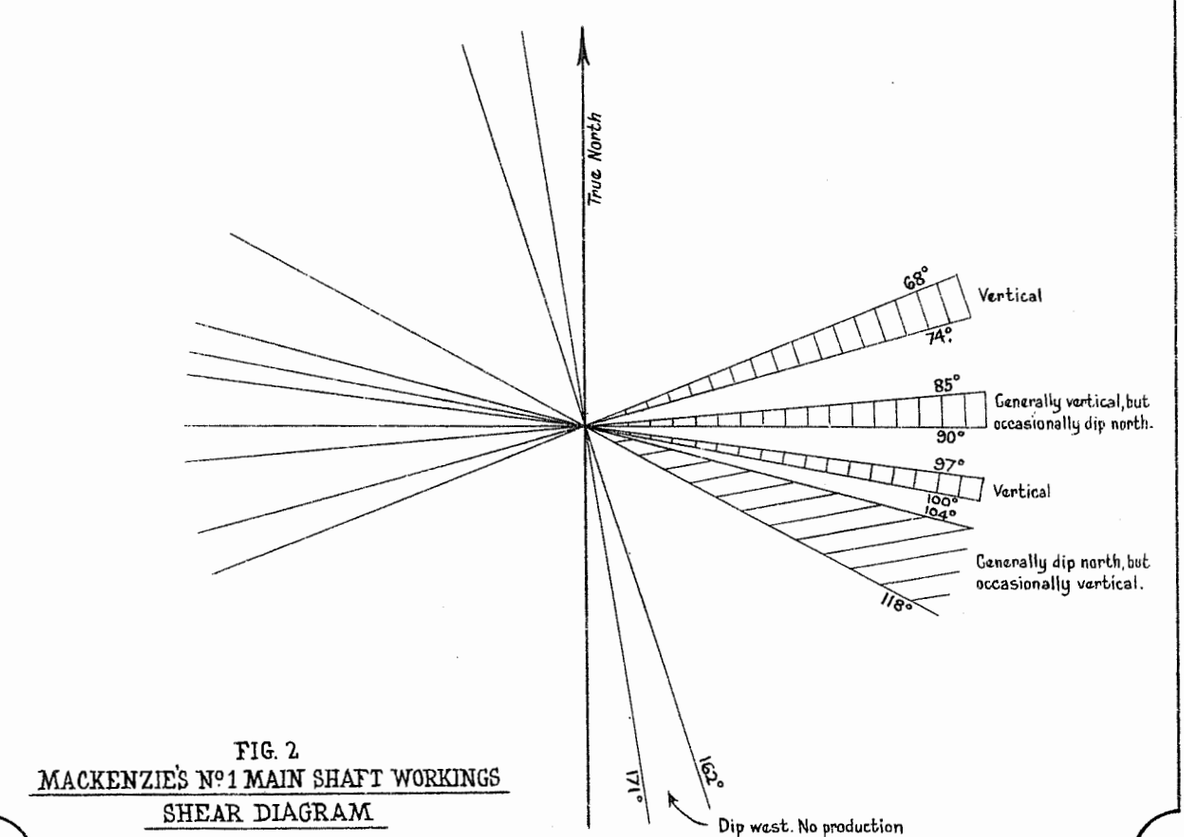

FIG. 2
MACKENZIE'S Nº1 MAIN SHAFT WORKINGS
SHEAR DIAGRAM

TABLE 1.

Production from G.M.Ls. 1962w, 1966w, 1970w, 1967w, 2111w, 2112w, 2119w, 2120w, *for the Period* 1932 *to* 1943 (*Oct.*)

Registered Name of Company or Lease.	Lease Number.	Period.	Alluvial.	Dollied and Specimens.	Ore Treated.	Gold Therefrom.	Total Gold.	Grade dwts. per Ton.	Silver.
			fine ozs.	fine ozs.	Tons (2,240 lbs.)	fine ozs.	fine ozs.	Tons (2,240 lbs.)	fine ozs.
Lady Rosina	1962w ...	1932	...	...	155·0	214·96	214·96	27·7	...
		1933	...	...	602·0	1,555·72	1,555·72	51·7	...
Carnbe	1966w ...	1933	...	...	422·0	456·84	456·84	21·6	...
Lady Rosina Extended...	1970w ...	1933	...	...	121·5	234·69	234·69	38·6	...
Mackenzie's Find ...	1967w ...	1933	...	...	337·0	354·90	354·90	21·1	...
		1934	...	...	289·0	116·72	116·72	8·1	...
Ora Banda Mines, N.L. ...	1962w, 1970w	1934	...	...	219·0	423·32	423·32	38·7	...
		1935	...	...	8,278·0	5,050·38	5,050·38	12·2	...
		1936	...	...	2,001·0	1,132·54	1,132·54	11·3	...
Ora Banda Amalgamated Mines, N.L.	1962w, 1970w	1936	...	...	13,193·0	7,284·42	7,284·42	11·0	...
	1966w, 1967w	1937	...	...	16,495·0	8,308·73	8,308·73	10·1	...
	2111w, 2112w	1938	...	...	18,730·0	8,699·86	8,699·86	9·3	175·00
	2119w, 2120w	1939	...	...	18,955·0	8,019·87	8,019·87	8·5	...
		1940	...	...	23,775·0	8,330·00	8,330·00	7·0	...
		1941	...	...	24,065·0	6,649·00	6,649·00	5·5	...
		1942	...	...	20,745·0	5,262·00	5,262·00	5·1	...
		1943 (to Oct.)	...	...	13,150·0	3,266·00	3,266·00	5·0	...
			...	...	161,532·5	65,359·95	65,359·95	8·1	175·00

miles south-south-west of the workings. At the mill the ore is first of all put through a cracker and then through a ten-head battery. From the battery it goes through a classifier, then a ball mill to a cyanide plant. Some of the gold is recovered at the battery by means of cloths and the remainder by zinc boxes. The residues are estimated to contain just over 1 dwt. gold per ton.

The writer wishes to thank the mine manager, Mr. Kingdon, for assistance and information given during the course of his examination and also the underground manager, Mr. Kittelty, for information regarding the workings, especially those off Mackenzie's No. 1 Main Shaft.

GENERAL DESCRIPTION OF THE WORKINGS AND ORE BODIES.

As can be seen from the plan,* the workings are divided into two sections and there are two main haulage shafts—Nicholson's No. 1 Main Shaft and Mackenzie's No. 1 Main Shaft. In addition to the main workings, some shallow prospecting work, off other shafts, has been done, but this prospecting work was inaccessible to the writer. Some of these shallow workings were inspected by Forman in 1936[2]. All ore bodies consist of lenticular quartz veins and stringers in narrow shear zones. Quite a number of shear zones are developed having varying strikes and dips and more will be said of these in a later section of this report. The ore bodies are not confined to any one set of shears. Although the two main shafts are only 15 chains apart and the country rock is the same throughout all the workings, there are quite striking differences between the workings off each of these shafts. It will be convenient to describe the workings off each shaft separately.

Nicholson's No. 1 Main Shaft Workings.

Two main ore bodies—designated by Forman as the East Lode and the West Lode—have been worked.

The East Lode has ben worked from the surface to No. 6 level (V.D. 557 feet). From the surface to No. 5 level its general dip is vertical, but between 5 and 6 levels it has a general northerly dip of about 70°-75°. To No. 4 level the ore body is developed in a shear zone, or zones having a vertical dip and a strike varying from 111°-128°. In the Nos. 5 and 6 levels the eastern portion of the ore body is developed in the same shear zone, but the western portion is developed in a shear zone having a general strike of from 96°-99° and a northerly dip. The shoot has a maximum stope length of 320 feet above No. 6 level and is reported to have been stoped over an average width of from four to five feet. The pitch is westwards at an average angle of approximately 55°.

At the time of inspection ore was being broken from above No. 5 level (60W-100W) and it is anticipated by the management that some ore could be obtained from above No. 2 level (270E-330E and 380E-440E). A leading stope has been taken from both of these places above No. 2 level, but no work was in progress there at the time of inspection. It is reported that some good ore was encountered in a winze to No. 2 level from a small level off a shallow shaft at 480E and 232S. Insufficient work has been done to make a reliable estimate of the ore likely to be available at each of these places, but no great quantity is anticipated.

The stope above No. 6 level is reported to have averaged 10-12 dwts. The average reported values on No. 6 level are shown on the plan. It will be seen that these averaged 12 dwts. over a width of 48 inches and a length of 230 feet in the central portion of the level. Values at either end of the level are lower. The only work done below No. 6 level is a winze at 120W, which is reported to have followed the ore body down for 30 feet on the underlay. The average values are reported to have been 15 dwts. over 36 inches. The ore body is reported to have ended at 30 feet, but only a small amount of exploratory work has been done below that depth. This winze was full of water at the time of inspection. No other winzes have been sunk from the No. 6 level.

Forman's West Lode consists of three separate shoots developed in two sets of shear zones striking from 62°-77° and 87°-90° respectively. The dip is to the north. The main work has been done on an ore body striking from 87°-90° and dipping north. This has been followed down to just above No. 3 level, where it is intersected by a vertical shear as illustrated by Forman[3]. Very little work has been done on this ore body since 1936. This shoot has a maximum stope length of 140 feet above No. 2 level, and is reported to have had an average width of five feet.

[2] Forman, F. G., Op. Cit.
* Plan not published.

[3] Forman, F. G., Op. Cit.

TABLE II.

Diamond Drilling Results.

Bore No.	Elevation or Depression.	Workings.	Level.	Assay Results.											
				ft.	ins.	ft.	ins.	ozs.	dwts.	grs.	ft.	ins.	ft.	ins.	ozs.	dwts.	grs.
1	Horz	Mackenzie's No. 1 Main Shaft	3	187	0	— 189	0	0	0	19	191	0	— 193	0	0	5	0
				189	0	— 191	0	0	2	9	193	0	— 195	0	0	1	11
2	+ 60°....	do. do.	4	2	0	— 4	0	0	0	9	41	0	— 43	0	0	0	14
				10	0	— 12	0	0	1	9	43	0	— 45	3	0	1	19
				17	9	— 19	9	0	14	9	45	3	— 47	0	0	0	19
				32	0	— 35	0	0	2	9‡	53	0	— 55	0	0	2	0
				35	0	— 37	0	0	1	19	55	0	— 57	0	0	2	0
											57	0	— 59	0	0	2	0
											59	0	— 61	0	0	1	19
											61	0	— 63	0	0	0	19
											65	0	— 67	0	0	0	19
											67	0	— 69	0	0	0	19
											69	0	— 71	9	0	0	19
											71	9	— 74	0	0	10	0
3	Horz	do. do.	4	2	0	— 4	0	0	0	14	183	0	— 185	0	0	1	19
				4	0	— 6	0	0	4	0	191	0	— 193	0	0	2	0
				6	0	— 8	0	0	1	14							
				103	0	— 105	0	0	0	9							
				165	0	— 167	0	0	2	0							
4	+ 44° 14′	do. do.	4	4	0	— 6	0	0	1	19	59	0	— 61	0	0	2	0
				8	0	— 10	0	0	0	9	61	0	— 63	0	0	4	9
				12	0	— 14	0	0	3	5	63	0	— 65	0	0	4	0
				14	0	— 16	0	0	0	9	67	0	— 69	0	0	2	9
				16	0	— 18	7	0	4	14	73	9	— 76	0	0	1	5
				18	7	— 21	0	0	2	19							
				31	0	— 33	0	0	2	0							
				38	9	— 41	0	0	1	14							
				41	0	— 43	0	0	2	19							
5	Horz	do. do.	4	2	0	— 4	0	0	1	5	12	0	— 14	0	0	2	0
				4	0	6	0	0	2	9	16	0	— 18	0	0	3	14
				6	0	— 8	0	0	3	19							
6	do.	do. do.	4	54	0	— 56	0	0	2	19							
7	do.	do. do.	4	0	0	— 4	3	0	1	5							
				4	3	— 6	0	0	1	9							
8	do.	do. do.	4	All assays trace.													
9	do.	do. do.	3	147	0	— 149	0	0	2	14	187	0	— 194	7	0	2	14
				170	0	— 172	5	0	0	14‡	187	0	— 189	10	0	8	9‡
				172	5	— 174	11	0	1	19‡	189	10	— 194	7	0	5	19‡
				174	11	— 177	2	0	0	9‡	194	7	— 197	11	0	2	9‡
				181	8	— 182	0	0	0	19							
				182	0	— 184	0	0	0	9							
10	do.	do. do.	3	155	0	— 157	0	0	4	7							
				202	0	— 204	0	0	3	14							
11	do.	do. do.	4	6	0	— 8	0	0	2	9							
				8	0	— 10	0	0	1	14							
				36	0	— 39	0	0	0	14							
				39	0	— 41	0	0	6	0							
				41	0	— 43	0	0	5	19							
				43	0	— 45	0	0	2	19							
12	do.	do. do.	4	130	0	— 132	0	0	4	19							
13	do.	do. do.	3	All assays trace.													
14	do.	do. do.	?	Hole abandoned at 37′ 6″ and position not fixed.													
15	do.	do. do.	3	74	0	— 76	0	0	3	5							
				76	0	— 78	0	0	2	14							
				88	0	— 90	0	0	1	9							
				90	0	— 92	0	0	2	19							
				92	0	— 95	0	0	2	0							
				95	0	— 97	0	0	9	7							
16	do.	do. do.	3	52	5	— 60	10	0	1	14							
				68	0	— 70	0	0	2	0							
				79	0	— 81	0	0	2	14							
				81	0	— 94	6	0	1	19							
				97	0	— 101	4	0	0	9‡							
				101	4	— 106	6	0	0	9‡							
				106	6	— 111	3	0	0	9‡							
				111	3	— 115	8	0	0	14‡							
17	do.	Nicholson's No. 1 Main Shaft	4	240	8	— 242	8	0	11	14							
18	do.	do. do.	4	125	0	— 127	0	0	1	5							
19	do.	do. do.	4	All assays trace.													
20	do.	do. do.	4	All assays trace.													
21	do.	do. do.	3	0	0	— 5	6	1	8	9	12	1	— 15	0	0	1	14
								1	9	5	15	0	— 19	11	0	2	14
				5	6	— 8	0	0	2	9							
22	do.	do. do.	3	94	7	— 97	10	0	1	5							
23	do.	do. do.	3	All assays trace.													
24	— 60° 42′	do. do.	5	66	0	— 69	0	0	2	0	72	0	— 74	0	0	10	0
															0	8	9
				69	0	— 72	0	0	10	0							
								0	9	14							
25	—56° 18′	do. do.	5	95	0	— 97	0	0	1	19							

TABLE II—*continued.*

Diamond Drilling Results—continued.

Bore No.	Elevation or Depression.	Workings.	Level.	Assay Results.											
				ft.	ins.	ft.	ins.	ozs.	dwts.	grs.	ft.	ins.	ft.	ins.	ozs.	dwts.	grs.
26	— 74°	Nicholson's No. 1 Main Shaft	5	82	0	— 84	0	0	3	14	101	0	— 103	0	0	7	19
				84	0	— 86	0	0	2	19	103	0	— 105	0	0	1	0
				88	0	— 90	0	0	15	0	115	0	— 117	0	0	6	0‡
				90	0	— 92	0	0	6	0							
								0	5	5							
				99	0	— 101	0	0	6	0							
27	— 55°	do. do.	5	All assays trace.													
28	Horz	do. do.	3	All assays trace.													
29	do.	do. do.	3	All assays trace.													
30	do.	do. do.	3	All assays trace.													
31	— 55°	do. do.	5	78	0	— 83	0	0	3	9							
				78	0	— 83	0	0	0	14‡							
32	— 37°	do. do.	5	41	0	— 43	0	0	4	0							
33	— 33°	Mackenzie's No. 1 Main Shaft	5	93	0	— 95	0	0	12	19							
				95	0	— 97	0	0	0	9							
				119	0	— 121	0	0	4	19							
34	— 40°	do. do.	5	All assays trace.													
35	— 40°	do. do.	5	120	0	— 122	0	0	1	0							
				122	0	— 124	0	0	2	0							
36	— 54°	do. do.	5	119	0	— 121	0	0	3	0	153	0	— 155	0	0	3	5
				121	0	— 123	0	0	1	5	155	0	— 157	0	0	1	9
				123	0	— 125	0	0	1	9	157	0	— 159	0	0	1	9
37	Horz	do. do.	5	24	0	— 26	0	0	2	0							
38	do.	do. do.	5	All assays trace.													
39	do. ...	do. do.	5	2	0	— 4	0	0	1	5							

NOTE.—(1) Assays marked thus (‡) are sludge assays.
(2) Assay results supplied by Ora Banda Amalgamated Mines, N.L.

Ore is being broken at the present time from below No. 2 level (100W-180W). It is anticipated by the management that some ore might be obtained from selected places above No. 1 level between 100E and 100W, but no development work has been done. It is not anticipated that the quantity of ore obtained would be very great.

The workings off Nicholson's No. 1 Main Shaft are estimated to make 32,000 gallons of water per day mainly from the west ends of Nos. 5 and 6 levels. A very heavy flow of water was encountered in a drill hole in the west face of No. 5 level. The flow was too great for the mine pumps and the hole was plugged.

Mackenzie's No. 1 Main Shaft Workings.

The principal ore body has been worked from the surface down to No. 7 level (V.D. 710 feet). It has a variable strike and dip and has formed in a number of intersecting sheers, of which more will be said in a later section of this report. It has a maximum stope length above No. 4 level of 520 feet and is reported to have had an average width of from four to five feet. The pitch is vertical. The ore body has been practically stoped out from the surface to No. 6 level and no ore was being obtained from above No. 6 level at the time of inspection. The reported average values at No. 6 level are shown on the plan. It will be seen that in that section of No. 6 level, which has been stoped, the average value is reported to have been 6½ dwts. over 48 inches. Beyond the east end of the main stope at this level the average value is reported to be only 4 dwts. over 48 inches.

The values at No. 7 level and also in the winze from No. 6 level are reported to have averaged 5 dwts. over 48 inches. A leading stope has been taken off at this level and the broken ore was being hauled at the time of inspection. Ore could be seen in the west face, but the east face was inaccessible because of broken ore. It is reported that the east face is still in ore. No further work is contemplated at this level and no winzes have been sunk below this level.

At No. 2 level a parallel ore body has been stoped off a drive, which is approximately 40 feet south of Mackenzie's No. 2 Shaft. The stope has a maximum height of 50 feet. It is considered possible by the management that there may still be some ore above this stope but no development work has been done. A winze, No. 1 west winze, was sunk in ore for 30 feet below the level and it is estimated by the management that 1,100 tons of 7 dwts. ore probably exists below this level.

A parallel ore body north of the main ore body has been tested at three levels, Nos. 1, 2 and 4. In all drives the average values are reported to have been about 2 dwts. over the full width of the drive.

The workings off Mackenzie's No. 1 Main Shaft are practically dry—about one hour's pumping each morning is all that is necessary.

DIAMOND DRILLING.

During 1940 thirty-nine bores were drilled—23 from the workings off Mackenzie's No. 1 Main Shaft and 16 fom the workings off Nicholson's No. 1 Main Shaft. These bores are shown on the plan. The whole of the cores were assayed, generally in two feet lengths, and the results of this work were made available to the writer. All results greater than a trace are recorded in Table 11. The assay results for horizontal bores are shown on the plan, but those for depressed or elevated bores are not shown.

A number of depressed bores were drilled from Nos. 5 levels in both lots of workings and some good values recorded. Subsequently Nos. 6 levels were driven, but otherwise very little development work followed the diamond drilling. The values obtained were generally low and patchy, there being no continuity of ore bodies suggested by adjacent drill holes.

GENERAL GEOLOGY.

Under this heading it is proposed to discuss the country rock and also the various shear zones in which the ore bodies have formed.

Country Rock.

The workings occur in a soil covered area and no outcrops were seen in their vicinity. Underground the country is seen to be a porphyrite, with felspar phenocrysts, up to one inch in diameter, set in a fine grained

matrix. The degree of abundance of those phenocrysts varies considerably and often in a face they are seen to occur in patches. Over appreciable areas of the face they are absent. Away from the ore channels the rock is massive and shows a blocky jointing. In the vicinity of the ore channels it is strongly sheared and very fine grained. Sulphides are often seen in the walls of the drives and examination of thin sections shows the presence of carbonates. In the vicinity of the ore channels occasional remains of felspar phenocrysts are seen (2/2826) and there is a grading from the heavily sheared rock to the porphyrite. The porphyrite is known locally as the "cat" rock or "native cat" rock.

A number of specimens were brought back and have been examined in thin section by the writer's colleague, Dr. K. R. Miles, who comments as follows:—

"Specimens examined included types of "cat rock" forming the country rock of the principal lodes at Grant's Patch, together with specimens of schist from the lode channel itself. The "cat rock" specimens were marked B1, B2, B3-B6a, B6b, B10 (registered numbers 2/2817-2/2823, B10 discarded). This is a markedly porphyritic rock containing phenocrysts of felspar—mostly cloudy from alteration but where sufficiently fresh, determined as labradorite (Ab_{45} An_{55})—set in a cloudy altered ground mass ranging from very fine to medium-fine-grained and consisting essentially of felspar, a chloritised ferromagnesian mineral and epidote, carbonate, pyrite, etc. Several specimens viz., 2/2817, 2/2819, 2/2820 showed a suggestion of flow orientation in the ground mass minerals. This rock is classified as a porphyrite or porphyritic andesite, an intermediate basic rock of igneous origin which may have been either a sill or a flow. The ground mass of one medium-fine-grained specimen (2/2818) shows affinities with dolerite.

The rocks from the ore channel viz., B8, B9, B11-14 (registered numbers 2/2825-2/2829, B8 discarded) are for the most part sheared and heavily altered and replaced by carbonates and sulphides. Relict structures are sufficient to identify these as having been derived from the porphyrite (or andesite) "cat rock" as a result of dynamic metamorphism (shearing) and later hydrothermal alteration.

Porphyrite (andesite) and its sheared products constitute all except one of the specimens examined, the odd one (2/2824) being a medium grained amphibolised dolerite (dolerite amphibolite), a hypabyssal intrusive possibly representing a more basic facies of the same magma from which the porphyrite was derived."

Specimen 2/2824—a dolerite amphibolite—comes from the south face of a crosscut opposite to Nicholson's No. 1 Main shaft at No. 5 level. (Co-ordinates 60S, 15E.) Underground this rock appeared to be more sheared as the lode channel was approached and no boundary between the dolerite amphibolite and the porphyrite was seen. This is a point which should be checked as opportunity offers. It should be noted that the ground mass of one other specimen (2/2818) showed affinities with a dolerite.

At two places in the workings off Mackenzie's No. 1 Main Shaft—south faces Nos. 2 and 6 level plats—pillow lava was seen. At No. 6 level the pillows were well developed and were seen to be finer grained at their margins than in their centres. The centres of pillows showed well developed felspar phenocrysts, while at the margin the phenocrysts were small and inconspicuous. Two specimens were collected (2/2819, 2/2820)—one from the centre and one from the margin of a pillow—and both were found in thin section to be fine grained porphyrites (or andesites?) similar in every way to the other specimens of porphyrite collected. It is concluded therefore that the porphyrite is a flow rather than a sill.

Shear Systems.

(a) *Nicholson's No. 1 Main Shaft Workings.*—An analysis of the strikes of various ore bodies suggests that there are at least five sets of shears having strikes and dips as indicated in Figure 1. This diagram has been generalised from a larger one on which the general strikes of the various ore bodies were plotted. The principal production has been from an ore body formed in that set of shears having a general strike of from 111°-128°, but there has also been appreciable production from ore bodies having the following general strikes:—87°-90°, 96°-98° and 62°-77°. All workable ore bodies have been stoped and the levels timbered and it is not now possible to see the points at which the shears appear to have junctioned. Consequently it cannot be positively stated that at all places where there is a change in the general strike of the level that the ore body has formed in a new shear, but it would appear probable that it has. Good evidence for this is to be seen at No. 4 level off Mackenzie's No. 1 Main Shaft, of which more will be said in the next section of this report.

It has been suggested that there are two sets of shears having the following strikes 87°-90°, 96°-98°, but it is possible that these belong to one system of shearing having a strike varying from 87°-98°. If this is so then that portion of the ore body at the western ends of Nos. 5 and 6 levels has formed in the same set of shears as the ore bodies at Nos. 1 and 2 levels (40W-40E and 20W-50E respectively).

The pitch of main ore body is to the west and appears to be controlled by the pitch of the intersection of the shears.

(b) *Mackenzie's No. 1 Main Shaft Workings.*—Figure 2 is a shear system diagram for these workings compiled in the same manner as Figure 1. It will be noticed that while there is general correspondence of the strikes of the shears in both lots of workings there are noticeable differences in the dips, e.g., in the workings off Nicholson's shaft those shears having a strike of from 111°-128° have a vertical dip, while in the workings off Mackenzie's Shaft those shears having a strike of from 104°-108° generally have a northerly dip, although there are some with a vertical dip.

In these workings the existence of parallel shears can be well seen at Nos. 2 and 4 levels. At No. 4 level opposite to the main shaft the ore is seen to continue beyond the end of the stope for a short distance along a shear having a strike of 71°, although the main portion of the ore has been diverted to a shear having a general strike of 104°. A similar set of conditions is seen in the drive to the west of this point.

The pitch of the ore body is vertical and is controlled by the pitch of the intersection of the shears. Below No. 3 level the ore body has formed in shears having a general vertical dip and consequently has a vertical pitch. The pitch of the intersection of two shears is dependent upon the dip of each of the shears. At No. 2 level the main ore body has formed in parallel shears all belonging to the one system.

CONCLUSION.

Because of wartime conditions development work has lagged behind ore breaking and the reserves of ore, which can be immediately worked, amount to only a few hundred tons.

The values—5 dwts. per ton—at No. 7 level, off Mackenzie's No. 1 Main Shaft are reported to be lower than can be profitably worked by the Company. The values in these workings are reported to have been decreasing with increasing depth. In the past ore from these workings has been mixed with high grade ore from the workings off Nicholson's No. 1 Main Shaft, but at the present time very little high grade ore is available and consequently the 5 dwt. ore is not being worked. No winzes have been sunk below No. 7 level. There is no geological reason for supposing that the conditions below this level are different from those above it.

The values at No. 6 level off Nicholson's No. 1 Main Shaft and the stope above it were very satisfactory—those in the stope being reported to have averaged 10-12 dwts. over 4-5 feet. Only one winze has been sunk below this level. This winze is reported to have been in good values—15 dwts.—for 30 feet. There is no geological reason for not testing the ore body by other winzes, below No. 6 level.

THE TUNGSTEN DEPOSITS ON M.Cs. 24 AND 25, CALLIE SOAK, MURCHISON G.F.

By R. S. Matheson, B.Sc.

GENERAL INFORMATION.

As a result of an application for financial assistance from the Mines Department a brief examination of these deposits was carried out on the 16th and 17th January, 1943.

The deposits are situated in the vicinity of Callie Soak, about 25 miles north-west of Cue and about 3¾ miles west of Telegootherra Trig. The deposits are about 11 miles north-west by road from the Big Bell Mine.

Some notes on tungsten deposits from the Callie Soak area are already contained in Bulletin 57* and the Mining Handbook.

According to the official production statistics 8·41 tons wolfram valued at £1,148 were recovered from 238·64 tons of ore, obtained from the area during the period 1910 to 1916. Calculations based on the price during the period of production, which was about 46s. per unit for 65 per cent. ore, shows that there is an error in the statistics, and they should read 8·41 tons of WO_3 not 8·41 tons of wolfram. Allowing for this correction it will be seen that the ore produced from this area, which was no doubt hand picked, averaged 3·52 per cent. WO_3.

GEOLOGY.

The area is composed mainly of porphyritic granite, which is intruded by a series of quartz and pegmatite veins. A few lenses of quartz-biotite rock†, which may possibly be recrystallised remnants of pre-existing sediments, are also present. The complex is presumably of Pre-Cambrian age.

The principal tungsten mineral is wolframite (ferberite variety), but scheelite occurs, and is fairly abundant in two places. The tungsten minerals are everywhere associated with fractured, translucent, somewhat ironstained, quartz veins, and the quartz-biotite rock is frequently their host rock. Wolframite is not confined to the quartz, but also occurs in the quartz-biotite rock in proximity to quartz veinlets.

Cassiterite does not appear to be associated with the wolframite at this locality, but hematite pseudomorphs after magnetite are fairly common.

The soil in proximity to the lodes contains detrital wolframite, and is reported to be sufficiently rich, in a few places, to warrant working.

THE LODES.

The writer was concerned mainly with Martin's Lode and Bald Hill Lode, which are situated on M.Cs. 25 and 24 respectively, but a few smaller lodes occurring in the area were also inspected. The wolframite was readily detected by its marked physical characters but a "Mineralight" lamp was used to assist in the detection of scheelite.

The co-ordinates given below are referred to the plan‡ accompanying Dr. Moss's report.

Martin's Lode (Co-ords. 1390S, 575E).

This is the only lode seen in the district, which has prospects of being worthy of large scale development. The financial assistance applied for is to prospect this lode.

The lode consists of a lens of quartz-biotite rock intruded by quartz veins and veinlets, which strikes N. 50° E. and probably dips vertically. It attains a height of about 15 feet above the general level of the surrounding country, and has a length of 265 feet and an average width of about 65 feet.

The two main quartz veins are barren, but a network of wolframite-bearing quartz veinlets occurs in the lens. The wolframite is not confined to the quartz veinlets, but was noted in the quartz-biotite rock in proximity to them, in several places. Wolframite is most abundant along the south-eastern side of the lode, but it is also present on the north-western side. A small amount of scheelite, occurring in quartz, was detected by the "Mineralight" near the south-west end of lode, on the north-west side of the two well defined quartz veins. The reported occurrence of detrital wolframite on all sides of the lode supports the view that it has been mineralised erratically as a whole.

The existing workings consist of four shallow trenches; three on the south-eastern side of the lode and one on the north-western side. The trenches are short, and the longest extends only about half-way across the width of the lode.

The assay results from samples already taken from the lode give no indication of its average value, and this information can only be obtained by trenching and bulk sampling. A good indication of the economic value could be obtained, however, by bulk sampling the material mined from one trench across the centre of the lode.

Bald Hill Lode.

This lode is situated on a bare granite hill about 90 chains south-west of Martin's Lode.

A pegmatitic quartz vein, which strikes N. 20° W. and probably dips vertically, has been mined here over a length of 40 to 50 feet and to a depth of about 16 feet. The workings could not be examined due to the presence of water which stands at nine feet in the shaft. The vein appears to be about six feet wide and consists of a mixture of laminated quartz, felspar and mica, which is mineralised erratically with wolframite and scheelite. Wolframite frequently occurs as a core in the scheelite.* Most of the production from the Callie Soak areas has come from this deposit.

Detrital wolframite is present in the soil on the north-eastern side of the workings, and a fair amount of scheelite has been overlooked in the dumps.

This deposit has prospects of being quite a good small scale proposition.

Other Lodes.

Although these lodes have little bearing on this report it is advisable to record their presence.

A pegmatitic quartz vein containing wolframite and scheelite, which has prospects similar to the Bald Hill Lode, is situated about 22 chains west of Martin's Lode (at Co-ords. 1440S, 880W). The vein is lenticular, and strikes N. 50° W. and probably dips vertically. It outcrops over a length of 90 feet and has a maximum width of about 10 feet. Mineralisation has apparently been erratic, and the workings consist of a few potholes and one shaft, which has been sunk to a depth of 20 feet on a small fairly rich shoot. A fair amount of scheelite, and wolframite within scheelite, was noted in the dumps near the shaft. Scheelite is not abundant in the walls of the underground workings, and the floor of the workings, which is the most likely place for its occurrence, was covered at the time of inspection. A little molybdenite is scattered through this quartz vein.

Another scheelite and molybdenite bearing quartz vein has been opened up in a shallow trench, the co-ordinates of which are 200S, 820W. The vein is only a few inches wide however, and does not warrant much attention.

Wolframite-bearing quartz veinlets are associated with most of the small lenses of quartz-biotite rock shown on Dr. Moss's plan, but the mineralisation does not appear to have been extensive.

SUMMARY AND CONCLUSIONS.

The tungsten deposits in the Callie Soak area consist of wolframite and scheelite bearing, pegmatitic quartz veins, which are intruded into a complex of porphyritic granite and scattered lenses of quartz-biotite rock. In some deposits wolframite is the most abundant tungsten mineral, while in others scheelite predominates. The wolframite deposits are generally associated with quartz veinlets intruding lenses of quartz-biotite rock, and mineralisation of the host rock as well as the quartz

* Woodward, H. P., G.S.W.A. Bull. No. 57 (1918), pp. 53-54. Maitland, A. G., G.S.W.A. Mining Handbook (1919), Chap. II., Part III., Section 6.

† See specimen No. 2/2578, Geological Survey Collection.

‡ For report and plan refer to Mines Dept. File 1166/42.

* See specimen No. 2/2579, Geological Survey Collection.

was noted in several places. Only very small amounts of scheelite occur in these deposits. The scheelite deposits are associated with quartz veins intruding granite and a fair amount of wolframite is generally present. In these deposits mineralisation appears to have been confined to the quartz.

A few of the deposits warrant prospecting, but only one of them (Martin's Lode) has prospects of being worthy of large scale development. This lode consists of a lens of quartz-biotite rock, about 265 feet long and 65 feet average width, which has been intruded by a network of wolframite-bearing veinlets. Mineralisation has been rather erratic, but there is reason to believe that the WO_3 content of the lens as a whole, or a large part of it, may be sufficient to warrant large scale development.

A fair amount of trenching and bulk sampling would be required to determine the average value of the lode, and this would prove costly, but some indication of the economic value could be obtained by bulk sampling the material mined from one trench across the centre of the lode.

THE MOLYBDENITE DEPOSITS ON P.A's. 2323, AND 2324, MT. MULGINE.

Yalgoo Goldfield.

By R. S. Matheson, B.Sc.

General Information.

Mt. Mulgine is situated about seven miles south south-west of Warriedar, and about 55 miles east of the railway at Perenjori.

About 78 tons of Molybdenite ore valued at £865[1] were mined from shallow workings at this centre during the period 1917 to 1922, the price of molybdenite at the time being about £5 per unit for 90 per cent. concentrates. No production has been recorded since 1922, and this has been attributed to low prices. An increasing demand for molybdenite in the last few years has led to renewed interest in the deposits, and the price (at January, 1943) has again risen to £5 per unit. Since 1938 examinations of the deposits have been made by representatives of the Big Bell Mines, Ltd., and the Broken Hill Pty. Co. Ltd., and also by Dr. F. A. Moss, who holds one of the existing prospecting areas.

The writer's inspection was made during the period 13th to 15th January, 1943, as a result of an application[2] to the Mines Department for financial assistance to prospect the deposits.

Geology.

The writer's investigations were of necessity confined to a small area in the vicinity of the workings, but the general geology has already been described in departmental reports.[3]

Mt. Mulgine is a rough, isolated hill which attains a height of about 300 feet above the general level of the surrounding country. It is composed mainly of fresh, foliated, microcline-muscovite granite, which is intruded by a network of pegmatitic quartz and pegmatite veins. Narrow dolerite dykes, which have a general north-west strike, intrude this complex. The granite varies from fine to coarse grained, and its foliation planes strike in a north-westerly direction and dip almost vertically.

All the molybdenite occurrences are associated with the pegmatitic quartz veins, which generally strike in a north to north-west direction and dip vertically. The quartz veins are lenticular and vary in width from a stringer to about 12 inches. Although molybdenite is sometimes present in the quartz, it usually occurs as thin seams on the margins of the veins or as scattered flakes and rosette-like forms in the adjacent granitic wall rock. The marginal seams of molybdenite are erratic in occurrence, and the impregnation of the wall rock varies in width from a few inches to about two feet. Wider zones of mineralisation occur where quartz veins intersect, or are parallel and in close proximity to one another. The molybdenite has been weathered out of the mineralised zones in places to depths up to two feet from the surface, but the nature of the vugs, together with occasional spots of molybdic ochre or residual flakes of molybdenite appear to give a fairly reliable indication of the existence of deposits.

Pyrite is a common constituent in the mineralised zones and fluorite was noted in one or two places, while the occasional presence of scheelite, magnetite, pyrrhotite, and manganese has been recorded. In the mineralised zones the molybdenite is reported to occur in close association with the mica, either interleaved with or completely replacing it.

The Workings.

The 14 trenches and adit referred to in Dr. Moss's report were examined by the writer, but in only five of the trenches and the adit were the prospects sufficiently encouraging for the deposits to warrant detailed examinations. The trenches are situated on the southern slope of Mt. Mulgine and the adit is at the head of a gully on its western side. Descriptions of these workings are given below, and the co-ordinates are referred to Plan No. 3 accompanying Dr. Moss's report.[4]

Trench A. (Co-ords 16—M, Western trench).

This trench strikes N. 13° W., is about 92 feet long, and it has a maximum depth of 12 feet. Mineralisation commences rather suddenly in the trench, about 48 feet from the north-west face, on a joint plane which strikes N. 60° W. and dips 65° N.E. Although the floor of the trench is covered, it seems likely that a molybdenite impregnated zone extended from the joint to the face, the average width being about six feet. The mineralised zone occurs between two quartz veins which are well exposed in the face. The eastern vein has an average width of about 12 inches and can be traced back to the joint, while the western vein only extends about half this distance, and diminishes in width from six inches in the face to a stringer. Quartz veinlets probably intruded the intervening granite, so that conditions were very favourable for mineralisation. No mineralisation appears to have occurred beyond the outer boundaries of the quartz veins.

The results of three samples taken from this trench by the Big Bell Mines Ltd. during the investigation are given below.

Sample.	Sample Width.	$\%MoS_2$.
Horizontal sample from N.W. face	4 ft.	1.38
Vertical sample from east wall, 22 ft. from N.W. face	6 ft.	0.42
Horizontal sample edge of shallow hole (so called winze) on N.W. side of joint	6 ft.	1.01

Trench B. (Co-ords 17 to 18—L).

This trench swings from south-west to north, is about 36 feet long, and has a maximum depth of six feet at the north face. A 4in. quartz vein, which strikes N.-S. and dips very steeply west, can be seen extending from the face into the eastern wall of the trench. The granitic country on both sides of the vein has been impregnated with molybdenite and pyrite, and the mineralised zone is exposed over a length of 20 feet over an average width of three feet. In this trench unweathered lode material is encountered at two inches from the surface. Indications of the mineralised zone were noted in the outcrops to 27 feet beyond the north face, but could be traced for only a few feet south of the trench.

An eight inch pegmatite vein, which strikes N. 65° W. and dips vertically, cuts through the trench near the north face, but its relationship to the quartz vein could not be established.

The north face was sampled over a width of nine feet by the Big Bell Mines Ltd., and it assayed 0·69% MoS_2.

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[1] Maitland A.G., G.S.W.A. Bull. No. 89, p. 70.

[2] Refer to Mines Dept. File 1038/42.

[3] Blatchford, T., Mines Dept. Ann Rept., 1918, pp. 77-78. Maitland A.G., G.S.W.A. Mining Handbook, Chap. II., Part III, Section VII.

[4] For report and plan, see Mines File 1038/42.

Trench C. (Co-ords 17—M).

This trench strikes N. 15° W., is about 44 feet long, and has a maximum depth of 12 feet at the north-west face. The mineralised zone has an average width of about eight feet six inches, and extends about 38 feet back from the face, where it cuts out rather suddenly. No defined quartz vein was seen in this trench, but there are indications that a network of quartz veinlets occurred. Molybdenite is reported to have been picked up on the strike 50 feet beyond the north-west face, but the lack of surface indications suggests that the mineralised zone is not continuous between these two points.

The assay results of samples collected from this trench by the Big Bill Mines Ltd. are given below:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample from N.W. face	5 ft. 9 in.	6.99
Horizontal sample 37 feet from N.W. face	6 ft. 9 in.	1.91

Trench D. (Co-ords 17—N.).

This trench is V shaped, and its apex faces north. The south-eastern branch is 38 feet long, and the south-western branch is 28 feet long. The trench has been excavated to a maximum depth of eight feet from the surface.

Three narrow quartz veins, which strike about N. 15° W. and dip vertically, were intersected in this trench.

In the south-eastern branch a quartz vein, varying from 18 inches to 10 inches wide, is exposed. Molybdenite occurs erratically within the vein and as seams along its walls. There has been practically no mineralisation of the adjacent country. The vein has also been prospected in trenches to the north and south, but the assay results are not encouraging.

Another quartz vein occurs on the north-west wall of the south-west branch, about eight feet west of the vein described above. The vein is about 10 inches wide and mineralisation extends over 18 inches, but the vein is a short lens which cuts out before reaching the south-east wall.

About six feet further west, another quartz vein about six inches wide occurs, and the adjacent country, for a few inches on both sides of it, is impregnated with molybdenite. The maximum width of the mineralised zone is 15 inches.

The assay results of samples collected from this trench by the Big Bell Mines Ltd. are given below:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample face of S.E. branch	4 ft.	0.28
Horizontal sample N.W. wall of S.W. branch 3 ft. to 8 ft. from S.W. face ..	5 ft.	0.62
Horizontal sample N.W. wall of S.W. branch 8ft. to 13 ft. from S.W. face ..	5 ft.	0.31
Horizontal sample S.E. wall of S.W. branch 0 ft. to 3 ft. from S.W. face	3 ft.	0.41

Trench E. (Co-ords 17—O to P).

This trench strikes N. 47° W., is about 22 feet long and has a maximum depth of 10 feet.

A two inch quartz veinlet with a thin seam of molybdenite on its west wall is exposed for a few feet in the floor of this trench. Mineralisation of the wall rock is confined to the eastern side of the veinlet and does not exceed 14 inches in width. In the north-west face the mineralised zone is only about six inches wide and does not extend to the floor.

The assay results of samples collected from this trench by the Big Bell Mines, Ltd. are given below:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample from N.W. face	3 ft. 6 in.	0.57
Floor sample	6 in.	High Grade

North-West Adit Workings.

The adit was inaccessible at the time of the writer's inspection, due to the presence of water and foul air. At the surface, however, vugs and occasional flakes of molybdenite were noted in quartz veins for about two chains east of the mouth of the adit.

In the report of the Big Bell Mines Ltd., these workings are described as follows:—

> "A trench was cut in the side of the hill to form an open cut 79 feet long, some six to 10 feet wide, and of height from zero to 34 feet. At the floor of the 34ft. face an adit was driven for a distance of 49 feet. Near to and in the mouth of the adit a winze was sunk to a depth of five feet and has formed a soak for water. The total tonnage excavated (all by hand drilling) is in the order of 1,170 tons, of which 690 tons was overburden, and 480 tons of stone carrying some molybdenite. Most of the tonnage lies in dumps near the entrance to the open cut.
>
> The whole of the workings are in granite-carrying small quartz and pegmatitic quartz veins. A dolerite dyke strikes across the open cut close to the mouth of the adit, and maintains a width of about four inches from floor to surface, a distance of over 30 feet."

The following assay results are reported to have been obtained from samples collected during this examination:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample from face of adit	3 ft. 9 in.	0.83
Horizontal sample from roof near shallow winze ..	4 ft. 6 in.	1.43

SUMMARY AND CONCLUSIONS.

An inspection of the principal workings at Mt. Mulgine showed that five trenches and the adit contained molybdenite in sufficient quantities to warrant a detailed examination. The molybdenite is associated with quartz veins, and generally occurs as thin seams along their margins or as scattered flakes and rosette-like forms in the adjacent granitic wall rock. Molybdenite is occasionally scattered through the quartz veins themselves. The floors of the trenches and the adit could not be examined, but the observations made were sufficient to show that the marginal seams of molybdenite are erratic in occurrence, and the width of impregnation of the wall rock very variable. Mineralisation has been erratic horizontally, and it is reasonable to expect it to be similar vertically.

The comparison between the quantity of material mined and the production, which is given below, is supporting evidence of erratic mineralisation, and it is obvious that mining at this centre, as a whole, has been carried out at some considerable loss.

The total production from this centre is 78 tons of molybdenite ore valued at £865, and it was obtained during the period 1917 to 1922. If the 1918 price of molybdenite, which was £5 per unit, is assumed to have been obtained for the whole of the production, then the average value of the ore was about 2¼ per cent. MoS_2. The 78 tons of molybdenite ore have been recovered from workings which, according to the Big Bell Mines Ltd., yielded 4,000 tons of rock. Admittedly some of the workings are of a prospecting nature, but the fact can not be overlooked that the marketable ore constituted only about two per cent. of the total amount of material mined at this centre. Making an allowance for dead work and assuming that one per cent. molybdenite ore could be treated profitably on the spot, it is not unreasonable to adopt a recovery value of 20 per cent. for this grade of ore in any large project.

The five trenches and adit in question would yield about 120 tons of material per vertical foot, from which, if the above recovery value of 20 per cent. is accepted, 24 tons of one per cent. molybdenite ore could be recovered. The prospects are, therefore, not encouraging.

In conclusion, the writer is of the opinion that while small parcels of ore averaging about two per cent. MoS_2 may be obtained from these deposits by selective mining, due to erratic mineralisation it is unlikely that sufficient ore of suitable grade could be developed to justify any large scale project.

BENTONITE AT MARCHAGEE, WESTERN AUSTRALIA.

Interim Report.

By K. R. Miles, D.Sc., F.G.S.

In August, 1943, a very brief inspection was made of a clay deposit claimed to contain high grade colloidal clay (bentonite) near Marchagee on the Midland Railway line, some 150 miles north of Perth. The clay deposits occur in several clay pans located about nine miles west of Marchagee Siding. The country in the immediate vicinity of the clay pans is a sand plain covered with low scrub vegetation, and sprinkled with boulders of travertinous limestone. Scattered high points on this sand plain are capped by ferruginous gravel.

The principal deposit, located on M.C. 258H on the south-west corner of Victoria Loc. 5866 consists of a long narrow, irregular shaped clay pan, running in the approximate direction N. 35° W. This clay has an average depth of two to three feet and bottoms on sand. It consists of A. Top Clay, 9-10 inches thick—a greyish clay which is claimed to be high grade bentonite grading into B. Middle Clay (transition layer)—of highly gypseous clay (about six inches) which grades downward to C. Bottom Clay, a fawn-brown coloured clay average about 15 inches, very similar in general appearance to the Top Clay but claimed to have very inferior colloidal properties. All three layers, but particularly the top and bottom, are plentifully sprinkled with fragments of travertine.

For purposes of computation the clay deposit can be taken as approximately 25 chains long by one chain wide. Assuming that the average thickness of Top Clay is nine inches then the deposit contains a little over 3,000 tons of high grade bentonite, on a conservative estimate. Should the Bottom Clay on further testing prove to be of commercial importance then, assuming an average thickness of 12 inches of pure material, this would yield a further 4,000 tons of bentonite.

Samples of the different varieties of clay from this deposit have been sent to the laboratories of the C.S.I.R., Melbourne, for further testing in connection with the Foundry Sands Investigation.

Some 12 to 15 chains south-east of M.C. 258H is a small shallow clay pan covering less than a quarter of an acre. At the time of inspection this pan was rather wet but a sample hole revealed a surface layer about 12 inches deep of clean clay underlain by gypseous material. Should this type of material prove to be a useful colloidal clay it is estimated that this deposit may contain a maximum of about 400 tons of bentonite.

M.C. 259H on Victoria Loc. 7308 lies about 1½ miles south-east of M.C. 258H. This contains a clay pan which at the time of inspection was covered with water and could not be sampled. The clay pan covers an area of about 1½ acres or more. It is claimed that the top four inches of clay on this deposit is useless as colloidal clay but that beneath this is a layer, about 12 inches thick, of fair grade bentonite, underlain by a hard layer of ferruginous cement. Assuming that the overall average thickness of workable bentonite is 12 inches in this deposit, it will contain approximately 2,500 tons.

The above are the only known deposits of commercial bentonite in Western Australia, amounting to a possible total of about 10,000 tons of clay whose quality and properties have yet to be checked by thorough testing of plasticity and colloidal properties. Considerable tracts of country geologically and physiographically similar to that of Marchagee can be found in this and adjacent districts, however, and it is possible that other similar bentonite bearing clay pans will yet be located.

NOTES ON A SALT DEPOSIT NEAR WYALKATCHEM, S.W. DIV.

By K. R. Miles, D.Sc., F.G.S.

During his return to Perth from an inspection of salt lakes in the Campion district on June 15th, 1943, the writer took the opportunity of making a brief inspection of a small lake salt deposit approximately nine miles south-south-west of Wyalkatchem townsite. This lake, which is approximately circular, covers an area of about six to seven acres, lies near Bulagen Spring on Reserve ↑ 21221, about 15 to 20 chains south-east of the south-east corner of Avon Loc. 17135 (Lands litho 33/80).

Portion of this lake is at present leased by a Mr. Duffeld, who is producing salt to fulfil Army contracts. The lake occurs in a shallow depression in yellow sand plain country. At the time of inspection the lake was covered with water to a depth of about 11 inches in the centre. This was stated to be about four inches above the water level of last month, due to recent heavy rains. Little water is said to enter this lake from surface drainage, the increase being largely produced by underground seepage. Measurement of the salt concentration in the water by hygrometer indicated 65 to 70% NaCl at the surface.

At the time of inspection the salt layer being worked was approximately 2-2½ inches thick, consisting of clean well crystallised halite overlaying a thin crust (half to one inch thick) of rather dirty salt, beneath which is a zone of gypseous mud. This lower salt layer is the product of crystallisation of an earlier season and it serves to seal off the impure gypsum-bearing brines below. Care is taken not to break this layer and to gather only the clean salt which is continually forming upon its upper surface. By this means Mr. Duffeld claims to be able to obtain a uniformly clean product consistently free from gypsum and other chemical impurities.

Plant on the lease includes a small mill which is run by a truck engine driven by producer gas. Salt stacked on the bank amounts to several hundred tons. It is claimed that two men operating this plant can produce and bag between 1½ and 2 tons of salt per day. Mr. Duffeld considers that with additional plant a steady production of about 1,500 tons per annum could be maintained from this deposit for a number of years. Samples of the crude salt, crude washed salt and the coarsely ground final product, were collected for purposes of departmental reference.

NOTES ON THE SALT LAKES—CAMPION DISTRICT.

By K. R. Miles, D.Sc., F.G.S.

This district is experiencing its wettest season for many years. Very heavy falls were recorded in the early months of this year (1943), and there have been periodic soaking rains throughout the last six months. Most of the lakes are filled with water. It has, furthermore, been reported that the main chain of lakes extending from Yellowdine and Southern Cross northwards through Lakes Seabrook and Koorkoordine, respectively, to Lake Deborah and thence south-westwards through Warrachuppin, Lake Brown to Hines Hill, Baandee and towards the Avon River south of Beverley, have for a short time been more or less connected by flowing water. No salt was seen in any of the lakes visited during the recent inspection carried out between the 9th and 17th of June, 1943.

South Lake Campion.

The site of an old salt lease, 1564/152, is a small lake lying just west of the Campion-Merredin road, about five miles south of the Alunite works at the new town-

site of Chandler. This lake is in the strip of country connecting the Lake Campion lake series with the eastern end of Lake Brown. (See plan.) It is about 30 chains long by 20 chains wide and was three parts filled with samphire, the remainder being covered with water. The total area available for salt catchment is small. On the eastern side the main road is a long, narrow, curved arm of lake running north and south, about 30 chains wide and probably near a mile long. This was covered with water. No salt was seen hereabouts but seed gypsum was plentiful on the western shore line.

Lake Brown.

Salt is reputed to have been obtained in the past from several portions of Lake Brown, particularly in the south-eastern corner, and towards the centre of the main body of the lake.

The probable site of one old salt lease, 1572/152, in the south-eastern end of the Lake Brown chain, is a small, circular lake about 12 chains east of the road and three-quarters of a mile south of the narrow causeway crossing, which lies some seven miles south-west of Chandler. This lake is about 20 chains in diameter, and at the time of inspection was mostly covered with water to a maximum depth of about 4½ inches. No salt existed on the floor of the lake, which consists of red clay, underlain by whitish clay containing scattered crystals of gypsum. A sample (No. 1) of the water was collected from the centre of this lake.

About a quarter of a mile north of this circular lake is the southern shore of the main arm of Lake Brown east of the causeway. This was covered with water and extended northwards for over a mile, and was about half a mile wide. A sample of water (No. 2) was collected from a point about half a mile south of the causeway and 10 chains east of the western shore. The water here was about 9½ inches deep and the floor of the lake a blue-grey mud.

The main body of Lake Brown itself was seen to be covered with water. Some salt is reputed to have been obtained from somewhere near the central portion of this lake, a mile or more south-east of the main Lake Brown-Nungarin road crossing. No detailed inspection was made of this part of the lake and no water samples collected, owing to its general inaccessibility because of the water logged condition of the surrounding ground.

An isolated pear-shaped stretch of lake lying west of the road and about one to one and a half miles north of the narrow causeway mentioned above is reputed to have been worked for salt in the past. The bulk of this lake appears to be a silted-up samphire-covered flat containing narrow water-filled channels. No salt was seen, but the eastern shores were plentifully sprinkled with seed gypsum. No water samples were taken.

Warrachuppin Lakes.

It is not known if salt has been collected from these in past years. The main lake is about 1½ miles east of Warrachuppin siding and just north of the railway line. It is flanked on the western end by a large granite rock (trig. hill). It was covered with water, a sample of which (No. 4) was taken from about five chains north of the shore where it was 10 inches deep. No salt or gypsum was seen. It is probable that, owing to the heavy run off of fresh rain water from the rock into this lake, the salt concentration may be lower than elsewhere. Other smaller lakes to the south of the railway line were water-filled and showed no signs of salt.

Baladjie.

Inspection of the western end of the Lake Deborah chain at about 1½ miles due north of Baladjie siding showed that the lake was here completely filled with water over its entire expanse. A sample (No. 3) was collected at about 15 chains north of the southern shore where the water was 11-12 inches deep. The floor of the lake consists of fine red mud, underlain at a few inches by a bluish puggy clay containing thin sandy lenses and thickly scattered with flat disc-shaped crystals (often showing penetration twins) of gypsum. No salt was seen.

SCHEELITE DEPOSITS IN THE CENTRAL GOLDFIELDS, WESTERN AUSTRALIA.

By K. R. Miles, D.Sc., F.G.S.

Introduction.

The writer spent the period, March 2nd-18th of this year in a tour of inspection of a number of scheelite and wolframite deposits which are at present being actively investigated in the Central Goldfields District of the State. Localities visited included Coolgardie, Londonderry, Higginsville, Norseman, Comet Vale and Westonia. It had been intended also to inspect a small wolfram show at Ora Banda but the project was abandoned owing to car trouble on the road.

The writer took with him the Mineralight Ultra Violet Ray Lamp recently acquired by the Department. The object of this trip was to inspect and assess the possibilities of each deposit, and with the aid of the Mineralight lamp to assist the operating companies wherever possible in their surface and underground prospecting and mining development.

Owing to the sporadic nature of the scheelite distribution in all occurrences, the first aim has proved very difficult of achievement and it was found possible to gain only a very general idea of the scheelite content of the deposits, in some cases due to inability to obtain sufficient precise measurements with the instruments and in the time available, and in others due to lack of sufficient surface exposures or of underground development.

The assistance provided by the Mineralight lamp was very definite and was fully acknowledged by the managements of the operating companies at all centres visited. In this regard the picture, both visual and mental, provided in a few minutes by the action of the ultra-violet light particularly in underground workings, is such as can seldom be obtained even after the closest examination under ordinary light and the most exhaustive sampling involving many hours of labour. Lamping of surface outcrops and dumps also proved of considerable value, giving as it does a much broader and more complete picture of the distribution of the scheelite on a much larger scale and on a rough quantitative as well as qualitative basis. This was particularly the case at Higginsville and Comet Vale, though it is to be admitted that in both these localities the lamp seldom revealed the presence of scheelite on the surface or in dumps at places where it had not already been detected by dish sampling.

As regards the actual technique of lamping, all surface lamping was carried out at night, the darker the night the greater the effective area of illumination by the ultra-violet rays. It was found that in old dumps well washed by rains scheelite particles down to very minute grains could clearly be distinguished under the lamp, but on newly broken surfaces of old dumps and on new dumps only a small percentage of the scheelite present on the surface—mostly coarse fragments—could be activated by the rays. In examining surface soil overlying supposed lines of lode, and also in shallow pits, trenches and costeans it was found necessary to distinguish scheelite fragments from scattered dead leaves of certain shrubs which gave off a slightly fluorescent glow, and from the inherent whiteness of the ubiquitous travertine some of which appears to give a faint phosphorescent afterglow. After a little experience, however, the writer had no difficulty in distinguishing the scheelite under the lamp, the characteristic bluish white glow being very uniform in colour in all deposits investigated. Fresh surfaces of scheelite gave the best illumination, but even highly weathered and hydrated surfaces of scheelite crystals gave a weak fluorescence under strong ultra-violet light.

The underground workings—except for the upper portions of some shafts—were all examined and lamped during day time. It was found essential that all faces to be lamped should be thoroughly washed down—frequently a very difficult procedure in old workings—since not only do the accumulated dust, mud and (frequently) salt, very effectively mask any scheelite which may be present, but scheelite fragments and scheelite dust may often be distributed over barren faces as a result of the firing of a

scheelite-bearing face considerable distances away. Furthermore, the composite machine oils used underground invariably fluoresce fairly strongly, giving a whitish light under the lamp, and it was found necessary to examine insufficiently cleaned faces with great care in order that no small oil spots should be mistaken for scheelite. The strong tendency of scheelite to crush to a fine slime under the impact of explosives was clearly demonstrated on several occasions when partly washed, freshly fired scheelite-bearing faces were found under the lamp to be covered by a fine white fluorescent sludge.

In order to obtain as much experience as possible in quantitative estimations by visual examination of scheelite under ultra-violet rays, the writer carefully inspected and lamped all dumps which had been sampled and assayed for WO_3, at all centres visited. Conclusions to be drawn from these inspections, however, are subject to modification by a number of variable factors, viz., the degree of superficial concentration on old dumps (both sand dumps and ore dumps) by wind and rain erosion, the average grain size of the ore in the dumps, the possible presence of the sometimes associated tungsten mineral wolframite, which does not fluoresce, and the well known tendency of scheelite to slime, and its ability to self concentrate in sands, etc. However, as a result of his observations the writer was able to obtain a limited amount of useful comparative data upon which to base a quantitative estimate of scheelite during lamping.

The Deposits.

Londonderry.

Whilst in the Coolgardie district the opportunity was taken to inspect and lamp a scheelite prospect held by the Coolgardie Scheelite Syndicate. This is situated about one mile from the old tantalite leases at Tantalite Hill, on a bearing slightly east of north, and about two miles south-west of the old Londonderry townsite.

The find consists of a small prospecting shaft sunk to a depth of about 15-18 feet on a narrow quartz vein in schistose epidiorite-amphibolite country. This shaft is situated on the southern slopes of a low hill in undulating country. The quartz vein is about 18 inches to 2 feet in width and where exposed strikes in the direction north 85° east. About 10 feet east-north-east of the shaft are the outcrops of several thin quartz stringers which run in an approximate north-south direction.

About 12 feet south-west of the prospecting shaft is a shallow pot hole less than 8 feet deep. On the north face of this hole is exposed about 15 inches of quartz together with several stringers 1 inch wide. Underfoot the quartz bulges to about 3 feet wide.

The writer was informed that scheelite had been found in the prospecting shaft. To a depth of about 10 feet this shaft had been opened out to about 8 feet by 6 feet, whilst below this it was much smaller. It was claimed that scheelite could be traced over a length of 5-6 feet having an average width of about 8 inches and a maximum of 1 foot. On lamping it was found that there was practically no trace of scheelite on the north-eastern face of the shaft, whilst scheelite fragments, scattered over one thin seam having a maximum width of about 6 inches could be traced in a mixture of quartz and amphibolite stringers on the south-western face. A thin skin containing a little scheelite was disclosed on the north-western wall. The quartz reef appears to dip steeply to the north-west. No scheelite was visible on the floor of the shaft which was covered with rubble. The scheelite concentration in this shaft seemed disappointingly low, being probably less than .5 per cent. over a workable width of (say) 3 feet for the full length exposed. On lamping, small fragments of scheelite were seen to be sporadically scattered through the adjacent quartz dump, which contained no more than about five tons of broken stone.

There was almost no sign under the lamp of the existence of scheelite in the shallow pit south-east of the prospecting shaft, though it is reported that a few fragments have been obtained from here. A small dab of gold was originally found in this hole. The lamp also revealed no trace of scheelite associated with the quartz stringers outcropping to the east-north-east of the shaft.

It was claimed that traces of scheelite had been found associated with quartz along a line extending southwards on the surface for more than 3,000 feet. Using the lamp it was found that occasional specks of scheelite, sometimes associated with quartz floaters were to be seen in one or two places, but there was absolutely no sign of the existence of any connected scheelite lode formation, the amphibolite to the south of the find proving for the most part quite barren.

Higginsville.

Geology and Occurrence.—At the time of the writer's inspection mining development operations were being carried on at the Higginsville Scheelite Mine on G.M.L. 5668, by Norseman Gold Mines, N.L. The mine is situated on the crest of a low ridge running approximately north and south, at about ½ mile south-east of the Higginsville railway siding. The country rock hereabouts is medium grained fibrous actinolitic amphibolite having a rude schistosity, in some places merely incipient and superficial and in others distinctly marked, and trending at all angles from about north 10° east to north 10° west.

Surface workings along the alleged main line of scheelite lode extend over a length of about 400 feet in the direction north 20° east from the main shaft at the southern end of the workings through the No. 1 north shaft which is approximately 100 feet north of the main shaft, to the No. 2 north shaft, about 200 feet further north again. The main shaft and No. 1 north shaft are connected by underground workings, and at some 30 feet north of the latter shaft is a narrow open cut leading downwards into a stope, but northwards of this point the workings consist of a series of shallow potholes, trenches and costeans.

At a little less than 50 feet north of the main shaft a quartz reef which branches to the north-east is exposed in an open-cut. This is a fairly well defined vein averaging about one foot wide and is known as the North-East Branch Lode. It strikes at approximately N. 55° E. and is traceable on the surface for 80-90 feet. A shaft sunk on the line of this lode at about 100 feet from its point of branching with the main lode has been called the No. 1 north-east shaft. There are no further surface indications of the branch lode north or north-east of the No. 1 north-east shaft, although the presence of several costeans and pot holes indicates that a search had been made for its continuation.

The surface workings were first lamped. Several old dumps in the northern and central portions of the main line of workings showed the presence of a fair amount of scheelite fragments, confirming dish samples previously panned by the company. Definite traces of scheelite were also proved in several dumps and in the sands on a lease adjoining the scheelite lease to the north. At a point about 200-230 feet north of the main shaft, and on the east-sloping ground just below the "main lode" line of surface workings was found a fair concentration of detrital scheelite mixed with gravel and loam. This material was in all probability shed from the outcrops of pre-existing scheelite from the crest of the rise in this vicinity and it is possible that some more scheelite veins may be found as a result of further surface prospecting hereabouts.

Scheelite was seen *in situ* in several trenches and one open-cut in the main lode line of workings. Its common occurrence was as thin stringers occasionally associated with a little quartz and in other places almost devoid of quartz, in amphibolite schist country. It was noted also that the country rock was frequently very little oxidised or weathered right up to the surface outcrops. From a superficial examination it appeared that the scheelite was very irregularly distributed through the lode channel and was of a distinctly lenticular habit. A few very insignificant traces of scheelite were found with the aid of the lamp in several pot holes sunk south of the main shaft in localities where scheelite was reported to have been found. Lamping of the current ore dump revealed that except for an occasional specimen stone very little more scheelite could be detected under the ultra violet rays than with the naked eye, and that the *apparent* scheelite content of the ore dump was

no greater than that of the adjoining mullock dump. This was undoubtedly due to the fine rock dust masking ore and mullock alike.

The scheelite lode formation in the main lode has been opened up underground and mined at the southern end over a length of about 150 feet. The main shaft has been sunk to a depth of about 100 feet, whilst levels have been driven at approximately 40 feet and 70 feet. A considerable block of ore has been stoped north of the main shaft above the 70-ft. level, between 25 feet and 120 feet north. A further block has been stoped south of the main shaft for about 50 feet, between about 30 feet and 60 feet, vertical depth.

The lode formation is a white quartz reef. Lamping underground revealed that where found the scheelite usually occurs as marginal stringers or bunches moulded on one side against quartz, and on the other against the amphibolite wall rock. Frequently the stringers could be seen completely enclosed in the amphibolite, but scheelite was seldom found embedded in the wider and more solid portions of the quartz reefs. The scheelite was very irregularly distributed, making any estimate of ore reserves very difficult to obtain. The greater part of the lode formation in the northern end of the 70-ft. level appeared to be barren of scheelite. A short length of what appeared to be fair grade scheelite ore (1·5 per cent.?) is probably still available between the main shaft and about 25 feet north, above the 70-ft. level. Although some massive bunchy scheelite is obtained, under the lamp it appears that the mineral is disseminated in fairly thin stringers and flattened fragments. The lode formation as a whole dips almost vertically or at a very steep angle to the east and during lamping it was observed that, if anything, the scheelite stringers favoured the hanging wall rather than the footwall of the formation.

Very little scheelite was seen in the south end of the workings at the bottom level, but overhead over a length of about 15 feet some scheelite ore remains to be stoped. Scheelite stringers very broken and irregular but more or less continuous in formation were traced in the main shaft from 15 feet to 40 feet down on both north and south faces. There was very little sign of scheelite in the bottom sections of the main shaft.

The No. 1 north-east shaft has been sunk to a depth of about 42 feet on a steep underlay to the south-east, and some driving and stoping has been carried out for a short distance south-westward. The lode formation appears to have cut out a short way north-east of the shaft. The No. 1 north-east shaft workings are not connected underground with the main workings. Lamping revealed fair scheelite values on the hanging wall of the No. 1 north-east shaft between about 10 feet and 42 feet (bottom) suggesting the necessity of taking out further stripping cuts and possibly crosscutting into the hanging wall to test the possible width and extent of the scheelite stringers. It was noticeable that where the quartz formation was large and massive, in the No. 1 north-east workings, it was usually found to be barren of scheelite.

From the lamping of the surface and underground workings on this lease it is obvious that appreciable quantities of scheelite do exist and although in a few places good concentrations of coarsely crystalline scheelite have been found, in general its irregular distribution and often widely disseminated state make selective mining to obtain even up to about ·8-1 per cent. scheelite in the final ore a matter of considerable difficulty. The present company operating this deposit is endeavouring to maintain an average production of about 50 tons per week of ore containing about ·6 per cent. scheelite. In order to carry out any large scale mining for scheelite in the Higginsville district it appears obvious that it would be necessary to perfect a treatment plant capable of successfully concentrating scheelite ore containing at least as low as ·01 per cent. scheelite.

Treatment.—Whilst in the district the writer took the opportunity of inspecting the scheelite treatment plant which is located at the Norseman Gold Mines, N.L's., Norseman Mine at Norseman. The treatment consists of crushing to pass a coarse screen (about one-eighth mesh), the crushed ore then passing direct from the trommels to two Wilfley tables arranged in series. A sample of the residues from the treatment plant was tested under the ultra violet rays. The sample had been sieved through screens of varying mesh from medium-coarse down to very fine. It was found that scheelite could be clearly distinguished in relatively appreciable quantities in all fractions, indicating a distinct loss in treatment. From a purely megascopic examination the writer estimated that the residue contained in the neighbourhood of ·05 per cent. scheelite. It was interesting to note also that, although the quantity of residue contained in each fraction differed slightly, the percentage of scheelite visible in each fraction appeared to be roughly of the same order.

Samples of residues have now been sent to the School of Mines, where it is hoped that with the aid of the Superpanner more quantitative data regarding the scheelite losses from this treatment plant will be obtained.

Comet Vale.

Geology and Occurrence.—The scheelite workings (M.C. 23Z) at Comet Vale are situated on the late G.M.L. 5590Z (5410Z), "King of the Hills," in hilly country immediately west of Lake Goongarrie, and three to three and a half miles east of Comet Vale townsite. The country rock in the vicinity of the lease consists of fairly dense fine grained, usually blocky altered basic lava—now serpentinised basaltic amphibolite which here and there shows a rude schistosity striking nearly east and west. A large white quartz reef has intruded the amphibolites in a composite belt in the central northern portion of the lease. This quartz runs approximately 10° north of due west in a broken line over a length of about 500 feet, and forms the backbone of a sharp ridge which slopes down steeply to the south to a broad gully, and to the north into a short east running gully. The lease is flanked to the north, south-west and south-east by high land. A thin dyke of felspar porphyry intersects the amphibolite-quartz ridge in the centre of the lease, running in an approximate north-south line almost up to the quartz reef where it cuts out abruptly.

The amphibolite in the immediate vicinity of the previously mentioned line of quartz reef, on both its northern and southern sides has been altered to a coarsely crystalline amphibolite (actinolitic) schist. Evidence of movement in the schist along a line of fissuring prior to the intrusion of the quartz can be seen in the presence of small drag folds in the planes of schistosity of the schist lying immediately south of the quartz in several places, and also in the curved and folded legs occasionally emanating from the main quartz body, suggesting intrusion and replacement by the quartz of pre-existing drag folds.

Portions of the composite quartz reef on the eastern half of the ridge have been mined for gold in the past, several adits having been driven into the hill from the east and south-east. The adits extend into stopes, several of which open upwards into open-cuts, and also connect up with a winding drive running a little west of north for about 200 feet.

At about half way along the quartz reef line there is a distinct break of about 50 feet in the reef, the quartz on the western side of this gap apparently having been displaced slightly to the south-westward. The scheelite workings at present being operated are located along a line of schistosity which cuts through the gap in an approximate east-west direction, making an angle of about 25° with the main quartz reef line. These scheelite workings are connected to a long inclined adit, the south adit, running into the hill in the direction of N. 45° E. for a distance of about 110 feet.

As a result of his surface inspections, the writer prepared a rough geological sketch map of the area, fixing the geology and the positions of surface workings by pace and compass traverses. The approximate positions of the underground workings on this map are based on a plan by M. V. Weatherall, kindly loaned the writer by Mr. E. Mundle, of Gold Fields Australian Development, Ltd.

Lamping for scheelite was first carried out over the surface workings. Traces of scheelite seams were seen in several small potholes about 120 feet N.N.W. of the scheelite workings (west shaft) and in a long shallow trench or open-cut extending immediately west of this point. No sign of scheelite was found on the surface between this open-cut and the workings, the slopes here being covered by a thick mantle of quartz boulders and

rubble. Despite the heavy overburden, however, it is probable that did a strong line of scheelite lode connect the present workings with the abovementioned open-cut, some traces at least of scheelite would have been found in the loam on the lower slopes in this vicinity.

About 70 feet further west of the open-cut referred to above, is another trench or open-cut some 20 feet long and eight feet deep on the western slope of the central ridge. Scheelite was reported to have been obtained from this trench in the past. The east and west faces showed about one foot of white quartz, none of which revealed scheelite under the lamp. Traces of scheelite were seen on the northern wall of the trench, however, whilst frequent scheelite specimens were visible in an ajdacent small dump of quartz fragments evidently broken out from the trench.

At some 65 feet to the westward and down the slope from the last trench is the mouth of the west adit, which runs at about N. 25° E. into a hill for about 35 feet, where it branches into two forks each extending a further 20 feet. At about 15 feet from the mouth of the adit the lamp revealed a thin seam of scheelite having maximum width of about two inches associated with stringy quartz in amphibolite schist. A few scattered blebs of scheelite were also located near where the adit drive forked. The exposures in this adit gave little promise of yielding workable supplies of scheelite.

At the writer's suggestion two short costeans were dug at intervals in the country between the two scheelite-bearing open-cuts or trenches described above. No trace of scheelite was found in either of these, on lamping, indicating that the scheelite occurrences along this belt are more or less isolated and do not represent portions of a continuous lode formation.

At about 60 to 70 feet due north of the main scheelite workings is a short line of shafts and surface pot hole running in the general direction of N. 60° W. These workings are on what is known as the north lode which is reported to have been worked for scheelite during the last war. The shafts here were inaccessible but the dumps under the lamp revealed an abundance of scheelite fragments.

No trace of scheelite was found during a brief lamping of the broken surface quartz in the eastern half of the composite quartz reef ridge.

Lamping of the underground workings revealed that the scheelite ore is only sparsely distributed through the lode formation in a disappointingly irregular manner. The workings consist of a rather winding west drive running from the foot of the inclined south adit at a vertical depth of about 50 feet, for about 75 feet to meet the west shaft (vertical), and also an east drive running eastward for about 55 feet. The east shaft (vertical) connects with the east drive at about 20 to 25 feet east of the adit. A crosscut has been driven northwards from near the face of the east drive for a distance of 25 feet and opposite this north crosscut is a short crosscut running south to break through into the old gold workings. Scattered thin seams of scheelite nowhere more than about one inch wide were seen in the back of the west drive at its extreme western end near the west shaft, and a few small crystals were noticed on the south wall about 30 feet west of the adit. The remainder of the west drive appeared quite barren of scheelite. The beginning of the east drive also appeared quite barren overhead except for a strip from about 15 feet west of the east shaft to the shaft itself where some scheelite was visible in the backs of a small leading stope. The average grade of ore in this stope is probably less than one per cent. over a width of 15 inches. Eastward of the east shaft the only scheelite seen was one or two small scattered crystals on the south wall. There was no sign of scheelite in the north crosscut which had been driven out in an attempt to intersect the eastern continuation of the old north lode scheelite formation. Scheelite was visible on both the eastern and western faces of the east shaft almost from the surface down to about 40 feet V.D., in discontinuous lines of stringers. The maximum width of scheelite mineralisation in the shaft is about 18 inches, the average about nine inches. A lamping estimate based on observation alone suggests an average grade of little more than one per cent. scheelite in this section.

It was noticed that the scheelite in this mine was seldom associated with quartz bodies of any size. More commonly it occurs in scattered small crystals or thin stringers enclosed in actinolitic schist, though occasionally scheelite fragments are found moulded upon thin quartz stringers. Nowhere was the scheelite seen in bunches or in large crystalline aggregates. In general it must be understood that the development work carried out in the scheelite workings to date has exposed no appreciable tonnage of available scheelite ore but rather to the contrary has revealed that only relatively very limited quantities of workable ore can be expected from this mine.

The writer was informed that during development good scheelite ore was encountered underfoot along the southern side of the east drive from a short distance past the adit to a point about 10 feet east of the east shaft, but the lamp failed to reveal any sign of scheelite in the muddy floor. From the general tenor of the ore elsewhere in this part of the mine, it is doubtful if any better average grade would be obtainable underfoot. However, the possibility of an improved scheelite value at depth should certainly be tested by means of a winze sunk on the lode formation in the east drive.

In passing it may be mentioned here that on the flat low ground forming the north-eastern corner of the lease are the sands and residues dumps from the old scheelite treatment plant operated during the last war. The profiles of several portions of one dump were lamped and it was interesting to note that an appreciable quantity of fine ground scheelite could be seen in roughly banded layers throughout the dump—in places concentrations up to about five per cent. or more.

Treatment.—Mining development operations at Comet Vale have been carried out by Goldfields Australian Development Company Ltd., which was responsible for the sinking of the west and east shaft and for the driving on the east and west drives and the north crosscut. Two parcels of ore obtained during this development work have already been treated at the State Battery, Coolgardie. These two crushings were of 50 tons and about 100 tons respectively. A third crushing of 30 tons had been railed to Coolgardie a few days before the writer's arrival at Comet Vale. The ore for this last crushing was obtained from the small leading stope off the east shaft on the east drive and is probably more representative of the ore to be obtained by selective mining than the first two crushings which were obtained solely from development work. About 150 tons of further development ore remains in dumps on the lease.

The figures for the treatment of the first two parcels only are so far available. The following were supplied through the courtesy of the Superintendent of the State Batteries:—

Parcel.	Weight of Ore.	Weight of Concentrates.	WO_3 Content (Calculated from Assay).	Per cent. WO_3 Recovered.
	tons.	lbs.	lbs.	
1	50	440	168	·15
2	97	266	166	·076
Total ...	147	706	334	·102

From these figures it can be seen that, even allowing for a possibly rather low percentage recovery from the treatment plant at the Coolgardie Battery, the head value of the scheelite ore in these two parcels must have been fairly low—well under 5 per cent. scheelite.

Westonia.

Towards the close of his tour the writer made a brief inspection of the property of Edna May (W.A.) Amalgamated Gold Mines at Westonia. Wolframite is reputed to have occurred in the past in relative abundance through the ore bodies of this mine and the present company has recently been engaged in sampling and testing some of the old sands dumps with the object of deciding on the possibility of re-treating these for recovery of their tungsten content. Sample analyses

had indicated that the two dumps on the western side of the leases contained appreciable quantities of tungsten, and experimental work is at the present time being carried out at the School of Mines, Kalgoorlie, to work out various technical details of a practicable treatment process.

An evening was spent in lamping the various sands dumps on the leases. In general the ultra-violet rays gave very useful confirmation of the sampling results and indicated furthermore that a considerable proportion of the tungsten present in these dumps occurs as scheelite as well as wolframite. The best concentrations of scheelite were seen in the two dumps on the western sides of the leases as mentioned above, whilst a drain running at the foot of the principal dump was found to contain a high concentration of both scheelite and wolframite. Scheelite was usually found to be relatively abundant amongst the coarser residues in the vicinity of the original spillways in many of the old dumps.

The geology of the Edna May mining centre was recently described by Mr. R. S. Matheson.* Briefly, the gold bearing lodes here consist of a complex series of quartz reefs intruded in an elliptical belt forming the contact between greenstone (amphibolite) and a series of granitic replacement gneisses.

A profitable day was spent in lamping various portions of the old and new underground workings. Finely disseminated scheelite was located in a number of places where tungsten ore (originally thought to be principally wolframite) had been known to occur in the past. In the old workings especially, the results of the lamping were of course considerably impaired by the mud and dust covering everything, but some good examples of what is probably the typical occurrence of scheelite in the mine were seen in portions of the new workings on the No. 6 level hanging wall section of the south reef and on the No. 5 level (south reef) in the Central Lease. It was noticeable that the scheelite occurred principally in the wall rock immediately adjoining the quartz reef rather than in the reef itself. The most favourable host rock appeared to be a rather streaky type of quartz biotite gneiss which may be either coarsely or finely banded. The scheelite occurs either in small seamlets or in scattered groups of individual fragments or disseminated tiny grains. Seldom was scheelite seen in any quantity in the blocky reef quartz itself.

Scheelite evidently occurs in many cases associated with and replacing wolframite. On examining individual specimens of apparently massive homogeneous crystalline wolframite, from various localities underground, under the ultra-violet rays it was found that in all specimens the wolframite was in course of replacement, to a varying degree, by granular aggregates of fine crystalline scheelite.

From the underground lamping it was clear not only that the scheelite (and presumably wolframite) was distributed very sporadically through the mine, but that the maximum concentrations of tungsten ore present in any part was far too low to permit of any economic mining for tungsten alone. However, providing a suitably efficient extraction process is obtained, some useful quantities of tungsten ore should be available from the two old sands dumps mentioned above (some 60,000 tons of sands in all). Furthermore, if the company were to carry out its present intention, on the erection of suitable plant, of treating the current run of ore residues before passing them out to the dump, it should be possible to increase the tungsten head value of the ore at little extra cost by judicious mining here and there of some additional selected wall rock.

In this way a small but no doubt useful production of an extremely important and valuable, in fact, essential, war-time mineral could probably be maintained for a considerable time to come.

* Reports on Some Mining Groups in the Yilgarn-Goldfield—Edna May Group. Annual Progress Report Geol. Survey, W.A., 1939, pp. 18-22.

Conclusions.

As a result of his inspections of the scheelite deposits at Londonderry, Higginsville, Comet Vale and Westonia described in the preceding pages, the writer has drawn the following conclusions:—

(1) The Londonderry occurrence is more of mineralogical interest than of economic importance, there being no indication in the present exposures that any ore body of workable size exists.

(2) At Comet Vale development has revealed limited quantities of scheelite sporadically distributed in a rather poorly defined ore body. Although there are no geological reasons why the scheelite should not exist at least in similar grade at depths greater than those so far explored, the possibilities of other than a very small scale of production appear rather remote under existing conditions.

(3) The Higginsville scheelite mine contains scattered lenses of fairly good grade scheelite and other sections in which disseminated low grade scheelite is available. Development operations so far carried out indicate the customary sporadic distribution of this ore, however, which adds considerably to the difficulties of economical mining. The ore formation appears to continue strongly in depth and further lenses should be met with below the existing bottom level.

(4) Lamping of the sands dumps and parts of the underground workings of the Edna May Amalgamated Gold Mines, at Westonia, has confirmed sampling results indicating fair concentration of scheelite and wolframite in several of the dumps; and has provided some valuable information regarding the general distribution of scheelite in the ore bodies of the mine itself.

(5) The remarkable value of the Mineralight lamp in investigations of this nature, and the tremendous advantage of its assistance over the old and laborious "blind stabbing" methods of dish sampling in scheelite mining were clearly demonstrated during the course of this tour.

A LEPIDOLITE DEPOSIT NEAR TANTALITE HILL, LONDONDERRY, COOLGARDIE, G.F.

By K. R. Miles, D.Sc., F.G.S.

During a visit to the district in March, 1943, the writer made a search for a pegmatite dyke thought to contain appreciable quantities of the lithium bearing mica lepidolite in the vicinity of the tantalite leases at Tantalite Hill, south-west of Londonderry. The aim of this search was to investigate the possibilities of the lepidolite deposit as a source of lithium, for which there was reported a keen war-time demand. The pegmatite dyke was duly located within the boundaries of the late M.L. 86, "Tantalite Ridge" (since taken out as M.L. 93), which forms the south-eastern member of a group of mineral leases originally pegged for tantalite, around the site of the original tantalite find known as Mercer's Find and later called Tantalite Hill, which lies some three miles W.S.W. of the old Londonderry railway siding.

Geology and Occurrence.

The country hereabouts consists principally of greenstone—medium-fine and coarser grained amphibolite and amphibolite schists having a general north-south trend and occasionally capped by ferruginous laterite. The country is undulating and moderately well timbered. The pegmatite dyke in question runs in a direction approximately N. 30° E., intruding the greenstone and is probably about 100-200 feet wide, both the eastern and western boundaries being obscured by overlying soil and rubble. The dyke is either rather irregular in composition, containing segregated areas of quartz, lepidolite-bearing felspar pegmatite and lepidolite lenses, or is a

composite one in which masses of white quartz have apparently been later intruded into the original pegmatite-filled fissure. Outcrops over the full length and breadth of the dyke are very irregular and poor, a great proportion of the dyke being hidden under soil and rubble over-burden.

Four lenses of massive scaly lepidolite were located within this pegmatite dyke-zone. The largest lens (No. 1) lies approximately four chains on a bearing N. 60° W. from the south-east corner peg of M.L. 86. This portion of the dyke lies on the northern side of a gentle slope which rises gradually south-westwards to a ridge whose crest is formed by a low outcrop of white quartz. Northwards the ground flattens to a gentle rubble covered slope.

The lepidolite in these lenses consists of masses of interlocking scales averaging .05-.1 inches in diameter. The lenses are irregular bodies, lenticular, and more or less elongated in the main direction of the dyke. Their margins are usually seen to be moulded upon clear white quartz. Their general distribution was fixed by pace and compass traverses as shown on the accompanying sketch plan, plotted on a scale of 40 feet to an inch.

The main lepidolite lens (No. 1) is the most southerly of the group. It measures approximately 33 feet in length, has a maximum width of about 9 feet and tapers out to thin stringers both to the north and the south. No. 2 lens is situated in the line of No. 1 lens about 12 feet further north. It has a maximum length of about 10 feet and average width of not more than 18 inches. Some 20 to 25 feet east of No. 1 lens and running the direction north 50° east is another thin broken lens of massive lepidolite (No. 3) extending over a length of about 16 feet with an average width of about 18 inches. No. 4 lens also rather irregular in width, lies about 55 feet due north of No. 1 lens and runs in the direction north 40° east for about 20 feet. Its average width is probably slightly less than 18 inches.

Tonnage.

Assuming then that lens No. 1 has an average width of about five feet (a generous estimate), then the total area of lepidolite exposed at the surface in the four lenses would amount to approximately 234 square feet. Allowing for the lepidolite ore to weight at the rate of 15 cubic feet/ton, then the tonnage of lepidolite ore available would be approximately 15½ tons per vertical foot. Now it is to be expected by the very nature of the occurrence that these lepidolite bodies will be lenticular in depth as in length. Assuming that they extend to depths equal to their lengths, before lensing out or giving way to further lenses, it would be a generous estimate to concede an average depth of 30 feet for the deposits. Based on a average depth of 30 feet, the total tonnage available from surface indications would then be approximately 450 tons. This may be considered a maximum figure. Loose boulder and rubble of lepidolite scattered over the ground surface might yield a further five or six tons of ore.

Grade.

In order to determine the grade of this lepidolite ore a representative sample of chips from the four lenses were collected by the writer and these were submitted to the Government Mineralogist and Analyst for an analysis of the lithium content. Although the chips appeared to consist almost entirely of interlocking lepidolite flakes, it is probable that the ore contains a certain amount—possibly up to 10 per cent.—of interstitial granular quartz.

The lithium analysis proved the ore to be of low grade, containing only 3·87 per cent. Li_2O. This indicates a fair percentage of impurity in the original ore as pure lepidolite usually contains from 4·5-6·2 per cent. Li_2O. There is at the present time a steady demand for lithium ore, the American price being A16s. 11½d. per long ton unit of contained Li_2O. Buyers have stipulated a minimum grade of six per cent. Li_2O however, which appears to rule out all possibility of utilising the above described lepidolite deposit under existing market conditions.

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Trench C. (Co-ords 17—M).

This trench strikes N. 15° W., is about 44 feet long, and has a maximum depth of 12 feet at the north-west face. The mineralised zone has an average width of about eight feet six inches, and extends about 38 feet back from the face, where it cuts out rather suddenly. No defined quartz vein was seen in this trench, but there are indications that a network of quartz veinlets occurred. Molybdenite is reported to have been picked up on the strike 50 feet beyond the north-west face, but the lack of surface indications suggests that the mineralised zone is not continuous between these two points.

The assay results of samples collected from this trench by the Big Bill Mines Ltd. are given below:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample from N.W. face	5 ft. 9 in.	6.99
Horizontal sample 37 feet from N.W. face	6 ft. 9 in.	1.91

Trench D. (Co-ords 17—N.).

This trench is V shaped, and its apex faces north. The south-eastern branch is 38 feet long, and the south-western branch is 28 feet long. The trench has been excavated to a maximum depth of eight feet from the surface.

Three narrow quartz veins, which strike about N. 15° W. and dip vertically, were intersected in this trench.

In the south-eastern branch a quartz vein, varying from 18 inches to 10 inches wide, is exposed. Molybdenite occurs erratically within the vein and as seams along its walls. There has been practically no mineralisation of the adjacent country. The vein has also been prospected in trenches to the north and south, but the assay results are not encouraging.

Another quartz vein occurs on the north-west wall of the south-west branch, about eight feet west of the vein described above. The vein is about 10 inches wide and mineralisation extends over 18 inches, but the vein is a short lens which cuts out before reaching the south-east wall.

About six feet further west, another quartz vein about six inches wide occurs, and the adjacent country, for a few inches on both sides of it, is impregnated with molybdenite. The maximum width of the mineralised zone is 15 inches.

The assay results of samples collected from this trench by the Big Bell Mines Ltd. are given below:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample face of S.E. branch	4 ft.	0.28
Horizontal sample N.W. wall of S.W. branch 3 ft. to 8 ft. from S.W. face ..	5 ft.	0.62
Horizontal sample N.W. wall of S.W. branch 8ft. to 13 ft. from S.W. face ..	5 ft.	0.31
Horizontal sample S.E. wall of S.W. branch 0 ft. to 3 ft. from S.W. face	3 ft.	0.41

Trench E. (Co-ords 17—O to P).

This trench strikes N. 47° W., is about 22 feet long and has a maximum depth of 10 feet.

A two inch quartz veinlet with a thin seam of molybdenite on its west wall is exposed for a few feet in the floor of this trench. Mineralisation of the wall rock is confined to the eastern side of the veinlet and does not exceed 14 inches in width. In the north-west face the mineralised zone is only about six inches wide and does not extend to the floor.

The assay results of samples collected from this trench by the Big Bell Mines, Ltd. are given below:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample from N.W. face	3 ft. 6 in.	0.57
Floor sample	6 in.	High Grade

North-West Adit Workings.

The adit was inaccessible at the time of the writer's inspection, due to the presence of water and foul air. At the surface, however, vugs and occasional flakes of molybdenite were noted in quartz veins for about two chains east of the mouth of the adit.

In the report of the Big Bell Mines Ltd., these workings are described as follows:—

> "A trench was cut in the side of the hill to form an open cut 79 feet long, some six to 10 feet wide, and of height from zero to 34 feet. At the floor of the 34ft. face an adit was driven for a distance of 49 feet. Near to and in the mouth of the adit a winze was sunk to a depth of five feet and has formed a soak for water. The total tonnage excavated (all by hand drilling) is in the order of 1,170 tons, of which 690 tons was overburden, and 480 tons of stone carrying some molybdenite. Most of the tonnage lies in dumps near the entrance to the open cut.
>
> The whole of the workings are in granite-carrying small quartz and pegmatitic quartz veins. A dolerite dyke strikes across the open cut close to the mouth of the adit, and maintains a width of about four inches from floor to surface, a distance of over 30 feet."

The following assay results are reported to have been obtained from samples collected during this examination:—

Sample.	Sample Width.	%MoS_2.
Horizontal sample from face of adit	3 ft. 9 in.	0.83
Horizontal sample from roof near shallow winze ..	4 ft. 6 in.	1.43

SUMMARY AND CONCLUSIONS.

An inspection of the principal workings at Mt. Mulgine showed that five trenches and the adit contained molybdenite in sufficient quantities to warrant a detailed examination. The molybdenite is associated with quartz veins, and generally occurs as thin seams along their margins or as scattered flakes and rosette-like forms in the adjacent granitic wall rock. Molybdenite is occasionally scattered through the quartz veins themselves. The floors of the trenches and the adit could not be examined, but the observations made were sufficient to show that the marginal seams of molybdenite are erratic in occurrence, and the width of impregnation of the wall rock very variable. Mineralisation has been erratic horizontally, and it is reasonable to expect it to be similar vertically.

The comparison between the quantity of material mined and the production, which is given below, is supporting evidence of erratic mineralisation, and it is obvious that mining at this centre, as a whole, has been carried out at some considerable loss.

The total production from this centre is 78 tons of molybdenite ore valued at £865, and it was obtained during the period 1917 to 1922. If the 1918 price of molybdenite, which was £5 per unit, is assumed to have been obtained for the whole of the production, then the average value of the ore was about 2¼ per cent. MoS_2. The 78 tons of molybdenite ore have been recovered from workings which, according to the Big Bell Mines Ltd., yielded 4,000 tons of rock. Admittedly some of the workings are of a prospecting nature, but the fact can not be overlooked that the marketable ore constituted only about two per cent. of the total amount of material mined at this centre. Making an allowance for dead work and assuming that one per cent. molybdenite ore could be treated profitably on the spot, it is not unreasonable to adopt a recovery value of 20 per cent. for this grade of ore in any large project.

The five trenches and adit in question would yield about 120 tons of material per vertical foot, from which, if the above recovery value of 20 per cent. is accepted, 24 tons of one per cent. molybdenite ore could be recovered. The prospects are, therefore, not encouraging.

In conclusion, the writer is of the opinion that while small parcels of ore averaging about two per cent. MoS_2 may be obtained from these deposits by selective mining, due to erratic mineralisation it is unlikely that sufficient ore of suitable grade could be developed to justify any large scale project.

BENTONITE AT MARCHAGEE, WESTERN AUSTRALIA.

Interim Report.

By K. R. Miles, D.Sc., F.G.S.

In August, 1943, a very brief inspection was made of a clay deposit claimed to contain high grade colloidal clay (bentonite) near Marchagee on the Midland Railway line, some 150 miles north of Perth. The clay deposits occur in several clay pans located about nine miles west of Marchagee Siding. The country in the immediate vicinity of the clay pans is a sand plain covered with low scrub vegetation, and sprinkled with boulders of travertinous limestone. Scattered high points on this sand plain are capped by ferruginous gravel.

The principal deposit, located on M.C. 258H on the south-west corner of Victoria Loc. 5866 consists of a long narrow, irregular shaped clay pan, running in the approximate direction N. 35° W. This clay has an average depth of two to three feet and bottoms on sand. It consists of A. Top Clay, 9-10 inches thick—a greyish clay which is claimed to be high grade bentonite grading into B. Middle Clay (transition layer)—of highly gypseous clay (about six inches) which grades downward to C. Bottom Clay, a fawn-brown coloured clay average about 15 inches, very similar in general appearance to the Top Clay but claimed to have very inferior colloidal properties. All three layers, but particularly the top and bottom, are plentifully sprinkled with fragments of travertine.

For purposes of computation the clay deposit can be taken as approximately 25 chains long by one chain wide. Assuming that the average thickness of Top Clay is nine inches then the deposit contains a little over 3,000 tons of high grade bentonite, on a conservative estimate. Should the Bottom Clay on further testing prove to be of commercial importance then, assuming an average thickness of 12 inches of pure material, this would yield a further 4,000 tons of bentonite.

Samples of the different varieties of clay from this deposit have been sent to the laboratories of the C.S.I.R., Melbourne, for further testing in connection with the Foundry Sands Investigation.

Some 12 to 15 chains south-east of M.C. 258H is a small shallow clay pan covering less than a quarter of an acre. At the time of inspection this pan was rather wet but a sample hole revealed a surface layer about 12 inches deep of clean clay underlain by gypseous material. Should this type of material prove to be a useful colloidal clay it is estimated that this deposit may contain a maximum of about 400 tons of bentonite.

M.C. 259H on Victoria Loc. 7308 lies about 1½ miles south-east of M.C. 258H. This contains a clay pan which at the time of inspection was covered with water and could not be sampled. The clay pan covers an area of about 1½ acres or more. It is claimed that the top four inches of clay on this deposit is useless as colloidal clay but that beneath this is a layer, about 12 inches thick, of fair grade bentonite, underlain by a hard layer of ferruginous cement. Assuming that the overall average thickness of workable bentonite is 12 inches in this deposit, it will contain approximately 2,500 tons.

The above are the only known deposits of commercial bentonite in Western Australia, amounting to a possible total of about 10,000 tons of clay whose quality and properties have yet to be checked by thorough testing of plasticity and colloidal properties. Considerable tracts of country geologically and physiographically similar to that of Marchagee can be found in this and adjacent districts, however, and it is possible that other similar bentonite bearing clay pans will yet be located.

NOTES ON A SALT DEPOSIT NEAR WYALKATCHEM, S.W. DIV.

By K. R. Miles, D.Sc., F.G.S.

During his return to Perth from an inspection of salt lakes in the Campion district on June 15th, 1943, the writer took the opportunity of making a brief inspection of a small lake salt deposit approximately nine miles south-south-west of Wyalkatchem townsite. This lake, which is approximately circular, covers an area of about six to seven acres, lies near Bulagen Spring on Reserve ↑ 21221, about 15 to 20 chains south-east of the south-east corner of Avon Loc. 17135 (Lands litho 33/80).

Portion of this lake is at present leased by a Mr. Duffeld, who is producing salt to fulfil Army contracts. The lake occurs in a shallow depression in yellow sand plain country. At the time of inspection the lake was covered with water to a depth of about 11 inches in the centre. This was stated to be about four inches above the water level of last month, due to recent heavy rains. Little water is said to enter this lake from surface drainage, the increase being largely produced by underground seepage. Measurement of the salt concentration in the water by hygrometer indicated 65 to 70% NaCl at the surface.

At the time of inspection the salt layer being worked was approximately 2-2½ inches thick, consisting of clean well crystallised halite overlaying a thin crust (half to one inch thick) of rather dirty salt, beneath which is a zone of gypseous mud. This lower salt layer is the product of crystallisation of an earlier season and it serves to seal off the impure gypsum-bearing brines below. Care is taken not to break this layer and to gather only the clean salt which is continually forming upon its upper surface. By this means Mr. Duffeld claims to be able to obtain a uniformly clean product consistently free from gypsum and other chemical impurities.

Plant on the lease includes a small mill which is run by a truck engine driven by producer gas. Salt stacked on the bank amounts to several hundred tons. It is claimed that two men operating this plant can produce and bag between 1½ and 2 tons of salt per day. Mr. Duffeld considers that with additional plant a steady production of about 1,500 tons per annum could be maintained from this deposit for a number of years. Samples of the crude salt, crude washed salt and the coarsely ground final product, were collected for purposes of departmental reference.

NOTES ON THE SALT LAKES—CAMPION DISTRICT.

By K. R. Miles, D.Sc., F.G.S.

This district is experiencing its wettest season for many years. Very heavy falls were recorded in the early months of this year (1943), and there have been periodic soaking rains throughout the last six months. Most of the lakes are filled with water. It has, furthermore, been reported that the main chain of lakes extending from Yellowdine and Southern Cross northwards through Lakes Seabrook and Koorkoordine, respectively, to Lake Deborah and thence south-westwards through Warrachuppin, Lake Brown to Hines Hill, Baandee and towards the Avon River south of Beverley, have for a short time been more or less connected by flowing water. No salt was seen in any of the lakes visited during the recent inspection carried out between the 9th and 17th of June, 1943.

South Lake Campion.

The site of an old salt lease, 1564/152, is a small lake lying just west of the Campion-Merredin road, about five miles south of the Alunite works at the new town-

site of Chandler. This lake is in the strip of country connecting the Lake Campion lake series with the eastern end of Lake Brown. (See plan.) It is about 30 chains long by 20 chains wide and was three parts filled with samphire, the remainder being covered with water. The total area available for salt catchment is small. On the eastern side the main road is a long, narrow, curved arm of lake running north and south, about 30 chains wide and probably near a mile long. This was covered with water. No salt was seen hereabouts but seed gypsum was plentiful on the western shore line.

Lake Brown.

Salt is reputed to have been obtained in the past from several portions of Lake Brown, particularly in the south-eastern corner, and towards the centre of the main body of the lake.

The probable site of one old salt lease, 1572/152, in the south-eastern end of the Lake Brown chain, is a small, circular lake about 12 chains east of the road and three-quarters of a mile south of the narrow causeway crossing, which lies some seven miles south-west of Chandler. This lake is about 20 chains in diameter, and at the time of inspection was mostly covered with water to a maximum depth of about 4½ inches. No salt existed on the floor of the lake, which consists of red clay, underlain by whitish clay containing scattered crystals of gypsum. A sample (No. 1) of the water was collected from the centre of this lake.

About a quarter of a mile north of this circular lake is the southern shore of the main arm of Lake Brown east of the causeway. This was covered with water and extended northwards for over a mile, and was about half a mile wide. A sample of water (No. 2) was collected from a point about half a mile south of the causeway and 10 chains east of the western shore. The water here was about 9½ inches deep and the floor of the lake a blue-grey mud.

The main body of Lake Brown itself was seen to be covered with water. Some salt is reputed to have been obtained from somewhere near the central portion of this lake, a mile or more south-east of the main Lake Brown-Nungarin road crossing. No detailed inspection was made of this part of the lake and no water samples collected, owing to its general inaccessibility because of the water logged condition of the surrounding ground.

An isolated pear-shaped stretch of lake lying west of the road and about one to one and a half miles north of the narrow causeway mentioned above is reputed to have been worked for salt in the past. The bulk of this lake appears to be a silted-up samphire-covered flat containing narrow water-filled channels. No salt was seen, but the eastern shores were plentifully sprinkled with seed gypsum. No water samples were taken.

Warrachuppin Lakes.

It is not known if salt has been collected from these in past years. The main lake is about 1½ miles east of Warrachuppin siding and just north of the railway line. It is flanked on the western end by a large granite rock (trig. hill). It was covered with water, a sample of which (No. 4) was taken from about five chains north of the shore where it was 10 inches deep. No salt or gypsum was seen. It is probable that, owing to the heavy run off of fresh rain water from the rock into this lake, the salt concentration may be lower than elsewhere. Other smaller lakes to the south of the railway line were water-filled and showed no signs of salt.

Baladjie.

Inspection of the western end of the Lake Deborah chain at about 1½ miles due north of Baladjie siding showed that the lake was here completely filled with water over its entire expanse. A sample (No. 3) was collected at about 15 chains north of the southern shore where the water was 11-12 inches deep. The floor of the lake consists of fine red mud, underlain at a few inches by a bluish puggy clay containing thin sandy lenses and thickly scattered with flat disc-shaped crystals (often showing penetration twins) of gypsum. No salt was seen.

SCHEELITE DEPOSITS IN THE CENTRAL GOLDFIELDS, WESTERN AUSTRALIA.

By K. R. Miles, D.Sc., F.G.S.

Introduction.

The writer spent the period, March 2nd-18th of this year in a tour of inspection of a number of scheelite and wolframite deposits which are at present being actively investigated in the Central Goldfields District of the State. Localities visited included Coolgardie, Londonderry, Higginsville, Norseman, Comet Vale and Westonia. It had been intended also to inspect a small wolfram show at Ora Banda but the project was abandoned owing to car trouble on the road.

The writer took with him the Mineralight Ultra Violet Ray Lamp recently acquired by the Department. The object of this trip was to inspect and assess the possibilities of each deposit, and with the aid of the Mineralight lamp to assist the operating companies wherever possible in their surface and underground prospecting and mining development.

Owing to the sporadic nature of the scheelite distribution in all occurrences, the first aim has proved very difficult of achievement and it was found possible to gain only a very general idea of the scheelite content of the deposits, in some cases due to inability to obtain sufficient precise measurements with the instruments and in the time available, and in others due to lack of sufficient surface exposures or of underground development.

The assistance provided by the Mineralight lamp was very definite and was fully acknowledged by the managements of the operating companies at all centres visited. In this regard the picture, both visual and mental, provided in a few minutes by the action of the ultra-violet light particularly in underground workings, is such as can seldom be obtained even after the closest examination under ordinary light and the most exhaustive sampling involving many hours of labour. Lamping of surface outcrops and dumps also proved of considerable value, giving as it does a much broader and more complete picture of the distribution of the scheelite on a much larger scale and on a rough quantitative as well as qualitative basis. This was particularly the case at Higginsville and Comet Vale, though it is to be admitted that in both these localities the lamp seldom revealed the presence of scheelite on the surface or in dumps at places where it had not already been detected by dish sampling.

As regards the actual technique of lamping, all surface lamping was carried out at night, the darker the night the greater the effective area of illumination by the ultra-violet rays. It was found that in old dumps well washed by rains scheelite particles down to very minute grains could clearly be distinguished under the lamp, but on newly broken surfaces of old dumps and on new dumps only a small percentage of the scheelite present on the surface—mostly coarse fragments—could be activated by the rays. In examining surface soil overlying supposed lines of lode, and also in shallow pits, trenches and costeans it was found necessary to distinguish scheelite fragments from scattered dead leaves of certain shrubs which gave off a slightly fluorescent glow, and from the inherent whiteness of the ubiquitous travertine some of which appears to give a faint phosphorescent afterglow. After a little experience, however, the writer had no difficulty in distinguishing the scheelite under the lamp, the characteristic bluish white glow being very uniform in colour in all deposits investigated. Fresh surfaces of scheelite gave the best illumination, but even highly weathered and hydrated surfaces of scheelite crystals gave a weak fluorescence under strong ultra-violet light.

The underground workings—except for the upper portions of some shafts—were all examined and lamped during day time. It was found essential that all faces to be lamped should be thoroughly washed down—frequently a very difficult procedure in old workings—since not only do the accumulated dust, mud and (frequently) salt, very effectively mask any scheelite which may be present, but scheelite fragments and scheelite dust may often be distributed over barren faces as a result of the firing of a

scheelite-bearing face considerable distances away. Furthermore, the composite machine oils used underground invariably fluoresce fairly strongly, giving a whitish light under the lamp, and it was found necessary to examine insufficiently cleaned faces with great care in order that no small oil spots should be mistaken for scheelite. The strong tendency of scheelite to crush to a fine slime under the impact of explosives was clearly demonstrated on several occasions when partly washed, freshly fired scheelite-bearing faces were found under the lamp to be covered by a fine white fluorescent sludge.

In order to obtain as much experience as possible in quantitative estimations by visual examination of scheelite under ultra-violet rays, the writer carefully inspected and lamped all dumps which had been sampled and assayed for WO_3, at all centres visited. Conclusions to be drawn from these inspections, however, are subject to modification by a number of variable factors, viz., the degree of superficial concentration on old dumps (both sand dumps and ore dumps) by wind and rain erosion, the average grain size of the ore in the dumps, the possible presence of the sometimes associated tungsten mineral wolframite, which does not fluoresce, and the well known tendency of scheelite to slime, and its ability to self concentrate in sands, etc. However, as a result of his observations the writer was able to obtain a limited amount of useful comparative data upon which to base a quantitative estimate of scheelite during lamping.

The Deposits.

Londonderry.

Whilst in the Coolgardie district the opportunity was taken to inspect and lamp a scheelite prospect held by the Coolgardie Scheelite Syndicate. This is situated about one mile from the old tantalite leases at Tantalite Hill, on a bearing slightly east of north, and about two miles south-west of the old Londonderry townsite.

The find consists of a small prospecting shaft sunk to a depth of about 15-18 feet on a narrow quartz vein in schistose epidiorite-amphibolite country. This shaft is situated on the southern slopes of a low hill in undulating country. The quartz vein is about 18 inches to 2 feet in width and where exposed strikes in the direction north 85° east. About 10 feet east-north-east of the shaft are the outcrops of several thin quartz stringers which run in an approximate north-south direction.

About 12 feet south-west of the prospecting shaft is a shallow pot hole less than 8 feet deep. On the north face of this hole is exposed about 15 inches of quartz together with several stringers 1 inch wide. Underfoot the quartz bulges to about 3 feet wide.

The writer was informed that scheelite had been found in the prospecting shaft. To a depth of about 10 feet this shaft had been opened out to about 8 feet by 6 feet, whilst below this it was much smaller. It was claimed that scheelite could be traced over a length of 5-6 feet having an average width of about 8 inches and a maximum of 1 foot. On lamping it was found that there was practically no trace of scheelite on the north-eastern face of the shaft, whilst scheelite fragments, scattered over one thin seam having a maximum width of about 6 inches could be traced in a mixture of quartz and amphibolite stringers on the south-western face. A thin skin containing a little scheelite was disclosed on the north-western wall. The quartz reef appears to dip steeply to the north-west. No scheelite was visible on the floor of the shaft which was covered with rubble. The scheelite concentration in this shaft seemed disappointingly low, being probably less than .5 per cent. over a workable width of (say) 3 feet for the full length exposed. On lamping, small fragments of scheelite were seen to be sporadically scattered through the adjacent quartz dump, which contained no more than about five tons of broken stone.

There was almost no sign under the lamp of the existence of scheelite in the shallow pit south-east of the prospecting shaft, though it is reported that a few fragments have been obtained from here. A small dab of gold was originally found in this hole. The lamp also revealed no trace of scheelite associated with the quartz stringers outcropping to the east-north-east of the shaft.

It was claimed that traces of scheelite had been found associated with quartz along a line extending southwards on the surface for more than 3,000 feet. Using the lamp it was found that occasional specks of scheelite, sometimes associated with quartz floaters were to be seen in one or two places, but there was absolutely no sign of the existence of any connected scheelite lode formation, the amphibolite to the south of the find proving for the most part quite barren.

Higginsville.

Geology and Occurrence.—At the time of the writer's inspection mining development operations were being carried on at the Higginsville Scheelite Mine on G.M.L. 5668, by Norseman Gold Mines, N.L. The mine is situated on the crest of a low ridge running approximately north and south, at about ½ mile south-east of the Higginsville railway siding. The country rock hereabouts is medium grained fibrous actinolitic amphibolite having a rude schistosity, in some places merely incipient and superficial and in others distinctly marked, and trending at all angles from about north 10° east to north 10° west.

Surface workings along the alleged main line of scheelite lode extend over a length of about 400 feet in the direction north 20° east from the main shaft at the southern end of the workings through the No. 1 north shaft which is approximately 100 feet north of the main shaft, to the No. 2 north shaft, about 200 feet further north again. The main shaft and No. 1 north shaft are connected by underground workings, and at some 30 feet north of the latter shaft is a narrow open cut leading downwards into a stope, but northwards of this point the workings consist of a series of shallow potholes, trenches and costeans.

At a little less than 50 feet north of the main shaft a quartz reef which branches to the north-east is exposed in an open-cut. This is a fairly well defined vein averaging about one foot wide and is known as the North-East Branch Lode. It strikes at approximately N. 55° E. and is traceable on the surface for 80-90 feet. A shaft sunk on the line of this lode at about 100 feet from its point of branching with the main lode has been called the No. 1 north-east shaft. There are no further surface indications of the branch lode north or north-east of the No. 1 north-east shaft, although the presence of several costeans and pot holes indicates that a search had been made for its continuation.

The surface workings were first lamped. Several old dumps in the northern and central portions of the main line of workings showed the presence of a fair amount of scheelite fragments, confirming dish samples previously panned by the company. Definite traces of scheelite were also proved in several dumps and in the sands on a lease adjoining the scheelite lease to the north. At a point about 200-230 feet north of the main shaft, and on the east-sloping ground just below the "main lode" line of surface workings was found a fair concentration of detrital scheelite mixed with gravel and loam. This material was in all probability shed from the outcrops of pre-existing scheelite from the crest of the rise in this vicinity and it is possible that some more scheelite veins may be found as a result of further surface prospecting hereabouts.

Scheelite was seen *in situ* in several trenches and one open-cut in the main lode line of workings. Its common occurrence was as thin stringers occasionally associated with a little quartz and in other places almost devoid of quartz, in amphibolite schist country. It was noted also that the country rock was frequently very little oxidised or weathered right up to the surface outcrops. From a superficial examination it appeared that the scheelite was very irregularly distributed through the lode channel and was of a distinctly lenticular habit. A few very insignificant traces of scheelite were found with the aid of the lamp in several pot holes sunk south of the main shaft in localities where scheelite was reported to have been found. Lamping of the current ore dump revealed that except for an occasional specimen stone very little more scheelite could be detected under the ultra violet rays than with the naked eye, and that the *apparent* scheelite content of the ore dump was

no greater than that of the adjoining mullock dump. This was undoubtedly due to the fine rock dust masking ore and mullock alike.

The scheelite lode formation in the main lode has been opened up underground and mined at the southern end over a length of about 150 feet. The main shaft has been sunk to a depth of about 100 feet, whilst levels have been driven at approximately 40 feet and 70 feet. A considerable block of ore has been stoped north of the main shaft above the 70-ft. level, between 25 feet and 120 feet north. A further block has been stoped south of the main shaft for about 50 feet, between about 30 feet and 60 feet, vertical depth.

The lode formation is a white quartz reef. Lamping underground revealed that where found the scheelite usually occurs as marginal stringers or bunches moulded on one side against quartz, and on the other against the amphibolite wall rock. Frequently the stringers could be seen completely enclosed in the amphibolite, but scheelite was seldom found embedded in the wider and more solid portions of the quartz reefs. The scheelite was very irregularly distributed, making any estimate of ore reserves very difficult to obtain. The greater part of the lode formation in the northern end of the 70-ft. level appeared to be barren of scheelite. A short length of what appeared to be fair grade scheelite ore (1·5 per cent.?) is probably still available between the main shaft and about 25 feet north, above the 70-ft. level. Although some massive bunchy scheelite is obtained, under the lamp it appears that the mineral is disseminated in fairly thin stringers and flattened fragments. The lode formation as a whole dips almost vertically or at a very steep angle to the east and during lamping it was observed that, if anything, the scheelite stringers favoured the hanging wall rather than the footwall of the formation.

Very little scheelite was seen in the south end of the workings at the bottom level, but overhead over a length of about 15 feet some scheelite ore remains to be stoped. Scheelite stringers very broken and irregular but more or less continuous in formation were traced in the main shaft from 15 feet to 40 feet down on both north and south faces. There was very little sign of scheelite in the bottom sections of the main shaft.

The No. 1 north-east shaft has been sunk to a depth of about 42 feet on a steep underlay to the south-east, and some driving and stoping has been carried out for a short distance south-westward. The lode formation appears to have cut out a short way north-east of the shaft. The No. 1 north-east shaft workings are not connected underground with the main workings. Lamping revealed fair scheelite values on the hanging wall of the No. 1 north-east shaft between about 10 feet and 42 feet (bottom) suggesting the necessity of taking out further stripping cuts and possibly crosscutting into the hanging wall to test the possible width and extent of the scheelite stringers. It was noticeable that where the quartz formation was large and massive, in the No. 1 north-east workings, it was usually found to be barren of scheelite.

From the lamping of the surface and underground workings on this lease it is obvious that appreciable quantities of scheelite do exist and although in a few places good concentrations of coarsely crystalline scheelite have been found, in general its irregular distribution and often widely disseminated state make selective mining to obtain even up to about ·8-1 per cent. scheelite in the final ore a matter of considerable difficulty. The present company operating this deposit is endeavouring to maintain an average production of about 50 tons per week of ore containing about ·6 per cent. scheelite. In order to carry out any large scale mining for scheelite in the Higginsville district it appears obvious that it would be necessary to perfect a treatment plant capable of successfully concentrating scheelite ore containing at least as low as ·01 per cent. scheelite.

Treatment.—Whilst in the district the writer took the opportunity of inspecting the scheelite treatment plant which is located at the Norseman Gold Mines, N.L's., Norseman Mine at Norseman. The treatment consists of crushing to pass a coarse screen (about one-eighth mesh), the crushed ore then passing direct from the trommels to two Wilfley tables arranged in series. A sample of the residues from the treatment plant was tested under the ultra violet rays. The sample had been sieved through screens of varying mesh from medium-coarse down to very fine. It was found that scheelite could be clearly distinguished in relatively appreciable quantities in all fractions, indicating a distinct loss in treatment. From a purely megascopic examination the writer estimated that the residue contained in the neighbourhood of ·05 per cent. scheelite. It was interesting to note also that, although the quantity of residue contained in each fraction differed slightly, the percentage of scheelite visible in each fraction appeared to be roughly of the same order.

Samples of residues have now been sent to the School of Mines, where it is hoped that with the aid of the Superpanner more quantitative data regarding the scheelite losses from this treatment plant will be obtained.

Comet Vale.

Geology and Occurrence.—The scheelite workings (M.C. 23Z) at Comet Vale are situated on the late G.M.L. 5590Z (5410Z), "King of the Hills," in hilly country immediately west of Lake Goongarrie, and three to three and a half miles east of Comet Vale townsite. The country rock in the vicinity of the lease consists of fairly dense fine grained, usually blocky altered basic lava—now serpentinised basaltic amphibolite which here and there shows a rude schistosity striking nearly east and west. A large white quartz reef has intruded the amphibolites in a composite belt in the central northern portion of the lease. This quartz runs approximately 10° north of due west in a broken line over a length of about 500 feet, and forms the backbone of a sharp ridge which slopes down steeply to the south to a broad gully, and to the north into a short east running gully. The lease is flanked to the north, south-west and south-east by high land. A thin dyke of felspar porphyry intersects the amphibolite-quartz ridge in the centre of the lease, running in an approximate north-south line almost up to the quartz reef where it cuts out abruptly.

The amphibolite in the immediate vicinity of the previously mentioned line of quartz reef, on both its northern and southern sides has been altered to a coarsely crystalline amphibolite (actinolitic) schist. Evidence of movement in the schist along a line of fissuring prior to the intrusion of the quartz can be seen in the presence of small drag folds in the planes of schistosity of the schist lying immediately south of the quartz in several places, and also in the curved and folded legs occasionally emanating from the main quartz body, suggesting intrusion and replacement by the quartz of pre-existing drag folds.

Portions of the composite quartz reef on the eastern half of the ridge have been mined for gold in the past, several adits having been driven into the hill from the east and south-east. The adits extend into stopes, several of which open upwards into open-cuts, and also connect up with a winding drive running a little west of north for about 200 feet.

At about half way along the quartz reef line there is a distinct break of about 50 feet in the reef, the quartz on the western side of this gap apparently having been displaced slightly to the south-westward. The scheelite workings at present being operated are located along a line of schistosity which cuts through the gap in an approximate east-west direction, making an angle of about 25° with the main quartz reef line. These scheelite workings are connected to a long inclined adit, the south adit, running into the hill in the direction of N. 45° E. for a distance of about 110 feet.

As a result of his surface inspections, the writer prepared a rough geological sketch map of the area, fixing the geology and the positions of surface workings by pace and compass traverses. The approximate positions of the underground workings on this map are based on a plan by M. V. Weatherall, kindly loaned the writer by Mr. E. Mundle, of Gold Fields Australian Development, Ltd.

Lamping for scheelite was first carried out over the surface workings. Traces of scheelite seams were seen in several small potholes about 120 feet N.N.W. of the scheelite workings (west shaft) and in a long shallow trench or open-cut extending immediately west of this point. No sign of scheelite was found on the surface between this open-cut and the workings, the slopes here being covered by a thick mantle of quartz boulders and

rubble. Despite the heavy overburden, however, it is probable that did a strong line of scheelite lode connect the present workings with the abovementioned open-cut, some traces at least of scheelite would have been found in the loam on the lower slopes in this vicinity.

About 70 feet further west of the open-cut referred to above, is another trench or open-cut some 20 feet long and eight feet deep on the western slope of the central ridge. Scheelite was reported to have been obtained from this trench in the past. The east and west faces showed about one foot of white quartz, none of which revealed scheelite under the lamp. Traces of scheelite were seen on the northern wall of the trench, however, whilst frequent scheelite specimens were visible in an ajdacent small dump of quartz fragments evidently broken out from the trench.

At some 65 feet to the westward and down the slope from the last trench is the mouth of the west adit, which runs at about N. 25° E. into a hill for about 35 feet, where it branches into two forks each extending a further 20 feet. At about 15 feet from the mouth of the adit the lamp revealed a thin seam of scheelite having maximum width of about two inches associated with stringy quartz in amphibolite schist. A few scattered blebs of scheelite were also located near where the adit drive forked. The exposures in this adit gave little promise of yielding workable supplies of scheelite.

At the writer's suggestion two short costeans were dug at intervals in the country between the two scheelite-bearing open-cuts or trenches described above. No trace of scheelite was found in either of these, on lamping, indicating that the scheelite occurrences along this belt are more or less isolated and do not represent portions of a continuous lode formation.

At about 60 to 70 feet due north of the main scheelite workings is a short line of shafts and surface pot hole running in the general direction of N. 60° W. These workings are on what is known as the north lode which is reported to have been worked for scheelite during the last war. The shafts here were inaccessible but the dumps under the lamp revealed an abundance of scheelite fragments.

No trace of scheelite was found during a brief lamping of the broken surface quartz in the eastern half of the composite quartz reef ridge.

Lamping of the underground workings revealed that the scheelite ore is only sparsely distributed through the lode formation in a disappointingly irregular manner. The workings consist of a rather winding west drive running from the foot of the inclined south adit at a vertical depth of about 50 feet, for about 75 feet to meet the west shaft (vertical), and also an east drive running eastward for about 55 feet. The east shaft (vertical) connects with the east drive at about 20 to 25 feet east of the adit. A crosscut has been driven northwards from near the face of the east drive for a distance of 25 feet and opposite this north crosscut is a short crosscut running south to break through into the old gold workings. Scattered thin seams of scheelite nowhere more than about one inch wide were seen in the back of the west drive at its extreme western end near the west shaft, and a few small crystals were noticed on the south wall about 30 feet west of the adit. The remainder of the west drive appeared quite barren of scheelite. The beginning of the east drive also appeared quite barren overhead except for a strip from about 15 feet west of the east shaft to the shaft itself where some scheelite was visible in the backs of a small leading stope. The average grade of ore in this stope is probably less than one per cent. over a width of 15 inches. Eastward of the east shaft the only scheelite seen was one or two small scattered crystals on the south wall. There was no sign of scheelite in the north crosscut which had been driven out in an attempt to intersect the eastern continuation of the old north lode scheelite formation. Scheelite was visible on both the eastern and western faces of the east shaft almost from the surface down to about 40 feet V.D., in discontinuous lines of stringers. The maximum width of scheelite mineralisation in the shaft is about 18 inches, the average about nine inches. A lamping estimate based on observation alone suggests an average grade of little more than one per cent. scheelite in this section.

It was noticed that the scheelite in this mine was seldom associated with quartz bodies of any size. More commonly it occurs in scattered small crystals or thin stringers enclosed in actinolitic schist, though occasionally scheelite fragments are found moulded upon thin quartz stringers. Nowhere was the scheelite seen in bunches or in large crystalline aggregates. In general it must be understood that the development work carried out in the scheelite workings to date has exposed no appreciable tonnage of available scheelite ore but rather to the contrary has revealed that only relatively very limited quantities of workable ore can be expected from this mine.

The writer was informed that during development good scheelite ore was encountered underfoot along the southern side of the east drive from a short distance past the adit to a point about 10 feet east of the east shaft, but the lamp failed to reveal any sign of scheelite in the muddy floor. From the general tenor of the ore elsewhere in this part of the mine, it is doubtful if any better average grade would be obtainable underfoot. However, the possibility of an improved scheelite value at depth should certainly be tested by means of a winze sunk on the lode formation in the east drive.

In passing it may be mentioned here that on the flat low ground forming the north-eastern corner of the lease are the sands and residues dumps from the old scheelite treatment plant operated during the last war. The profiles of several portions of one dump were lamped and it was interesting to note that an appreciable quantity of fine ground scheelite could be seen in roughly banded layers throughout the dump—in places concentrations up to about five per cent. or more.

Treatment.—Mining development operations at Comet Vale have been carried out by Goldfields Australian Development Company Ltd., which was responsible for the sinking of the west and east shaft and for the driving on the east and west drives and the north crosscut. Two parcels of ore obtained during this development work have already been treated at the State Battery, Coolgardie. These two crushings were of 50 tons and about 100 tons respectively. A third crushing of 30 tons had been railed to Coolgardie a few days before the writer's arrival at Comet Vale. The ore for this last crushing was obtained from the small leading stope off the east shaft on the east drive and is probably more representative of the ore to be obtained by selective mining than the first two crushings which were obtained solely from development work. About 150 tons of further development ore remains in dumps on the lease.

The figures for the treatment of the first two parcels only are so far available. The following were supplied through the courtesy of the Superintendent of the State Batteries:—

Parcel.	Weight of Ore.	Weight of Concentrates.	WO_3 Content (Calculated from Assay).	Per cent. WO_3 Recovered.
	tons.	lbs.	lbs.	
1	50	440	168	·15
2	97	266	166	·076
Total ...	147	706	334	·102

From these figures it can be seen that, even allowing for a possibly rather low percentage recovery from the treatment plant at the Coolgardie Battery, the head value of the scheelite ore in these two parcels must have been fairly low—well under 5 per cent. scheelite.

Westonia.

Towards the close of his tour the writer made a brief inspection of the property of Edna May (W.A.) Amalgamated Gold Mines at Westonia. Wolframite is reputed to have occurred in the past in relative abundance through the ore bodies of this mine and the present company has recently been engaged in sampling and testing some of the old sands dumps with the object of deciding on the possibility of re-treating these for recovery of their tungsten content. Sample analyses

Division V.

School of Mines of W.A.

The Under Secretary for Mines.

I forward hereunder for the information of the Hon. Minister for Mines, my Annual Report for 1943.

1. KALGOORLIE SCHOOL OF MINES.

Enrolments.

The number of students enrolled during the year was as follows:—

	Class Enrolments.	Individual Enrolments.
First Term	549	289
Second Term	531	305
Third Term	475	284

Correspondence Class Enrolments—18.

Munition Trainees—Full-time training under the Commonwealth Technical Training Scheme —36.

R.A.A.F. Personnel Enrolments—83.

These were personnel from the Kalgoorlie R.A.A.F. Station who were admitted to classes at special concession fees approved by the Hon. Minister for Mines. Unfortunately, many of these men were posted to other R.A.A.F. stations before they had completed the year's work and therefore did not obtain the full benefit from the classes for which they had enrolled.

State School Students.

Elementary Chemistry	19
Elementary Physics	19

Staff.

Fortunately, changes in staff during the year have been few, the most important having been the appointment of Mr. C. Cockram as Assistant Lecturer in Mathematics in place of Mr. G. Stack who resigned on enlistment in the Royal Australian Air Force.

In addition, in consequence of the continued absence on war work of Mr. D. A. Sivyer, Science Assistant, classes previously conducted by him have been carried on by Messrs. W. M. Manson, R. W. Wilson, and R. G. Horseman, all of whom have carried out the work enthusiastically and successfully. In the coming year it will be necessary to appoint part-time instructors in place of Messrs. Manson and Horseman, the former of whom severed his connection with the Metallurgical Laboratory in September to take up duty as Metallurgist at Norseman Gold Mines, N.L., while the latter completed the course for the Diploma in Mining and has now accepted a Cadetship with the Broken Hill Proprietary Co., Ltd. My cordial thanks are due to these officers who have carried on the work of the absent officer at no small inconvenience to themselves.

All members of the staff have spared no effort in keeping the work of the School up to its high standard and the office staff have given valuable assistance in the administration and conduct of the business of the School.

Correspondence Classes.

These classes have been continued during the year and a pleasing feature of this phase of the School's activities has been the number of enquiries from and enrolment of men in the fighting forces and also of men who have returned to civil life after active service with different arms of the forces.

Army authorities are encouraging both returned service men and men still in the forces to take up certain lines of study for rehabilitation purposes and these correspondence classes are apparently meeting with the approval of Army Education Services.

The number of students who have enrolled for these classes during the year has been as follows:—Mining I., 9; Mining II., 2; Metallurgy I., 2; Assaying I., 4; Ore Dressing, 1.

Munition Training.

The authorities controlling the Commonwealth Technical Training Scheme under which men were being trained as fitters or turner machinists closed down in June the full-time training class which had been in operation since August, 1942. This class had, during the whole period of its existence (1942 and 1943), trained and passed out into employment as added tradesmen 30 fitters and 33 turner machinists, some of whom obtained employment on the goldfields, others in Perth and other parts of the State.

Unfortunately, owing to the difficulty of procuring workshop machinery, no new machines were installed in the period during which this class was in operation.

R.A.A.F. Personnel.

In consequence of the establishment of an R.A.A.F. Station at Kalgoorlie a considerable number of R.A.A.F. personnel desired to take advantage of the facilities of the School of Mines during their stay in Kalgoorlie.

To meet their wishes, authority was given for the admission of R.A.A.F. personnel to classes at a purely nominal fee for the year and in addition a special class in Workshop Practice II. was formed under Mr. S. C. Parker which was fully patronised.

State School Students.

In an endeavour to interest senior boys of the Central Schools of Kalgoorlie and Boulder in the study of science subjects with a view to their enrolment at the School of Mines on leaving the State schools, the Department agreed to admit these boys to classes in Elementary Chemistry and Physics without payment of fees.

Nineteen boys from the Kalgoorlie Central School attended for instruction in Chemistry and Physics and showed keen interest in the work, particularly in the laboratories, although the respective lecturers, Messrs. Dod and Edelman, found that it was necessary to institute special classes for the purposes of dealing with the fundamental principles of the subjects.

The encouragement of these boys to take an interest in science subjects is a step in the right direction and should lead to these boys continuing their technical education when they leave the primary schools.

R.A.A.F.

Members of the Staff have continued to act as a Recruiting Committee for the R.A.A.F., although enlistment has fallen off and has been for the most part confined to boys and girls who have now reached the minimum age for enlistment.

Revenue.

The revenue from fees, not including Correspondence Class and Metallurgical Laboratory fees has been £315 16s. 6d.

Correspondence Class fees amounted to £39 and fees received for investigations conducted in the Metallurgical Laboratory have amounted to £80 15s. 0d.

The fees received in connection with Correspondence Classes have been paid into a special Trust Fund which is used to defray the cost of conducting the classes, while fees received for ore dressing investigations have been paid into the Metallurgical Laboratory Trust Fund which is used to meet expenditure on maintenance supplies and incidentals in connection with the work of the Laboratory.

Public Assays and Mineral Determinations.

The number of free assays and mineral determinations carried out by members of the Staff for prospectors during the year was as follows:—

Assays for gold and other metals	53
Mineral determinations	93

In addition, information regarding the occurrence, exploitation, value, and sale of strategic minerals has been widely disseminated among prospectors to whom also advice and assistance has been given in solving problems met with in their search for and development of many minerals of importance in the war.

Post War Reconstruction.

During the year a Technical Training Committee was established in Perth by the Federal Government on which the Director was appointed by the Hon. Minister as the representative of the Mines Department.

Three meetings were held in Perth at which the Director was present when matters of importance to the School of Mines were discussed as part of the function of this Committee, which appears to consist in the making of recommendations to the Commonwealth for the co-ordination of all technical education after the war.

The work of this Committee has not yet been finalised although its deliberations in so far as they affect the School of Mines appear almost to have reached finality.

Commonwealth Assistance to Students.

In connection with the Commonwealth scheme of assistance to University students, reqnests have been made to the Minister for War Organisation of Industry and to the Universities Commission for the application of this scheme also to students of the School of Mines.

Assistance in this request has been sought from the Institution of Engineers, Australia, and the Australasian Institute of Mining and Metallurgy, both of which bodies have supported the claims of the School of Mines for inclusion in this scheme.

Army Education Service.

The School has co-operated with Army Education Service in supplying information to soldiers and returned soldiers regarding correspondence courses and the ordinary classes of the School and also conditions under which service men may be accepted as external students.

Similar information has also been supplied to Air Board for use in connection with the rehabilitation of discharged Air Force personnel.

Metallurgical Laboratory—Ore Dressing Investigations.

During the year eight applications for investigations were received, of which four only were concerned with the treatment of gold ores, the others being investigations into the treatment of scheelite and molybdenite ores.

Investigations which had not been completed in 1942 were completed and of these the most important which was carried to finality was an investigation into the flotation of pyrite from the Iron King Mine at Norseman. This investigation provided the information on which the flow sheet of the plant for the concentration of the pyrite was based and the concentrating plant is now producing high grade pyritic concentrate for flash roasting for the production of sulphur dioxide in the manufacture of sulphuric acid.

An investigation into the production of marketable graphite from a graphite ore from Munglinup has also been continued and a method of concentration has been devised which will produce very high grade flake graphite suitable for use in the manufacture of plumbago crucibles and high grade "amorphous" graphite suitable for use in the manufacture of electric batteries. It is expected that a small plant will shortly be operating along the lines laid down by the experimental work.

During the latter portion of the year, the Senior and Assistant Research Metallurgists spent considerable time at Ravensthorpe investigating the smelting of copper ores in a small experimental water-jacketed blast furnace and also assisted the management of Norseman Gold Mines, N.L., in overcoming the difficulties met with in the initial stages of the operation of the plant erected for the flotation of pyrite from the Iron King Mine.

The Assistant, Mr. W. M. Manson, resigned in order to accept the position of Metallurgist at Norseman Gold Mines, N.L. Mr. Manson was a member of the staff of the Laboratory for nearly three years and during that time carried out the analytical work of the Laboratory and also conducted classes in Engineering Chemistry I. and Assaying II. during the absence of the permanent instructor on war work. Mr. Manson's work has been very satisfactory and he well merits the advancement he has now received.

In connection with the work of the Laboratory 405 assays for gold have been carried out as well as 435 chemical analyses and 45 grading analyses, not including routine tests on cyanide solutions, etc.

Extension of the Laboratory building to provide much needed accommodation for special equipment and to provide dust-free conditions when crushing and sampling dry ores is now in the hands of the Public Works Department and, when completed, will enable the staff to work in more hygienic and less cramped conditions.

An important item of equipment added to the Laboratory by the Council for Scientific and Industrial Research has been a "Mineralight" lamp of the latest type for examination of minerals, particularly scheelite, under ultra-violet rays. This equipment will be of great assistance in the examination of scheelite ores both in the field and in the Laboratory.

Buildings.

External and internal painting of the school buildings is still urgently necessary and should, if possible, be put in hand during the coming year.

Advisory Committee.

The Advisory Committee has held regular monthly mettings and members have taken a keen interest in the work and the welfare of the school.

No changes in personnel have taken place during the year.

Diplomas and Certificates.

Diplomas and certificates issued during the year have been as follows:—

Diploma in Mining	2
Diploma in Metallurgy	6
Diploma in Engineering	4
Mine Surveyor's Certificate	4
Assayer's Certificate	1
Geologist's Certificate	1
Industrial Chemist's Certificate	1
	19

2. WILUNA SCHOOL OF MINES.

Enrolments.

The enrolments for 1943 were as follows:—

	Individual enrolments.	Class enrolments.
First Term	80	129
Second Term	68	118
Third Term	56	82

Classes have been conducted in Arithmetic, Elementary Mathematics, Preparatory Mathematics, Mathematics I., Fitting and Turning I. and II., Preparatory Mechanical Drawing, Mechanical Drawing I. and II., Electrical Engineering I. and II., Surveying I., Mining I., Preparatory Chemistry and Preparatory Physics.

Fees collected during the year amounted to £119 12s. 6d.

Staff.

Fortunately, very few changes in staff have been necessary this year and all members of the teaching staff have worked enthusiastically to maintain the interest of the students in their work.

My thanks are due to the members of the teaching staff for their valuable work during the year and also to Mr. H. H. Carroll, General Manager, Wiluna Gold Mines, Ltd., for the valuable assistance he has given the School by making the workshops of the Company available to the students for the practical classes.

Examinations.

The number of passes gained at the Annual Examinations was 78.

Advisory Committee.

Vacancies on the Advisory Committee caused by the resignation of Messrs. J. H. Terrell and H. Bumstead on account of their departure from the district were filled by the appointment of Mr. B. M. Rowe as Mines' representative in place of Mr. Terrell and of Mr. H. B. Northam, B.A., in place of Mr. H. Bumstead.

Mr. Terrell had been a member of the Advisory Committee since the foundation of the School, while Mr. Bumstead had given the School excellent service, both as a member of the Advisory Committee and as an instructor.

Regular monthly meetings of the Advisory Committee have been held throughout the year and have resulted in much good to the School.

General.

During the year I paid a visit of inspection to the School during which I inspected classes in operation and also discussed with the Advisory Committee and the Instructors matters of importance dealing with the work of the School.

The keenness of the Instructors who devote their leisure time to the work of the School is greatly appreciated by the Advisory Committee and myself.

Enrolments showed an increase over those for 1942, this increased interest in technical education in Wiluna apparently being largely due to the enthusiasm shown by the Registrar, Mr. G. M. Hickey, the Advisory Committee, and the Instructors, to whom my cordial thanks are due for their very valuable assistance.

3. NORSEMAN SCHOOL OF MINES.

Enrolments.

The enrolments for 1943 were as follows:—

	Individual enrolments.	Class enrolments.
First Term	48	124
Second Term	44	92
Third Term	31	65

The subjects in which classes have been held regularly throughout the year have been Elementary Mathematics, Preparatory Mathematics, Mathematics I., Preparatory Physics, Preparatory Chemistry, Preparatory Mechanical Drawing, Mechanical Drawing I. and II., Fitting and Turning I. and II., Preparatory Geology.

Fees received during the year amounted to £27.

Staff.

The School has again been dependent on members of the technical staffs of the mines and officers of the Education Department for the conduct of classes.

In consequence of the departure of Messrs. H. H. Evans, J. A. Dunn, and D. K. L. Peek who had conducted classes in Mechanical Drawing, Physics and Chemistry, respectively, Messrs. T. O'Brien and M. Blond were appointed Instructors in Mechanical Drawing and Physics while the Registrar, Mr. K. H. Hogg, temporarily conducted the classes previously conducted by Mr. Peek.

To all the members of the teaching staff the thanks of the School are due for their valuable assistance.

Examinations.

The number of passes gained at the Annual Examinations was 49.

Advisory Committee.

The Advisory Committee has held regular meetings during the year and its members have taken a keen interest in the work of the School.

The position of Instructors' representative vacated by Mr. Peek on account of his departure from Norseman was filled by the appointment of Mr. W. M. Manson. Mr. Peek had given the School very valuable service both as an Instructor and as a member of the Advisory Committee.

General.

During the year I paid two visits to the School when I attended meetings of the Advisory Committee and discussed with its members and also with members of the teaching staff details of organisation.

In this connection the thanks of the School are due to the General Managers and the Staffs of Norseman Gold Mines, N.L., and Central Norseman Gold Corporation for their interest in the work of the School and for their practical assistance in making available for the use of students their workshops and equipment, without which practical work in some subjects would not be possible.

To the Registrar, Mr. K. H. Hogg, the thanks of the School and my own personal thanks are due for his enthusiasm in the work of the School and his valuable assistance.

B. H. MOORE,
Director, School of Mines.

SCHOOL OF MINES OF W.A.

Class Enrolments, 1943.

Subject.	1st Term.	2nd Term.	3rd Term.
Elementary Mathematics ..	59	61	52
Elementary Chemistry	—	19	17
Elementary Physics	—	19	13
Preparatory Mathematics ..	50	37	36
Preparatory Mechanical Drawing	63	55	44
Preparatory Chemistry	39	31	26
Preparatory Physics	32	30	20
Preparatory Geology	11	9	8
Mathematics I.	20	18	15
Mathematics II.	9	9	8
Chemistry I.	13	11	9
Engineering Chemistry I. ..	6	6	6
Engineering Chemistry II. ..	2	1	1
Assaying I.	8	10	8
Assaying II.	1	1	1
Metallurgy II.	1	1	1
Geology	2	2	1
Mineralogy	5	5	5
Petrology	3	3	2
Mining I.	6	4	5
Mining II.	2	1	1
Ore Dressing	1	—	—
Surveying I.	1	1	1
Surveying II.	2	1	1
Mechanical Drawing I.	35	27	22
Mechanical Drawing II.	17	15	15
Applied Mathematics	9	10	8
Applied Mechanics	4	4	4
Building Construction	2	1	1
Physics I.	13	11	13
Fitting and Turning I.	44	41	40
Fitting and Turning II. ..	29	31	35
Machine Design	1	—	—
Mechanical Engineering I. ..	4	4	4
Mechanical Engineering II. ..	1	1	1
Electrical Engineering I. ..	6	3	4
Electrical Engineering II. ..	3	2	2
Internal Combustion Engines ..	30	27	33
Engine Driving I.	12	14	9
Engine Driving II.	3	5	3
Total Class Enrolments, 1943	549	531	475
Total Class Enrolments, 1942	562	409	344
Individual Students, 1943 ..	289	305	284
Individual Students, 1942 ..	295	267	212

ANNUAL EXAMINATIONS, 1943.

PASS LIST.

(T) Denotes terminal pass only. * Denotes equal.

Names are in order of merit.

ELEMENTARY MATHEMATICS.

All Sections.

Pass—
Kelly, R. J. (T)
Ion, C.

Arithmetic Section only.

Credit—
Mounster, J. J.

Pass—
Kelly, R. J.
Hunter, C.
Lawson, G. C.
Macdonald, M. W.
Collins, S. J.
Eiffler, G. A.
Munson, F. H.
Stearne, R. *
Currie, W. A.*
Whitchurch, L. R.*
Stanley, I. R.*
Lamotte, L.*
Wilkin, D. H.*
McKenzie, K.*

Algebra Section only.

Credit—
Clarke, N. C.
Kelly, R. J.
Chapman, G. M.

Algebra Section only—continued.

Pass—
Forster, E. T.
Mounster, J. J.
Greig, A. B.
Eiffler, G. A.
Macdonald, M. W.
Stearne, R.
Alcock, R. S.
Sanders, L. A.
Davenport, R. A.
Bassett, A.*
Armstrong, D. S.*
Reeves, C. A.*
Lonsdale, C. T.*

Geometry Section only.

Credit—
Kelly, R. J.

Pass—
Ion, C. E.
Forster, E. T.
Whitchurch, L. R.
Chadwick, N. W.*
Collins, S. J.*
Alcock, R. S.*
Davenport, R. A.*
Lonsdale, C. T.*
Chapman, G. M.*

PREPARATORY MATHEMATICS.

All Sections.

Credit—
Stevens, R. G. (T)
Anderson, J. F. (T)

Pass—
Ritchie, H. G.
McDonald, A. J.
O'Brien, A. R.
Greenwood, I. H.
Ritchie, W. G. (T)
Garrett, N. (T)

Algebra Section only.

Credit—
Stevens, R. G.
Anderson, J. F.
Garrett, N.

Pass—
Patroni, M.
Davey, G. F.*
Page, A. M.*
McDonald, A. J.
Ritchie, H. G.
Ritchie, W. G.
O'Brien, A. R.

Geometry Section only.

Credit—
Ritchie, H. G.*
Stevens, R. G.*
Anderson, J. F.
Loukes, K. R.
Erbe, W. V.
Davey, G. F.
Smith, K. R.
Bell, R. P.

Pass—
McDonald, A. J.
Greenwood, I. H.*
Lambert, R. C.*
Williams, P. B.*
O'Brien, A. R.*
O'Neill, J. P.*
DePassey, I. R.*
McCarthy, R. L.
Ritchie, W. G.

Trigonometry Section only.

Credit—
Anderson, J. F.
Stevens, R. G.
O'Brien, A. R.
McDonald, A. J.
Walton, A. H.

Pass—
Greenwood, I. H.
Schocker, W. F.
Ritchie, H. G.*
Lambert, R. C.*
Canning, D. G.
McKean, R. F.
Coleman, R. J.

PREPARATORY GEOLOGY.

Credit—
Anderson, J. F.
Ewing, D. A.

Pass—
Leach, J. R.
McMahon, W. F.
Greenwood, I. H.
Ritchie, H. G.
McDonald, A. J.
Shenton, E. F.

Pass in Practical only—
Ion, C.

PREPARATORY PHYSICS.

Credit—
Anderson, J. F.

Pass—
Tennant, Miss M. R.
Ritchie, H. G.

Pass in Theory only—
Wallis, F. A.
Forster, E. T. (T)

Pass in Practical only—
Adie, C. L.
Bell, R. P.
Erbe, W. V.
Greenwood, I. H.
Long, W.
McDonald, A. J.
McKean, R. F.

PREPARATORY CHEMISTRY.

Credit—
Anderson, J. F. (T)
Shenton, E. F.
Stevens, R. G. (T)

Pass—
Tennant, Miss M. R.* (T)
Greenwood, I. H.*
McDonald, A. J.
Long, W.
Hill, J. C.
Huxtable, M. J.
Ritchie, H. G.
Smith, K. R. (T)
Coleman, R. J.

Pass in Practical only—
Alcock, R. S.
Bruce, K. J.
Greig, A. E.
Jones, K. L.
O'Neill, J. P.
Schocker, W. F.

PREPARATORY MECHANICAL DRAWING.

Credit—
Anderson, J. F. (T)
James-Wallace, W. (T)

Pass—
Nicolay, T. G.
Greenwood, I. H.
McDonald, A. J.
Ritchie, H. G.
Whitchurch, L. R.
Whittle, J. A.
Hevron, K. J. (T)
Chapman, G. M.*
Schocker, W. F.*
Booker, J.
Keene, K. D.
McKenzie, K.
Reeves, C. A.* (T)
Greig, A. E.*
Davey, G. F. (T)
Bell, R. P.
Beck, A. J.
McCarthy, R. L.
Macdonald, M. W. (T)

MATHEMATICS. (First Course)

All Sections.

Credit—
Cox, E. J.

Pass—
Martin, J. D.
Turner, J. L.
Inman, R. D.
Dainton, R.
Ryder, K. N.
Boyd, J. P.

Algebra Section only.

Credit—
Cox, E. J.

Pass—
Martin, J. D.
Turner, J. L.*
Dainton, R.*
Christopher, L. F.*
Egan, B. J.*
Ryder, K. N.

Geometry Section only.

Credit—
Cox, E. J.
Martin, J. D.

Pass—
Egan, B. J.
Inman, R. D.
Thomson, A. W.
Harris, J. E.
Cole, H. E.*
Christopher, L. F.*

Trigonometry Section only.

Credit—
Cox, E. J.
Martin, J. D.
Turner, J. L.

Pass—
Dainton, R.
Boyd, J. P.
Harris, J. E.
Inman, R. D.

PHYSICS. (First Course)

Credit—
Cockram, C.
Cox, E. J.

Pass—
Hughes, E. E.
Fisher, E. W.
Martin, J. D.*
Chilvers, J. E.*
Inman, R. D.
Thomson, A. W.*
Dainton, R.*

Pass in Practical only—
Egan, B. J.
Franklyn, P. D.
Gobbart, W. G.
Lambert, R. C.
Ryder, K. N.

CHEMISTRY.
(First Course)

Credit—
Cockram, C.
Cox, E. J.
Gard, L. A.

Pass—
Franklyn, P. D.
Dainton, R.
Coleman, A. E.*
Canning, D. G.*
Chapman, G. M.*
Crowe, Ivan F.

ASSAYING.
(First Course)

Credit—
Horseman, R. G.

Pass—
Stewart, R. H. (T)
McMahon, W. F.
Huxtable, M. J.

Pass in Practical only—
Alcock, R. S.

ASSAYING.
(Second Course)

Credit—
Ewing, D. A.

ENGINEERING CHEMISTRY
(First Course)

Credit—
Horseman, R. G.

Pass—
Ewing, D. A.
Weedon, R. P. J.
Turner, J. L.
Barr, J. C.

ENGINEERING CHEMISTRY
(Second Course)

Pass—
Slade, L. J.
Hewitt, M. H.

METALLURGY.
(Second Course)
(Provisional, ponding Thesis)

Pass—
Barr, J. C.

Theses Accepted.
Zanker, T. A.
Pepper, R. S.
Slade, L. J.
Clauson, A. O.

MATHEMATICS.
(Second Course)

Credit—
Cockram, C.
Ewing, D. A.

Pass—
Weedon, R. P. J.

GEOLOGY.

Credit—
Cackett, W. S.

PETROLOGY.

Credit—
Cockram, C.

Pass—
Coleman, A. E.

MINERALOGY.

Credit—
Cockram, C.
Ewing, D. A.

Pass—
Ibbotson, G. R.
Gobbart, W. G.

MINING AND ECONOMIC GEOLOGY.

Pass—
Osborne, B.

Thesis Accepted—
Golding, H. D.

MINING.
(First Course)

Credit—
Cackett, W. S.
Boyd, J. P.

Pass—
Irving, J. R.
Hernesniemi, D.
Christopher, L. F.
Oldfield, L. (T)

MINING.
(Second Course)

Credit—
Cockram, C.
Lee, G. S.

SURVEYING.
(First Course)

Pass—
Boyd, J. P.

SURVEYING.
(Second Course)
(Provisional, pending Plan)

Credit—
Cackett, W. S.

Plans Accepted—
Laffer, G. A.

DRAWING.
(First Course)

Credit—
Cox, E. J.
Busch, E. H.
Tamblyn, L. F.

Pass—
Simmonds, G. D.
Madin, R. G.
Rose, D. C.
Hill, J. C. (T)
Simpson, R. T.
Haynes, M. G.
Turner, J. L.
Melville, R. J.
Andrysevich, A.
McKean, R. F. (T)

DRAWING.
(Second Course)

Credit—
Stevens, R. G.
Horseman, R. G.
Thomson, A. W.

Pass—
Smith, K. R.
Fisher, E. W.
Gilchrist, D.
Dainton, R.
Pearce, C. J.
Lambert, R. C.
Gard, V. J.
Weedon, R. P. J.

APPLIED MATHEMATICS.

Credit—
Weedon, R. P. J.
Fisher, E. W.

Pass—
Cox, E. J.
Cackett, W. S.
Turner, J. L.
Dainton, R.
Ryder, K. N.

APPLIED MECHANICS.

Credit—
Horseman, R. G.
Crowe, Ivan F.

Pass—
Ibbotson, R. G.

BUILDING CONSTRUCTION.

Credit—
Horseman, R. G.

Pass—
Gilchrist, D.

WORKSHOP PRACTICE.
(First Course)

Credit—
Cox, E. J.
Senior, K. B. (T)
Tamblyn, L. F.
Williams, L.

Pass—
Macdonald, M. W.
McDonald, A. J.
Sexton, G. J.
Dunstan, R. E.
Gard, V. J.*
Beck, A. J.*
Poletti, J. A.
Taaffe, J. M.
Wynne, V. E.

Pass in Theory only—
Davenport, R. A.
Currie, W. A.

Pass in Practice only—
Williamson, J.
Bassett, R.

WORKSHOP PRACTICE.
(Second Course)

Credit—
Newman, H. G.
Johnston, J. C.
Callander, D.
McDonald, K. J.*
Scattini, P. J.*
Dainton, R.*
Turner, J. G.*

Pass—
Cole, H. E.* (T)
Weedon, R. P.*
Dreger, R. R.*
Hopkins, L. G.* (T)
McGinniss, R. L.
Hatton, L. N. (T)
Barns, R. E.
Jones, K. D.*
Werndley, S. R.*
Sexton, J. F.*
Millard, J. T.* (T)
Robinson, H. W.* (T)
Henderson, P. B.*
Pearce, C. J.*
DePassey, I. R.
Tapper, L. T.
Dorrington, R. R. (T)
Smythe, E. T.

Pass in Theory only—
Evans, H. K.

Pass in Practical only—
Lawson, G.
Macgregor, P.
Browner, H. R.

MECHANICAL ENGINEERING.
(First Course)

Credit—
Turner, J. L.

Pass—
Weedon, R. P. J.

MECHANICAL ENGINEERING.
(Second Course)

Pass—
Coombe, G. F.

ELECTRICAL ENGINEERING.
(First Course)

Credit—
Horseman, R. G.

Pass—
Weedon, R. P. J.

ELECTRICAL ENGINEERING.
(Second Course)
(Provisional, pending Thesis)

Pass—
Cole, H. E.

Theses Accepted—
Hayes, J. A.
Pegler, R. A.

MACHINE DESIGN.

Theses Accepted.
Hayes, J. A.
Pegler, R. A.

INTERNAL COMBUSTION ENGINES.

Credit—
O'Brien, A. R.
Draper, K. M.*
Isted, A. T.* (T)
Rubery, D. H.*
Patroni, M.*
Jaekson, T. E. (T)
Johnston, J. C.*
McGowan, F. J.*
Dunstan, D. W.*

Pass—
Erbe, W. V.* (T)
Fyfe, N. L.*
Munday, J. R.
Werndley, S. R.
Townsend, E. G.
Marsland, G. J.
DePassey, I. R.*
Mitchell, A. J.*
Tate, H. E.*
Ridgwell, D. R.

ENGINE DRIVING I.

Credit—
Isted, A. T. (T)

Pass—
Moyle, H. L.*
Tate, H. E.*
Quadrio, D. M.
Evans, N. G.
Ashdown, H. F. (T)

ENGINE DRIVING II.

Pass—
Isted, A. T. (T)

SUPPLEMENTARY EXAMINATIONS, 1943.

ELEMENTARY MATHEMATICS.
Algebra Section.
Munson, F. H.

PREPARATORY MATHEMATICS.
Algebra Section.
Greenwood, I. H.

MATHEMATICS I.
Algebra Section.
Inman, R. D.
Chapman, J.

Trigonometry Section.
Fisher, E. W.

MATHEMATICS II.
Lee, G. S.
Cacket, W. S.

PHYSICS I.
Osborne, B.
Christopher, L. F.
Tamblyn, L. F.

APPLIED MECHANICS.
Pegler, R. A.

MINING I.
Faichney, J. M.

MINERALOGY.
Chapman, G. M.

PETROLOGY.
Chapman, J.

YEAR'S FEE SCHOLARSHIPS

PREPARATORY MATHEMATICS.
Stevens, R. G.

PREPARATORY GEOLOGY.
Anderson, J. F.

PREPARATORY PHYSICS.
Anderson, J. F.

PREPARATORY CHEMISTRY.
Anderson, J. F.

PREPARATORY MECHANICAL DRAWING.
Anderson, J. F.

MATHEMATICS I.
Cox, E. J.

MATHEMATICS II.
Coekram, C.

APPLIED MATHEMATICS.
Weedon, R. P. J.

MECHANICAL DRAWING.
(First Course)
Cox, E. J.

MECHANICAL DRAWING.
(Second Course)
Stevens, R. G.

ELECTRICAL ENGINEERING.
(First Course)
Horseman, R. G.

MINING.
(First Course)
Cacket, W. S.

MINING.
(Second Course)
Lee, G. S.

ASSAYING.
(First Course)
Horseman, R. G.

MECHANICAL ENGINEERING.
(First Course)
Turner, J. L.

BUILDING CONSTRUCTION.
Horseman, R. G.

SURVEYING.
(Second Course)
Cackett, W. S.

CHEMISTRY.
(First Course)
Cockram, C.

YEAR'S FEE SCHOLARSHIPS (continued).

GEOLOGY.

Cackett, W. S.

MINERALOGY.

Cockram, C.

PETROLOGY.

Cockram, C.

APPLIED MECHANICS.

Horseman, R. G.

INTERNAL COMBUSTION ENGINES.

O'Brien, A. R.

ENGINE-DRIVING. (First Course)

Isted, A. T.

WORKSHOP PRACTICE. (First Course)

Cox, E. J.

WORKSHOP PRACTICE. (Second Course)

Newman, H. C.

PHYSICS. (First Course)

Cockram, C.

SCHOLARSHIPS, PRIZES, ETC.

The following have been recommended :—

JUNIOR SCHOLARSHIP (£40 per annum).

Cockram, C.

ENTRANCE SCHOLARSHIP (£60 per annum).

Ritchie, H. G.

SENIOR SCHOLARSHIP (£75 per annum).

Cox, E. J.

CHAMBER OF MINES SCHOLARSHIP (£15 per annum).

Matallurgy.

Anderson, J. F.

CHAMBER OF MINES SCHOLARSHIP (£20 per annum).

Mining.

Martin, J. D.

W.A. SCHOOL OF MINES STUDENTS' ASSOCIATION SCHOLARSHIP (£15 per annum).

Cackett, W. S.

CRITCHLEY PARKER PRIZES.

Cockram, C.
Boyd, J. P.

C. A. HENDRY PRIZE.

Weedon, R. P. J.

WILUNA SCHOOL OF MINES.

ELEMENTARY MATHEMATICS.

All Sections.

Credit—
Hunter, R. S.
Hille, T. S.
Whalley, R. B.

Pass—
Errington, W. N.
Kealley, T. L.

Arithmetic Section only.

Credit—
Whalley, R. B.
Errington, W. N.
Hille, T. S.
Hunter, R. S.
Morrison, F. L.
Robinson, C. J.
Williams, A. C.

Pass—
Tisdale, R. F.
Hall, M. C.
Kealley, T. L.

Algebra Section only.

Credit—
Williams, A. C.
Robinson, C. J.*
Hunter, R. S.*
Hille, T. S.
Hughes, H.
Whalley, R. B.
Errington, W. N.

Pass—
Laughlin, E.
Morrison, F. L.
Kealley, T. L.

Geometry Section only.

Credit—
Hunter, R. S.
Hille, T. S.
Whalley, R. B.

Pass—
Hughes, H.
Errington, W. N.
Kealley, T. L.

PREPARATORY MATHEMATICS.

All Sections.

Credit—
Smith, A. D.
Forward, H. G.

Algebra Section only.

Credit—
Smith, A. D.
Forward, H. G.

Pass—
Jones, J. R.*
Vukobratich, S.*

Geometry Section only.

Credit—
Hille, W. C.*
Smith, A. D.*
Forward, H. G.
Groessler, G. H.

Pass—
Jones, J. R.*
Mulligan, T. E.*

Trigonometry Section only.

Credit—
Smith, A. D.
Hille, W. C.
Forward, H. G.

Pass—
Mulligan, T. E.

PREPARATORY CHEMISTRY.

Credit—
Smith, A. D.

Pass—
Mulligan, T. E.

PREPARATORY PHYSICS.

Credit—
Smith, A. D.

Pass—
Forward, H. G.

PREPARATORY MECHANICAL DRAWING.

Credit—
Smith, A. D.

Pass—
Webb, A. E.
Morrison, F. L.

MECHANICAL DRAWING. (First Course)

Credit—
Forward, H. G.

Pass—
Watson, R. L.*
Goodsell, G.*
Hughes, H.*

MECHANICAL DRAWING. (Second Course)

Credit—
O'Dea, W. J.
Hille, W. C.

Pass—
Hall, M. C.

MINING. (First Course)

Credit—
Rose, H. J.

Pass—
Hille, V. S.
Connolly, J. (Senr.)
Ainsworth, L.
Cosstick, J. R.
Cant, S. T.
Matson, W.
Tisdale, R. H.

ENGINEERING CHEMISTRY. (Second Course)

Pass—
Sims, A. J.

ELECTRICAL ENGINEERING. (First Course)

Pass—
Scarff, N. K.

ELECTRICAL ENGINEERING. (Second Course)

(Provisional, pending Thesis)

Pass—
Agnew, R.

SURVEYING. (First Course)

Pass—
Hille, W. C.
Taylor, E.
Henley, E. K.
Browne, Geo.

WORKSHOP PRACTICE. (First Course)

Pass—
Hackshaw, C. J.
Hunter, R. S.
Ramsay, I. G.

Pass in Practice only—
Jones, G. M.
Campbell, H.
Stidworthy, G.
Munyard, J.

WORKSHOP PRACTICE. (Second Course)

Credit—
Smith, L. E.
Toop, F. W.

Pass—
Agnew, R.
Browne, J. C.

SUPPLEMENTARY EXAMINATIONS, 1943.

ELEMENTARY MATHEMATICS.

Arithmetic Section.

Credit—
Franchina, P.
Laughlin, E.

Pass—
Sampey, B.

Algebra Section.

Pass—
Groessler, G.

YEAR'S FEE SCHOLARSHIPS.

ELEMENTARY MATHEMATICS.

Hunter, R. S.

PREPARATORY MATHEMATICS

Smith, A. D.

PREPARATORY CHEMISTRY.

Smith, A. D.

PREPARATORY PHYSICS.

Smith, A. D.

PREPARATORY DRAWING.

Smith, A. D.

MECHANICAL DRAWING. (First Course)

Forward, H.

MECHANICAL DRAWING. (Second Course)

O'Dea, W. J.

MINING. (First Course)

Rose, H. J.

WORKSHOP PRACTICE. (Second Course)

Smith, L. E.

NORSEMAN SCHOOL OF MINES.

ELEMENTARY MATHEMATICS.

All Sections.

Credit—
Joplin, W.
Cotterell, K. K.

Pass—
Bartlett, K. E.
Dehring, H.
Horsham, J. F.

Arithmetic Section only.

Credit—
Cotterell, K. K.
Joplin, W.

Pass—
Dehring, H.
McLauchlan, R.
Bartlett, K. E.
Trotter, E.
Horsham, J. F.
Dowglass, M.*
Kerr, A.*

Algebra Section only.

Credit—
Joplin, W.
Bartlett, K. E.
Cotterell, K. K.

Pass—
Horsham, J. F.
Dehring, H.
Kerr, A. A.

Geometry Section only.

Credit—
Joplin, W.
Cotterell, K. K.

Pass—
Horsham, J. F.
Bartlett, K. E.
Dehring, H.
Dowglass, M. R.

PREPARATORY MECHANICAL DRAWING.

Pass—
Joplin, W.
Cotterell, K.
Horsham, J.
Dowglass, M.
Dehring, H.
Bartlett, K. (T)

PREPARATORY PHYSICS.

Pass—
Dodd, K. C.

PREPARATORY CHEMISTRY.

Pass—
Forgan, F.

PREPARATORY MATHEMATICS.

Algebra Section only.

Pass—
Whitfield, D. W.

Geometry Section only.

Pass—
Whitfield, D. W.
Pugh, D.

Trigonometry Section only.

No Passes.

MATHEMATICS. (First Course)

All Sections.

Pass—
Peek, K.

Algebra Section only.

Credit—
Peek, K.

Pass—
Dodd, K. C.

Geometry Section only.

Pass—
Peek, K.

Trigonometry Section only.

Credit—
Peek, K.

Pass—
Dodd, K. C.

MECHANICAL DRAWING.
(First Course)

Pass—
Ellix, F.
Carey, L.

WORKSHOP PRACTICE.
(First Course)

Credit—
Baker, I. A.

Pass—
Swain, W. T.
Harvey, J. W.
Carey, L. J.

WORKSHOP PRACTICE.
(Second Course)

Credit—
Dodd, K. C.

Pass—
Pearson, E.
Scholey, J.
Thompson, J. W.
Radosevich, J. D.

Pass in Practical Section only—
Dehring, R.
Butler, E.

SUPPLEMENTARY EXAMINATIONS.

PREPARATORY MATHEMATICS.

Geometry Section.

Forgan, F.

MATHEMATICS I.

Algebra Section.

Scholey, J. W.
Baker, I. A.

ASSAYING.
(First Course)

Bach, D. J.

YEAR'S FEE SCHOLARSHIPS.

ELEMENTARY MATHEMATICS.

Joplin, W.

WORKSHOP PRACTICE.
(First Course)

Baker, I. A.

WORKSHOP PRACTICE.
(Second Course)

Dodd, K.

Division VI.

Annual Report of the Inspection of Machinery Branch of the Mines Department for the Year 1943.

OPERATIONS UNDER THE INSPECTION OF MACHINERY ACT, 1921. ANNUAL REPORT OF THE CHIEF INSPECTOR OF MACHINERY AND CHAIRMAN OF THE BOARD OF EXAMINERS FOR ENGINE-DRIVERS, FOR THE YEAR ENDED 31st DECEMBER, 1943, WITH STATISTICS.

The Under Secretary for Mines.

For the information of the Hon. Minister for Mines, I submit the report of the Deputy Chief Inspector of Machinery on the administration of the Inspection of Machinery Act, 1921, for the year ended 31st December, 1943.

The number of boiler inspections made again showed a slight increase, but the number of groups of machinery inspected decreased by nearly four per cent. due chiefly to the decline of gold mining. The number of accidents to persons recorded was nine less than in the previous year. There were three fatal accidents.

The financial result of the year's work shows a credit balance of £200 4s. 8d.

R. C. WILSON,
Chief Inspector of Machinery.

SECTION I.

Inspection of Boilers, Maintenance, etc.

See Returns I, II, III.

The total number of registered boilers (which includes various types of unfired pressure vessels, such as steam jacketed vessels, pans or stills, sterilisers, digesters, vulcanisers, air and gas receivers, montejus, etc.) which were recorded as fit for use on 31st December, 1943, was 4,963, an increase of 112 over the total on 31st December, 1942.

The number of boilers added to the register during 1943 was 160, an increase of 28. Return No. 1 gives particulars of the number of boilers of each type and the country of origin of the 146 new registrations; in addition, eight second-hand boilers were imported from other Australian States, four were transferred from other Departments in this State, and two which had been condemned were reconditioned and brought into use again.

The number of boilers which were removed from the register was 48, or 17 more than in 1942 Of these, 38 were permanently condemned, five were transferred out of this State, and five were transferred to other Departments.

The number of thorough inspections of boilers was 65 more, but the number of working inspections was 55 less than in 1942. There were 67 more certificates and nine more repair notices issued than during 1942.

Return No. II shows the useful boilers out of use as 2,963, or 59·7 per cent. of the total number on the register, but this is misleading as I explained in my report for 1942 as, although all these boilers were potentially useful when discarded, very few of them are likely to be used again owing to low original working pressure, cost of repair, distance from rail or other means of transport, excessive corrosion due to years of exposure, etc. Many of these boilers are on mines or farms which are off the beaten track and therefore have not been even seen by an inspector for 30 years or more, but there is always a possibility of some of them being brought into use again, and we are too short of staff to spare the time to go through all our files and make a purge of those never likely to be used again. Unfortunately, many boilers have been cut up for plates or used as tanks or scrub rollers without any notification having been given to this office.

New Construction.

The only new steam boilers registered which are worthy of note were two locomotives, five underfired and one waste heat, the remainder were mostly small boilers designed for sterilising dairy equipment. The two water tubes imported from Eastern States were small boilers attached to field cookers. Two of the underfired return multitubular boilers were built to the order of Eastern States buyers and were exported as soon as they were completed.

Maintenance.

Owing to war-time conditions, it is becoming increasingly difficult for boiler users to keep their boilers in a reasonably efficient state of repair. There is also great difficulty in getting boilers properly cleaned.

Hardly a day passes that we do not receive enquiries for second-hand boilers, and it is becoming increasingly difficult to find out-of-use boilers which can be put into commission again at a reasonable cost. The shortage of tubes, manpower and material frequently make it impossible to recondition potentially useful boilers.

Return No. 1.—*Showing the Number of Boilers of each Type, and Country of Origin of New Registrations for the Year ended* 31*st December*, 1943.

Type.	Country of Origin.				Total.
	United Kingdom.	Eastern States.	Western Australia.	Unknown Sources.	
Vertical Stationary	....	....	17	....	17
Vertical Multitubular Stationary	....	....	1	1	2
Return Multi. Stat Underfired	....	....	9	....	9
Water Tube	....	2	1	....	3
Locomotive	....	....	2	....	2
Saddle Back	....	7	....	....	7
Digester	....	....	5	....	5
Vulcaniser	1	1	3	2	7
Steam Jacketed Vessel	....	26	11	2	39
Steriliser	....	1	14	....	15
Air Receiver	10	3	24	2	39
Multitubular Stationary (Waste Heat)	....	....	1	....	1
Total	11	40	88	7	146

Return No. 2.—Showing Classification of Various Types of Useful Boilers in Proclaimed Districts on 31st December, 1943.

Types of Boilers.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Unproclaimed Areas.	Totals. 1943.	Totals. 1942.
Lancashire	42	57	....	99	100
Cornish	99	474	....	573	579
Semi-Cornish	11	37	....	48	48
Vert. Stat.	297	354	....	651	642
,, Port.	69	15	....	84	80
,, Mult. Stat.	41	26	....	67	64
,, ,, Port.	16	3	....	19	19
,, Pat. Tubular	49	....	....	49	49
Loco. Rect. Firebox Stat.	78	65	....	143	143
,, ,, ,, Port.	247	70	....	317	313
,, Circ. ,, ,,	154	9	....	143	146
Locomotive	75	42	....	117	117
Water Tube	201	124	....	325	324
Return Mult. Underfired Stat.	167	61	....	228	221
Return Mult. Underfired Port.	....	8	....	8	8
Return Mult. Int. Fired Stat.	38	13	....	51	50
Return Mult. Int. Fired Port.	2	....	....	2	2
Egg-ended and other types not elsewhere specified	217	24	70	311	282
Digesters	120	6	....	126	122
Air Receivers	513	446	....	959	932
Gas Receivers	7	....	....	7	7
Vulcanisers	283	10	....	293	300
Steam Jacketed Vessels	332	11	....	343	303
Total Registrations useful boilers	3,038	1,855	70	4,963	4,851
Total boilers out of use, 31st December, 1943	1,422	1,541	....	2,963	2,928

Return No. 3.—Showing Operations in Proclaimed Districts During Year ended 31st December, 1943.

(BOILERS ONLY.)

——	Districts worked from Perth.	Districts worked from Kalgoorlie.	Unproclaimed Areas.	Totals. 1943.	Totals. 1942.
Total number of useful boilers registered	3,038	1,855	70	4,963	4,851
New boilers registered during year	137	9	....	146	128
Boilers reinstated	2	....	....	2	1
,, converted	....	....	....	....	....
Boilers inspected— Thorough	1,623	314	...	1,937	1,872
Working	165	13	....	178	233
Boilers condemned during year— Temporarily	19	....	....	19	20
Permanently	35	3	....	38	24
Boilers sent to other States during year	3	2	....	5	4
Boilers sent from other States during year	2	....	6	8	1
Transferred to other Departments	4	1	....	5	3
Transferred from other Departments	4	....	....	4	2
Number of Notices for Repairs issued during year	511	....	....	511	502
Number of Certificates issued, including those issued under Section 30, during the year	1,616	314	....	1,930	1,863

SECTION II.

Explosions and Interesting Defects.

In a stainless steel steam jacketed pan used for manufacturing pickles, it was found that pits had penetrated right through the weld attaching the upper unjacketed portion of 16-gauge to the extension of the inner jacketed pan of 10-gauge. This weld is about half an inch above the top of the flange of the inner vessel so that it is not subjected to steam pressure. There are also signs of pitting in the welded seams of the inner pan itself, but these pits are not yet deep enough to warrant re-welding. This pan had been in use for only three years when the pits penetrated through the weld.

A header cap blew off one of the front headers of a Babcock and Wilcox boiler owing to the bolt head pulling through the inside clamp, the tube door was blown off its hinges and struck the boiler attendant, but fortunately he was only slightly injured and not scalded. The overstraining of these clamps by excessive tightening of the nut is, unfortunately, not uncommon in spite of the warnings of inspectors when they find strained clamps.

SECTION III.

Inspection of Machinery.

See Returns IV, V and VI.

The number of groups of machinery inspected in 1943 was 475 less than in 1942. This reduction was chiefly due to the decline in gold mining.

The only change as regards lifts was the erection of two new goods lifts and the dismantling of one goods lift. Only one permit to erect a lift was issued during 1943.

Return No. 4.—Showing Classification according to Motive Power of Groups of Machinery in use or likely to be used in Proclaimed Districts and which were on the Register during the Year ended 31st December, 1943.

Classification.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals. 1943.	Totals. 1942.
No. of Groups driven by steam engines	458	527	985	966
No. of Groups driven by oil engines	1,313	798	2,111	2,027
No. of Groups driven by gas engines	69	188	257	252
No. of Groups driven by compressed air	....	60	60	60
No. of Groups driven by electric motors	10,561	3,548	14,109	13,196
No. of Groups driven by hydraulic pressure	5	....	5	4
	12,406	5,121	17,527	16,505

Return No. 5.—Showing Operations in Proclaimed Districts during Year ended 31st December, 1943.

(MACHINERY ONLY.)

——	Districts worked from Perth.	Districts worked from Kalgoorlie.	Totals. 1943.	Totals. 1942.
Total registrations useful machinery	12,406	5,121	17,527	16,505
Total inspections made	9,242	2,472	11,714	12,189
Certificates (bearing fees)	3,215	384	3,599	3,964
Certificates (Steam without fees)	44	4	48	58
No. of extension certificates issued under section 42 of Act	....	....	....	....
Notices issued (Machinery Dangerous)	362	5	367	441

Return No. 6.—Showing Classification of Lifts on 31st December, 1943.

Types.	How Driven.	Totals. 1943.	Totals. 1942.
Passenger	Electrically-driven	189	189
	Hydraulically-driven	1	1
Goods	Electrically-driven	95	94
	Hydraulically-driven	3	3
	Belt-driven	4	4
Service	Electrically-driven	29	29
		321	320

Accidents to Machinery.

A hydro-extractor of the self-balancing, under-pivot, belt-driven type was shattered owing to the perforated copper basket bursting about half an inch from the vertical brazed seam. The basket was completely torn off its base, all the rivets attaching the basket to its base tore through the copper. The burst basket gripped the outer mild steel casing and twisted it off the four cast iron legs, which were fractured. The owner of the laundry was struck on the hip by the outer casing when

it was twisted round. A boy who was working near the machine was also slightly injured. Neither of them was incapacitated for more than four days.

SECTION IV.

There were no prosecutions.

SECTION V.

Accidents to Persons.

Return No. 7 includes only those accidents caused by working machinery subject to provisions of the Act, classed as serious, that is, those which prevented the injured person from following his usual occupation for a period of two weeks or more, but does not include accidents on timber mills or timber holdings, which are subject to the provisions of the Timber Industry Regulation Act, 1926.

The number of serious accidents reported was 35, being nine less than in 1942, and for the first time none has been recorded on the goldfields. The number of accidents causing the death of the injured person was three, or one more than the previous year.

One fatal accident was apparently caused by the deceased slipping while attempting to put a small belt, used for driving a firewood saw, on to the driving pulley and falling into the main driving belt from the gas engine to the generator. There was no witness of the accident and deceased died from the severe injuries which he received from being caught between the 9in. belt and the 5ft. diameter driving pulley. The saw is now driven by an electric motor.

Another fatal accident was caused by a small piece of wood which caught on the back of a circular saw hitting the deceased in the lower part of the abdomen, causing such severe internal injuries that he died two days later from peritonitis. This accident could have been prevented by the use of a suitable guard.

The third fatal accident was caused by excess of zeal on the part of the deceased, part of whose duties was to clean out the lift cars after the shop had closed. The doors of this lift were locked by means of toggle levers, and could only be opened from the outside by means of a small rod inserted through a small hole in the door for the purpose of raising one of the locking levers. Normally, the lift car was left at the ground floor for the convenience of the cleaner and the door was propped open. On the day of the accident this lift was put out of commission owing to an electric fault developing in the motor, the car was left at the third floor and a notice reading "lift under repair" was placed on each floor close to the call button. When the cleaner found the ground floor door was shut, he apparently procured a suitable rod from a display stand, opened the lift enclosure door with it and stepped into the well, falling into the pit. His injuries included fracture of the base of the skull, fractured right ribs and a perforation of right lung. He died about three hours after the accident. To prevent a similar accident occurring, the hole in each door, except the basement door, has been permanently filled and a plate held by two screws has been fitted over the hole in the basement door.

The remaining accidents were caused through want of reasonable care or lack of knowledge of the possible dangers involved.

Return No. 7.—Showing Persons Killed or Injured by Boiler and Machinery Accidents in Proclaimed Districts during the Year ended 31st December, 1943.

Numbers within brackets denote fatal accidents.

Class of Machinery.	Districts worked from Perth.	Districts worked from Kalgoorlie.	Total.
Metal and Tin Working—			
Emery Wheel	1	....	1
Automatic Shears	1	....	1
Heine Press	1	....	1
Goetz Press	1	....	1
Woodworking—			
Buzzer	3	....	3
Spindle Moulder	1	....	1
Shaper	1	....	1
Docking Saw	2	....	2
Circular Saw	2 (1)	....	2 (1)
Leather Working—			
Cutting Press	1	....	1
Jumbo Press	1	....	1
Corner Press	1	....	1
Offal Roller	1	....	1
General—			
Paper Bag Machine	1	....	1
Sizing Machine	1	....	1
Box Elevator	1	....	1
Wire Stitching Machine	2	....	2
Bottle Filling Machine	1	....	1
Platen Machine	1	....	1
Envelope Machine	1	....	1
Agitator	1	....	1
Mincer	1	....	1
Fibreboard Framing Machine	1	....	1
Clay Mixer	1	....	1
Bottle Making Machine	1	....	1
Boiler	1	....	1
Shafting	1	....	1
Belting	1 (1)	....	1 (1)
Passenger Lift	1 (1)	....	1 (1)
Goods Lift	1	....	1
	35 (3)	....	35 (3)

Return No. 7A.—Showing a Classification of Serious and Fatal Accidents and Nature of Injuries Received for the Year ended 1943.

	Area.		Remarks.
	Districts Worked from Perth.	Districts Worked from Kalgoorlie.	
Serious—			
Hand	4	....	There were 13 amputations in finger accidents and 1 in leg accidents.
Finger	20	....	
Arm	2	....	
Leg	2	....	
Other Major	4	....	
Total, Serious	32		
Fatal—			
Other Major	3	....	
Total, Fatal	3		

SECTION VI.

Engine-drivers' Examinations.

Return No. 8 shows that there were 16 more certificates issued than in 1942.

Examinations were held as follows: Perth, four; Kalgoorlie, four; Bunbury, two; Wiluna, one. Examinations were held at all advertised centres except Mt. Magnet.

Return No. 8.—Showing Total Number of Engine Drivers' and Boiler Attendants' Certificates (all Classes) Granted in 1943, compared with 1942.

	Number Granted.	
	1943.	1942.
Winding Competency, including certificates issued under Regulation 40 and Section 60 of the Act	3	5
First Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act	6	5
Second Class Competency, including certificates issued under Regulation 40 and Section 60 of the Act	25	13
Third Class Competency, including certificates issued under Regulations 40 and 45 and Sections 60 and 63 of the Act	20	26
Locomotive Competency, including certificates issued under Regulation 40 and Section 60 of the Act	8	3
Traction Competency, including certificates issued under Regulation 40 and Section 60 of the Act	....	....
Internal Combustion Competency, including certificates issued under Regulation 40 and Section 60 of the Act	39	49
Crane and Hoist Competency, including certificates issued under Regulation 40 and Section 60 of the Act	15	6
Boiler Attendant Competency, including certificates issued under Regulation 40 and Section 60 of the Act	65	60
Interim	....	1
Copies	6	4
Transfer	1	....
	188	172

Eleven days were spent on actual examination by the Travelling Board.

Twenty-nine days were spent in Perth dealing with applications for competency certificates, examination papers and enquiries, etc.

Twenty days were spent in travelling and looking into matters connected with engine-drivers, etc.

Two hundred and fifteen applications were received and 188 certificates were granted.

SECTION VII.

General Staff, Revenue and Expenditure, Mileage, etc.

Staff.—There have been no changes in the inspection staff, but owing to the illness of three inspectors a total of 29 weeks' inspection time was lost.

Revenue and Expenditure.—Return No. 9. Although the revenue decreased, the expenditure decreased by a greater amount, leaving a profit of £200 4s. 8d., compared with a loss of £182 5s. 8d. for the year 1942.

Mileage.—Return No. 10 shows that the miles travelled by road were 4,083 less than during 1942, making the third consecutive year that the miles travelled by road have decreased.

Return No. 9.—Showing Revenue and Expenditure for Year ending 31st December, 1943.

REVENUE.

——	1943.	1942.
	£ s. d.	£ s. d.
Fees for Boiler Inspections	2,516 15 5	2,489 5 8
Fees for Machinery Inspections	5,415 13 10	5,030 8 0
Engine Drivers' Fees	245 15 6	211 12 6
Incidentals	65 12 2	37 6 0
Decrease—£124 15s. 3d.	8,243 16 11	8,368 12 2

EXPENDITURE.

——	1943.	1942.
	£ s. d.	£ s. d.
Salaries	6,557 7 2	6,587 19 8
Incidentals	1,458 15 9	1,890 8 0
Engine Drivers	27 9 4	72 10 2
Decrease—£507 5s. 7d.	8,043 12 3	8,550 17 10

Profit—£200 4s. 8d.

I wish to thank all those who helped in carrying out the work of this branch, and to place on record my appreciation of the co-operation received from other Government Departments both in this State and the Commonwealth. In particular, I desire to thank all the officers of this branch for the good work they have done, and the staff of the Mines Department for their unfailing courtesy and assistance.

G. MOORE,
Deputy Chief Inspector of Machinery.

Return No. 10.—*Showing Distances Travelled, Number of Inspections made and Average Miles Travelled per Inspection for Year ended* 31*st December*, 1943.

Areas Traversed.	Rail Miles.			Road Miles.			Water Miles.			Total Miles.			Total Number of Inspections.			Average Miles per Inspection.		
	1943.	As compared with 1942.		1943.	As compared with 1942.		1943.	As compared with 1942.		1943.	As compared with 1942.		1943.	As compared with 1942.		1943.	As compared with 1942.	
		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.		Increase.	Decrease.
Districts worked from Perth	3,158	473	...	36,364	...	2,331	...	...	...	39,522	...	1,858	11,030	15	...	3·58	...	·17
Districts worked from Kalgoorlie	476	...	2,981	13,427	...	1,752	...	...	...	13,903	...	4,733	2,799	...	480	4·96	...	·72
Totals	3,634	473	2,981	49,791	...	4,083	...	...	...	53,425	...	6,591	13,829	15	480	3·86 4·19	= Average all Districts, 1943. = Average all Districts, 1942.	
Increases or Decreases	...	Decrease 2,508		...	Decrease 4,083		...	...	...	...	Decrease 6,591		...	Decrease 465		...	= Average Decrease .33 miles per inspection.	

Division VII.

Annual Report of the Government Mineralogist, Analyst and Chemist for the Year 1943.

The Under Secretary for Mines.

I have the honour to present for the information of the Hon. the Minister, my report on the operations of the Government Chemical Laboratory for the year ended 31st December, 1943.

STAFF.

Mr. H. E. Hill, Supervising Chemist, Food and Drugs Section, was seconded for the duration of war to be second in charge of the Defence Foodstuffs Organisation in Melbourne. He is in charge of all the laboratory work in this organisation.

Mr. J. C. Hood has been acting as Supervising Chemist in the Food and Drug Section during Mr. Hill's absence.

Mr. E. C. Hodgson, B.Sc., was appointed as a temporary chemist in May and started work in the Mineral Section.

Mr. H. P. Rowledge spent some time in the Pilbara, visiting localities at which various minerals have been or are being produced.

ACCOMMODATION.

Following the transfer of the Mineral Section to the new laboratories in December, 1942, the Agricultural and Food and Drugs Sections had moved in by the end of March. Much still remained to be done in the building and old apparatus had, in most instances, to be used instead of new, which, although ordered, had not arrived. The very barest quantity of new furniture was provided, it being thought that old chairs and tables from the Wellington street building would do, with the result that the refrectory which was to be fitted up for the use of the staff, cannot be used, as the chairs had to be taken for the rooms. No attempt has been made to improve the grounds. The new assay block and equipment has been of the greatest value in dealing with the sampling and crushing of parcels of strategic minerals. The building with its light and freedom from vibration is a vast improvement on that in Wellington street, but it cannot be in any way considered a modern laboratory because of its old and often out-of-date equipment.

Local Industries.

Potash.—Towards the end of the year the plant at Chandler to produce potash from alunite started working, although there are still chemical and technical difficulties to be overcome.

Alumina.—Considerable progress has been made on the development of a pilot plant to produce alumina suitable for the manufacture of metallic aluminium from the leached residues from the potash plant at Chandler.

Charcoal-Iron and Wood Distillation.—Work continued in connection with the proposed plant for the production of charcoal-iron and by-products from wood distillation at Wundowie about 40 miles east of Perth.

Mineral Production.—Western Australia's main contributions to the mineral requirements of the Allied Nations are tantalum and beryllium ores which are produced in the north-west and south-west of this State. As both have to be sold on chemical assay, much work was involved. Some parcels were crushed and sampled and prepared for shipment overseas.

Work for Allied Forces.—A considerable amount of analytical work was carried out for the Australian Army, Navy and Air Force, the United States Forces, and for the local munitions factory pending the completion of its own laboratory.

Revenue.

The revenue earned for the year amounted to £3,422 9s. 7d.

The following table shows the Source and Allocation of Samples for 1943.

Source, Department, etc.	Section 1. Foods, Drugs, and Toxicology.	Section 2. Mineralogy and Geochemistry.	Section 3. Agriculture, Sewage, and Water Supply.	Section 4. Soil Mineralogy.
Mines—				
Chemical Laboratories	3	23	24	65
State Batteries	9	161	....	....
State Mining Engineer	7	144	1	....
Under Secretary for Mines	....	18	6	2
Government Geologist	....	51	6	....
Explosive Branch	1	....	....	....
Minister for Mines	....	1	....	....
Health	83	....	3	....
Hospitals	27	....	1	....
Agriculture	406	2	694	22
Police	127	....	....	....
Government Stores and Tender Board	20	....	....	....
Metropolitan Water Supply	1	....	1,098	....
Works and Labour	4	....	118	....
Industrial Development	27	27	5	....
Forests	4	....	2	....
Treasury	....	....	1	....
Chief Secretary's Department—				
Prisons	....	....	3	....
Minister for North-West—				
Department of Native Affairs	....	....	1	....
Department of Labour—				
Chief Inspector of Factories	....	....	....	7
Department of War Organisation of Industry	1	....	....	....
University	1	....	....	....
Free	8	285	1	13
Pay—				
Aeronautical Inspection Directorate	26	....	7	....
Australian Canteen Service	2	....	....	....
R.A.A.F.	....	....	20	....
Department of the Navy	5	....	1	....
Department of the Army	35	23	14	....
Public	12	117	171	....
United States Defence Forces	246	....	228	....
State Engineering Works	....	22	1	....
State Insurance	3	....	....	....
Allied Works Council	....	....	13	....
Railways	38	....	....	....
Munitions	10	4,676	....	....
Supply and Shipping—				
Food Technology Division	250	....	8	....
Minerals Production	....	26	55	....
Local Governing Bodies	....	....	1	....
Liquid Fuel Board	4	....	....	....
Total	1,360	5,576	2,483	109
Grand Total	9,528			

Foods.—The added importance of food production in Western Australia was reflected in the increased number and nature of samples examined under this heading amounting to 424 samples.

In addition to samples received for analysis through the usual channels some investigations were started in collaboration with the Department of Agriculture on the vitamin content of locally grown fruit and vegetables.

Lemon Survey—237 Samples.—Attention was drawn by this Department prior to the establishment of the canning of citrus fruits in Western Australia that it was doubtful whether the acidity of a large proportion of locally grown lemons would comply with the Commonwealth Food Control specifications or the Food Regulations of the State.

With the co-operation of the Department of Agriculture and growers, an investigation was started with the object of correlating acidity, vitamin C, ratio of juice to total weight of lemons with seasonal and soil conditions, rainfall, cultivation, etc.

Samples were collected monthly since April from selected localities and much valuable information has been gained which will be of assistance in planning future programmes.

Interest in the progress of the work was shown by the Commonwealth Food Control and a request was made for a series of samples to be examined, on the general lines of the main investigation, covering acidity in the varying stages of ripeness—green, half-green, silver, yellow and full yellow. The results gave a valuable lead to systematic work which will have a considerable bearing on the picking and marketing of lemons.

Vegetable Research Committee—66 Samples.—A departmental committee set up by the Department of Agriculture to plan and direct research on production of vegetables fertiliser requirements, plant economy and vitamin content has been working in close collaboration with the various sections of this Laboratory.

The planting, growth and yields have been collated by the research officers of the Department of Agriculture. The sampliug, original moisture and vitamin content has been determined by the Food Section and subsequent work on chemical composition by the Agricultural Section of the Laboratory.

A programme covering winter and summer growth of various types of carrots from different localities, tomatoes from Geraldton and Wanneroo districts, cabbages from swamp and hills districts, is well advanced and has yielded valuable information.

Service Foodstuffs, Commonwealth Food Control—250 Samples.—Arrangements were made for this section to undertake work for the Food Technology Branch of this Commonwealth-wide activity set up to advise and control the processing and examination of all foodstuffs purchased for the armed forces in Australia.

The samples examined included canned vegetables, citrus fruit juices and canned sausages for Army requirements.

Much of the work was in connection with problems incidental to the establishment of the canning of these commodities and particularly with regard to citrus fruits.

The work has now ceased largely due to the seasonal nature of canning contracts.

Apple Dehydration and Food Processing.—The establishment of apple dehydration within the State created a number of problems associated with metallic stains from drying trays. Various metallic coatings were reported upon, none of which could be expected to give long service where exposed to contact with acid dipping solutions.

A problem of faulty external lacquering of one brand of canned carrots was traced at the factory as being due to splashing from the brine used in processing.

The simple expedient of hosing or wiping prior to lacquering provided a ready solution.

Juices from three varieties of apples were submitted for analysis as it is intended to make considerable quantities from local apples for the allied services.

Milk.—89 samples of milk were examined during the year for the Department of Agriculture, Milk Board and Department of Public Health.

A survey of milk supplied to the metropolitan areas was carried out by the Department of Public Health. Of the 46 official samples taken, 13 failed to comply with the Food and Drug Regulation as to chemical composition and successful prosecutions were launched against the vendors.

Forty-one samples examined for chemical composition and freezing point determinations for the Department of Agriculture were conspicuous for the large number of reputedly herd samples which gave freezing points above the accepted normal, indicating addition of water. In borderline cases it would appear that the freezing points are affected to some extent by seasonal or pasture conditions.

There is scope for considerable co-ordinated work along these lines.

Twenty samples of human milk were tested for infant welfare clinics and the King Edward Memorial Hospital to support feeding diagnosis.

Tea.—A complaint was made supported by a sample of the sophistication of one brand of tea with potassium permanganate (Condy's crystals).

Official samples of various brands failed to disclose the presence of permanganate or other foreign substance.

Coffee Substitute.—A promising coffee substitute was received from the North-West. The seeds were identified by the Government Botanist as *Brachychiton caudatum* (Hew.) Benth. from one of the Kurrajong trees of Kimberley.

Analysis of the ground seed gave the following figures:—

	Per cent.
Water	7.2
Fat	17.8
Protein (N x 5.3)	18.8
Ash	3.9
Fibre	13.5
Carbohydrate (by diff.) (Nitrogen free extract)	38.8
Alkaloidal bodies	None detected.

When roasted and made into an infusion the seeds would make quite a nutritive beverage free from bitterness and astringency. Analysis, however, failed to disclose the presence of any alkaloidal bodies such as caffein, normally present in the beans of the true coffee of commerce.

As a drink, therefore, these seeds would lack the stimulative properties of coffee but the undoubted coffee-like aroma and flavour make it a valuable substitute.

Steel Saucepans.—The staining of foodstuffs cooked in pressed steel saucepans was the subject of a complaint. No lead or other poisonous metals were found to be present and the stain was proved to be due to iron. The apparent spoilage, although vexatious, was not injurious to health and presumably had to be accepted as the result of a war-time substitution.

Olive Oil.—A sample of olive oil from the Harvey district was examined and found to be definitely not of commercial quality on account of the extraneous matter it contained, its dark colour and abnormal acidity.

No treatment could be suggested to render it suitable for human consumption.

Miscellaneous Food Samples.—A number of samples (19) comprising jams, sauces, cheese and butter were examined for the Government Tender Board and the Department of Agriculture respectively.

Liquors and Beverages.—The total number of samples under this heading was 22, of which two were brandies suspected of being under standard.

In the six wines which were received, saccharin was found in two cases and the vendors were successfully prosecuted.

One wine taken from a large quantity confiscated by court order was submitted for analysis and expression of opinion as to suitability for human consumption.

The sample was adversely reported upon both from its use for human consumption and suggested use for the purpose of distillation.

A comprehensive report by Mr. H. E. Hill was submitted to the Chief Inspector of Licensed Premises on the practicability of reducing the spirit strength of beers. Subsequently, to ascertain the present brewing practice, a number of beers and stouts were submitted to analysis for comparison with a similar series in 1937. Little variation was discernible except in one brand of pale ale.

It was noticeable in beers produced by certain types of fermentation that small quantities of the preservative substance sulphur dioxide were present.

These small amounts were thought to have been derived from the sterilisation of containers but, subsequent work by the brewery concerned, established the fact that they were there as the result of fermentation by certain strains of yeast.

Drugs and Medicines.—Anaesthetics comprised 52 out of the 53 samples received under this heading.

These were mainly routine test samples for compliance with the British Pharmacopoeia requirements for the Perth Hospital, Children's Hospital, and Government Stores Department.

Thirteen samples of anaesthetic ether and four samples of ethyl chloride were impounded anaesthetics sent by direction of district coroners in suspected cases of death under anaesthesia.

All the samples of ethyl chloride and seven samples of ether complied with the British Pharmacopoeia tests for purity; three did not comply, and three could be regarded as doubtful.

Toxicology and Industrial Hygiene.—In all 154 exhibits and specimens were examined in connection with several branches of toxicology.

Human Poisoning Cases.—The human poisoning cases numbered 39. The poisons found were barbiturates, 5; phenol disinfectants, 1; arsenic, 7; and cyanides, 4.

In 19 cases no poisons were detected, although in the case of three allied sailors thought to have drunk a cocktail containing the contents of a proprietary brand of fire extinguisher, the lengthy period of the onset of symptoms of poisoning precluded the possibility of recovering such toxic fluids as methyl alcohol or carbon tetrachloride unchanged from any organ.

Most of these analyses were made in connection with coroners' inquests and evidence was given in court by Mr. J. C. Hood or Mr. H. Sedgman.

Chemical analysis of the stomach contents, blood and urine for alcoholic contents has been made in a number of cases for the United States Services in which it is accepted as evidence of the sobriety or otherwise of the suspect.

Animal Poisoning.—Twenty-two specimens of stomach contents, viscera, etc., were received in connection with cases of real or supposed animal poisoning, four of which were the subject of investigation by the Criminal Investigation Branch as being of malicious intent.

Criminal Investigations.—Some work was undertaken for the Criminal Investigation Branch in connection with the death by shooting of an aboriginal by a white man in the North-West.

A bullet recovered from the decomposed body was weighed and comparison of weight and measurement made with various types of bullets of similar calibre. A series of bullets fired from a rifle were also weighed to establish the loss, if any, on firing.

Experimental work confirmed, as was to be expected, that there was a greater loss in weight in a bullet imbedded in decomposed fatty tissue than in fleshy tissue.

Strong evidence for a case of suspected arson was obtained by comparative analyses of kerosene from a tin found in the threatened premises, some fluid recovered from the floor and a trace of petroleum fraction found in a match which had been lit and the end burnt.

A number of articles and preparations (18 in all) seized during a raid on premises in Perth were submitted for identification and analysis and expression of opinion as to whether they contained prepared opium, *i.e.*, opium in a form capable of being used for the purpose of smoking. The articles included opium smoking pipes, solid and fluid opium and quantities of "dross."

A successful prosecution was obtained against the offenders under the Police Offences (Drugs) Act.

An explosion occurred at an electrical works in Perth as the result of an alleged prank by a youthful employee, against whom a charge of endangering human life was preferred. At the request of the C.I. Branch the circumstances were investigated by Mr. J. C. Hood, who considered the damage and exhibits confirmed the statement of the accused.

Mr. Hood was definitely of the opinion that the explosion would not have endangered life at any of the positions of employees adjacent to the scene of the explosion. The specific charge against the youth was altered to a minor one under the National Security Regulations.

Industrial Toxicology.—Evidence supporting analysis was given at the inquest of the driver who lost his life in the latter part of 1942 when his engine stalled in Swan View Tunnel.

A further mishap due to the fumes occurred during the passage of a troop train early in the year. Blood from the affected members of the train crew showed between 35 and 40 per cent. saturation with carbon monoxide.

Considerable attention was given by the Railway authorities towards the alleviation of the hazard and for the purpose of testing conditions and to prove the efficacy of a device proposed by Mr. Lloyd, Inspector of Mines, a number of passages were made through the tunnel. Samples were taken in the cab of an engine fitted with the Lloyd air vents both with and without the use of the device, and subsequently analysed for oxygen, carbon dioxide and carbon monoxide.

The results indicated that considerable improvement was effected by the use of the air vent.

Without the use of the air vent the maximum carbon monoxide was 0.19 per cent. whilst with the device in no case did the carbon monoxide exceed 0.04 per cent., quantities below the amount considered harmful even for somewhat prolonged exposure.

A visit was paid with inspectors of the Factories Department to premises devoted to spraying and hand painting aircraft components to investigate a suspected hazard due to inhalation of pigments, solvents and thinners with an associated fire and explosive risk.

An assessment of the health and explosive hazard was made and certain recommendations advanced for the improvement of conditions.

A dye used for dipping ammunition boxes suspected to be the cause of dermatitis was identified and stated to be unlikely to be the cause of the trouble.

A number of factories were visited to assess hazards attending the use of cyanide case hardening baths and hand welding operations.

Solution of the hazard generally lay with the installation or repair of ventilation systems.

The services of the Laboratory were sought to certify that conditions were safe before proceeding with the urgent repair of an allied war vessel necessitating the operation of four or five welders in the confined space of a fuel tank.

This entailed a careful inspection of the tank to ascertain the thoroughness of pre-steaming operations and checking the adequacy of the ventilation provisions during the progress of the work.

Work for Australian and Allied Services.

Department of the Army.—29 samples were received covering a variety of materials such as the composition and nature of petrols, lubricating oils, paints, etc., poisonous metals in water supply and diagnosis of marks and stains on documents.

Royal Australian Navy.—5 samples were received consisting of fuel and gyro oils and shellac.

Aeronautical Inspection Directorate.—26 samples were received consisting of coolant substances, wooden spars, rubber hose and miscellaneous solvents, solutions and components.

Work of an investigational nature was done on the tailplane of an aircraft concerned in an accident, the circumstances of which was the subject of a R.A.A.F. Court of Enquiry.

United States Navy.—Work from this source, usually of an urgent nature, amounted to 246 samples and consisted mainly of checking new fuel and lubricating oils to specifications and replacement limits of used oils.

Petrol supplies thought to be responsible for corrosion of tanks have been checked and corrosion problems generally of engine parts and deposits elucidated by analysis of fuel and components.

A water-line corrosion problem of flying boats thought to be due to action of local waters was solved by inspection without recourse to lengthy analysis.

Munitions—Gun Ammunition Factory.—Ten samples of materials used in production were checked against rigid specifications.

Natural Products.—A number of botanical materials were submitted as possible sources of drugs or odoriferous principles.

Two plant materials were also examined as potential rubber bearing plants. The quantity of rubber substance obtained showed little possibility of commercial exploitation.

Work was done on a local seaweed which showed considerable promise as a source of agar-agar.

Crudely prepared, the weed can be used as a gel in canned meats, etc., but the work of the mineral section aiming at clarification would extend the use of the product for bacteriological media and medicinal preparations.

In accordance with the policy of rendering chemical assistance to industry through the Department of Industrial Development, work was done for a firm who were experiencing difficulty in complying with specifications in respect to pre-shrunk woollen hose required for the services.

The process used was a patented one operated under license from Eastern States principals.

Batches of socks were tested in this laboratory for relaxation and felting shrinkage, all passed the Australian standard specifications.

Waters.—Water supplies from Mundaring reservoir, Mt. Charlotte reservoir and Kalgoorlie reticulation are still of good potable quality. Numerous samples from dams, wells, bores and rivers, from such places as—Moora, Bindoon, Ord River, Bridgetown, and Heathcote, Pingelly, Beverley, Karping, Narrogin, Blackwood River, and Hotham River, were received from the Department of Works and Labour and examined as to their suitability for domestic or stock purposes. Further samples from the rivers and streams survey in the south-western portion of the State were submitted for analysis. Several waters for complete analysis were received and came from:—Port Hedland (2), the total soluble salts were 443 and 125 grains per gallon; these were too saline for a small town supply. Three waters from the Goomarin extension, a fibrolite cement main that will supply water to the Campion Alunite Works, the reaction (pH) of these waters was too high for a domestic supply. A sample from a well on the west side of Garden Island had a soluble salt content of 60 grains per gallon. The reticulation water and that from the Nallan well at Cue contained 157 and 141 grains per gallon of soluble salts. Samples received from the Metropolitan Water Supply, comprised monthly samples from the Canning dam (deep water) and from the tunnel under the wall; also seepage water from the toe of the dam. Samples from domestic taps in various parts of the metropolitan area were examined for iron in suspension and solution. A sample of water from the outlet pipe in the Mt. Eliza reservoir was received for chemical analysis:—

	Grains per Gallon.
Carbonate, CO_3	1·58
Sulphate, SO_4	1·41
Nitrate, NO_3	·03
Chloride, Cl	16·58
Calcium, Ca	·92
Magnesium, Mg	·78
Sodium, Na	9·84
Potassium, K	·48
Alumina, Al_2O_3	trace
Silica, SiO_2	*Nil*
	31·62
Total Hardness	5·51
Iron, Fe	*Nil*
Assumed Combination—	
Calcium carbonate, $CaCO_3$	2·30
Magnesium carbonate, $MgCO_3$	·28
Magnesium sulphate, $MgSO_4$	1·77
Magnesium chloride, $MgCl_2$	1·33
Potassium chloride, KCl	·92
Sodium nitrate, $NaNO_3$	·04
Sodium chloride, NaCl	25·00
	31·64
Reaction pH = 7·5	neutral

Samples were also received for chemical analysis as follows: Royal Australian Navy, a bore water from Byford; Collie Grain Distillery, monthly samples from the Collie River; Government Geologist, bore water south side of Garden Island; four waters from salt lakes, Lake Brown (2), Lake Deborah and Warrachuppin, in connection with the Campion alunite industry; Allied Works Council, bore, Careening Bay, Garden Island and a well water from the south side of the same island; Under Secretary for Mines, corktree well, Yinnietharra mica field; Department of Industrial Development, water samples from Wundowie blast furnace site; Fremantle Cold Storage Co., well water in connection with the treatment of wool; Australian Blue Asbestos Co., water from pool at Wittenoom Gorge; Campion Alunite Works, scheme water (Goldfields), after passing through fibrolite pipes; Department of Interior, well water, Cape Naturaliste, and from well at Naval Base; Bunbury Water Board, water supplying the town; Plaistowes, Ltd., two well waters; U.S. Army, samples from various parts of the State; Australian Military Forces, samples from various parts of the State; R.A.A.F., 20 samples from different parts of the State. The United States Navy submitted 69 samples of battery and drinking water, from various shore bases and submarines; these were examined for suspended matter, total solids, organic and volatile matter, chlorine, iron, copper, nickel, ammonia, nitrites and nitrates. A number of samples were submitted by farmers, graziers, etc., taken from wells, dams, bores and rivers, these were examined as to their suitability for use as domestic, irrigation or stock supplies.

Soils.—In order to determine the nitrogen status of vineyard soils in the autumn, surface soil samples from the Upper Swan district were examined for ammonia and nitrate content. In connection with an apparent varietal difference in the need for potash in cauliflowers two soils were submitted from a property at Kenwick for total and replaceable potash determination. Soils in connection with problem of the development of smooth, bare, salt patches in a number of wheatbelt areas were examined for exchangeable cations in the soil from the patches of adjacent areas. In connection with the visit

of a member of the staff of the Waite Institute, South Australia, a number of soils from the Great Southern and Wheatbelt areas were collected and examined for reaction (pH). Several soils were received from farmers and market gardeners for salt determination, some of these were rather saline for general cultivation purposes.

Fertilisers.—No official samples taken under the Fertiliser Act were received during the year. Samples of superphosphate as supplied to the State Research Stations were sent in for check analysis. A number of samples of various materials used as fertilisers were received from the Department of Agriculture for analysis such as:—Turkey manure; some material collected in the Rockingham district (nitrogen 0·62 per cent., phosphoric oxide 0·17 per cent. and potash 0·06 per cent.); standard matured Serpentine super; wool scouring waste, its use had resulted in too vigorous top growth in turnips; phosphate guano from Pelsart Island and a mixture of two parts of the guano and one part of super (18 per cent.) were used in field experiments at Chapman, Whelarra and Wongan Hills; spent hops and barley combings used in vegetable growing at Balcatta; blood and bone used in conjunction with the spent hops and barley combings examined for nitrogen, phosphorus, magnesium, potash, copper, manganese and zinc; three samples of horse manure and also brewers' grains used in vegetable growing. The ash from prunings from Boyanup, if of value as a fertiliser; various odd samples, with a query as to their value as fertilising material, were received: a deposit from the Phillips River, near Hopetoun; stones from near Bulong for phosphate content (trace); swamp earth, Kendenup district (nitrogen content 0·11 per cent.); sandstone, Port Hedland (P_2O_5 0·019 per cent.); two salines gathered in the north (K_2O nil and trace); rock collected just over W.A. border on a branch of the Victoria River (P_2O_5 0·017 per cent.).

Pasture, Clovers, etc.—Samples of grain and straw taken from the rate of superphosphate and residual superphosphate experiments at Merredin and Wongan Hills, were examined for phosphate content. Samples from pasture deterioration and oat maturity experiments carried out in various parts of the State were examined for protein, fibre, ether extract, total ash, silica free ash, calcium and phosphorus in the original material. The nitrogen content of a large range of pasture samples and the general composition of clover hay were carried out with the view of studying problems in animal nutrition, particularly during the dry months. Samples of oats from grazing trials at Beverley and Merredin were examined for crude protein, crude fibre, ether extract, total ash with calcium and phosphorus in the original material. Pasture samples from Manjimup district in connection with the study of the variations in composition during the season were examined for nitrogen, phosphorus and calcium content. In connection with the examination of the fertilising value of Serpentine superphosphate, a number of pasture samples were examined for nitrogen, phosphorus, calcium, magnesium and potash. Subterranean clover samples were received in connection with the study of the copper status of soils in Western Australia; these samples were examined for copper, manganese, zinc, iron, phosphorus, calcium, magnesium and nitrogen. All of these samples were submitted by the Department of Agriculture.

Vine, Cauliflower, Cabbage, and Fruit Tree Leaves.—In connection with the study of the deterioration of vines in certain vineyards in the Upper Swan district, samples of mature leaves were analysed for calcium, magnesium, potash, phosphorus, iron and manganese in an endeavour to obtain comparisons which may lead to a diagnosis of a suspected nutritional disorder. The effect of copper fertilisers with vines at Gingin, entailed the determination of copper in a number of leaves. Samples of leaves from apple, orange, peach, plum and grape were examined for nitrogen, potash, copper and manganese. Cauliflower leaves obtained from Wanneroo were examined for manganese. Potato leaves from a crop suspected to be affected by "cockle-leaf," a disorder associated with soil acidity, were examined for iron and aluminium. Samples of potato leaves were collected and examined for their potash content; these were in connection with a disorder of potatoes known as "rust" or "bronzing" which affects the foliage as well as the yield. Potash as a fertiliser largely prevented the incidence of this disorder; the potash content in the unaffected leaves was from seven to nine times that in the affected leaves. In connection with a fertiliser experiment on cabbages grown at Balcatta, heart and mature leaves were examined for nitrogen, phosphorus, potash, calcium and magnesium content. In connection with an apparent varietal difference in the need for potash shown by two varieties of cauliflowers grown at Kenwick, leaves taken at early hearting stage were examined for their nitrogen, phosphorus, potash, calcium and magnesium content. All samples submitted by the Department of Agriculture.

Carrot Tops and Tubers.—Tubers and tops have been analysed for nitrogen, potash, phosphorus, calcium and magnesium; these were from fertiliser and minor element experiments carried out at Osborne Park and represent winter growing.

Cabbages.—Samples of cabbage grown at Herdsman's Lake, Osborne Park, Wanneroo and Pickering Brook were examined for calcium, magnesium, phosphorus, iron and copper.

Navy Beans and Soya Beans.—Samples taken from experiments conducted at Jandakot to test the effect of inoculation of total nitrogen and moisture content were examined. Three strains of inoculum, together with a control treatment were included in the experiment. Soya beans from the above plants were sent in and analysed for total ash, nitrogen, calcium, phosphorus and potash.

Lupins.—In connection with study of the establishment of lupins on poor country, a number of samples were collected at Gnangara and Maida Vale; these were dried, broken up by hand and after treatment, examined spectroscopically. A number of samples of New Zealand lupins, grown locally were examined for nitrogen, phosphorus and potash.

Tobacco Plant.—Samples received consisted of (a) bottom and middle leaf, (b) top leaf, (c) sucker leaf, (d) stalks; these were examined for nicotine content and contained (a) 1·43 per cent., (b) 1·42 per cent., (c) 0·92 per cent., (d) 0·28 per cent.

Phosphates.—In the search for phosphatic material within the State, suitable to be used in the manufacture of superphosphate, or as straight-out fertilising material; samples were sent in from Pelsart Island, W. Wallabi, Recherche Archipelago, and Dandaragan. These were examined for phosphate soluble in nitric and hydrochloric acid, moisture and insoluble in acids. In some cases total phosphate, citrate soluble phosphate, acid soluble phosphate, nitrogen, iron and alumina; insoluble in acid and calcium carbonate calculated from carbon dioxide was required.

Poultry Feed, Meatmeal, etc.—Samples of meatmeal and wheatmeal were received in connection with pig feeding trials at Muresk and they were examined for moisture, ash, protein, ether extract, fibre and nitrogen free extractives. A number of samples were received for manganese content, in connection with investigations into various aspects of poultry nutrition; the samples comprised:—Elephant grass (Mn 17 to 44 parts per million); lucerne (Mn 9 to 22 p.p.m.); Meatmeal, imported, 1941 (Mn 12 p.p.m.); Midland meatmeal, 1941 (Mn 43 p.p.m.); Imperial meatmeal, 1941 (Mn 33 p.p.m.); Imperial meatmeal, 1943 (Mn 78 p.p.m.); Livermeal, 1943 (Mn 8 p.p.m.); fishmeal, 1943 (Mn 3 p.p.m.). Samples of laying mash and growers mash were forwarded for analysis. Reports of dissatisfaction regarding these products had been received by the Department of Agriculture; they were examined for protein, fat, fibre and salt content; both samples contained coarse lumps of salt, up to one-quarter inch in diameter. A meatmeal from the Midland abattoirs for registration under the Feeding Stuffs Act was also received. Dried swill to be used as a pig food, gave the following figures calculated on a dry basis:—Ash, 15·94 per cent.; calcium, 1·56 per cent.; crude protein, 22·45 per cent.; ether extract (fat), 13·23 per cent.

Insecticides.—Several samples were received during the year, they were for check analysis, before being registered under the Plant Diseases Act.

Flax Plants.—Flax crops showing a terminal necrosis and dieback of young shoots were noticed by officers of the Department of Agriculture and a minor element deficiency was suspected. Samples were examined for calcium, magnesium, copper, manganese and zinc.

Salt.—A sample of crude salt from Widgiemooltha on analysis gave the following figures:—

	%
Water at 200°	1·50
Analysis of Dry Salt—	
Sodium chloride, NaCl	99·739
Magnesium chloride, $MgCl_2$	0·060
Magnesium sulphate, $MgSO_4$	0·084
Calcium carbonate, $CaCO_3$	0·007
Calcium sulphate, $CaSO_4$	....
Sodium nitrate, $NaNO_3$	trace
Insoluble in water	0·101

Crude salt from Lake Deborah forwarded by the Government Geologist as a possible source of salt for the Campion alunite industry, on analysis gave the following figures:—

		Dry Basis. %
Water at 200°C.	1·18 per cent.	
Calcium carbonate, $CaCO_3$		·005
Calcium sulphate, $CaSO_4$		·808
Magnesium sulphate, $MgSO_4$		·069
Magnesium chloride, $MgCl_2$		·345
Sodium chloride, NaCl		98·697
Insoluble (containing small grains of sand)		·076
Iron		trace
Sodium nitrate		trace

Bronze Bushing for the A.I.D.—A check on the composition of the bushes was required without in any way destroying the articles. They were drilled and drillings after treatment were examined spectroscopically.

Electrolytes.—A number (155) of battery electrolyte solutions from submarines were examined for ammonia, chloride, iron, copper, nickel, arsenic, antimony, manganese, nitrate and suspended matter; these were for the American Navy.

Trade Effluents.—Trade waste samples were examined with a view to their being suitable for discharge into departmental sewers. Tannery wastes, file reconditioning plant waste, effluents, etc., from a munitions factory neutraliser were received. The effluent from a potato dehydrating plant was also sent in to see if it was suitable for discharge into a sluggish stream.

Tomatoes.—A number of raw and canned tomatoes were examined for reaction (pH) by the glass electrode.

Sewage.—Routine control samples from the digesters at the Subiaco and Swanbourne treatment plants were collected and examined for reaction (pH) and solids in suspension. A large number of determinations of hydrogen sulphide, soluble sulphides, chlorine demand and free chlorine also reaction (pH) in sewage and sewer gas both before and after chlorination, were carried out at various places in the metropolitan area; portion of this work extended over several days and nights. This work was in connection with the deterioration of cement sewers. Samples from country and private installations were sent in from Albany, Merredin, and Claremont.

The samples of ocean water collected in December, 1942, on the beach and in the vicinity of the ocean outfall sewer, were finished in January of this year. No evidence of pollution could be detected in the beach samples.

Miscellaneous.—A number of single samples were received comprising:—Silver nitrate and potassium chromate solutions for the Australian Army. A pyrite flotation concentrate for sieving test. Deposit on the rudder of a launch moored on the Swan River; corrosion of the rudder was suspected in this case. Calcareous beach sand, for use on acid soils; samples of Ravensthorpe copper ore; roaster residues from a factory at Bassendean. Commercial manganese and zinc sulphates were examined spectroscopically; these samples were from material that had been used in minor element experiments, by the Department of Agriculture.

Gold.—Only a small number of gold assays were made during the year, principally 30 umpires and 80 check samples for the State Batteries Branch, "buyers" parcels of concentrates (gold bearing copper), and free assays for prospectors.

Copper.—Most of the copper ores were State Battery tailings samples assayed to determine the probable consumption of cyanide in gold extraction.

Tin.—Work was completed during the year on a large batch of tin-bearing samples collected from M.C.47 at Greenbushes by the Geological Survey. The tin content was found to range from 0.52-0.02% and each sample was also tested for tantalite and columbite.

Twenty-one samples of black tin concentrates from the vicinity of M.C.48—D.C.95 at Greenbushes were examined for the Geological Survey. The concentrates consisted of ilmenite, cassiterite (under 3% to over 60%), zircon and tourmaline. Tantalite and/or columbite were not present in most samples but one contained about 10% of tantalite.

Cassiterite from Kathleen Valley (a new locality for cassiterite) occurring in a pegmatite or greisen about two miles south of the Yellow Aster G.M., ranged from 1-18% in the samples examined. A parcel of ore from this locality was concentrated at the Coolgardie State Battery and the concentrate assayed, Sn 69.17% equal to 87.81% SnO_2 and the residues, 0·28% Sn equal to 0·35% SnO_2.

Tin-bearing samples were also examined from Hall's Creek, Marble Bar, Pilgangoora and Ravensthorpe.

Tungsten.—Thirty-five assays for tungsten were made during the year for the State Batteries Branch and represented ore from Comet Vale, Davyhurst and other localities concentrated at the Coolgardie Battery. The Davyhurst ore consisted of portion of the sands dump at the Golden Pole Mine and values varying from 0.05 to 1.65% WO_3 were obtained. About two tons (five parcels) of scheelite concentrates were forwarded from Yalgoo for sampling and WO_3 assay. As segregation of the gangue minerals occurred during the mining and coning of these concentrates it was found necessary to fine grind the parcels through 80 mesh screen and the final assay sample was re-ground and screened through a 150 mesh screen. The tungstic oxide content varied from 62 to 70% WO_3 in the five parcels. Wolfram-bearing ore was assayed from near the Bonnie Venture, Mt. Singleton.

Metals and Alloys:

Antimonial Lead Wires.— Four thousand six hundred and seventy-six samples of lead wire were analysed for antimony content for the Commonwealth Small Arms Factory pending the completion of their own laboratory. Details of a rapid technical method used in another munitions laboratory were received and comparisons of results by this and other methods led to modification and increased accuracy with very little additional time required for each assay. The continuous stream of hot acid vapours drawn through the fan exhaust system of the fume cupboards caused rapid deterioration of the system, as canvas joints rotted and hot acid vapours spread over the surrounding fans, motors and piping, causing much damage.

Bronze.—Fifty samples of a special bronze, used in aeroplane replacement parts and manufactured locally were analysed to show their compliance to a definite chemical specification which stated that zinc had to be "nil." It is doubtful if a commercial alloy of this type could be produced without spectroscopic traces of zinc and a maximum of 0·02%Zn was agreed upon.

Cast Iron.—Twenty-five samples of an annealed white cast iron produced by the State Implement Works were analysed for silicon, carbon, manganese, sulphur, and phosphorus, controlled amounts of which have to be present. With the establishment of their own laboratory at the Works, no further samples were analysed.

Steel.—Nineteen samples of a special steel used by the Department of the Army and giving varying wear in use were analysed to ascertain their compliance with specifications. Seventeen of the samples were found to conform to the limits given in the specification. Variation of composition within the limits of the specification would probably produce steels having appreciably different properties.

Miscellaneous Metal Samples.—These included centrifugal cast iron prepared from pig-iron and added scrap-iron; a farm tractor link; linotype metal for the Government Printing Office; phosphor-copper from the U.S. Navy; soft solder manufactured locally; and deposits from the lubricating systems of aeroplane engines.

Iron Ores.—In connection with the survey of iron-ores in the vicinity of Coate's Siding where it is proposed to erect a blast-furnace for production of pig-iron a number of samples from the systematic sampling of the iron-ore deposit at Wundowie about two miles west of Coate's Siding, started coming in from about the middle of December, 1942, and continued to be received until the beginning of March, 1943. The ore is a lateritic type. The ore was analysed for iron, insoluble and phosphorus. Partial analyses of the ore from a number of the sampling shafts are as follows:—

Shaft.	Depth of Sample.	Fe.*	Insoluble.	P.
	ft. ins. ft. ins.	%	%	%
Quarry VII.	0 1– 3 9	48·27	6·63	·29
	3 9– 4 6	40·57	7·11	·21
	4 6– 6 6	47·22	5·48	·40
	6 6– 9 3	46·74	6·50	·42
	9 3–10 3	23·56	20·64	·08
1490, 1000N	0 3– 2 3	44·27	11·30	·28
	2 3– 4 3	48·04	8·22	·37
	4 3– 6 3	49·65	6·77	·33
	6 3– 8 0	24·73	20·81	·03
1590, 1100N	0 3– 2 3	48·31	8·80	·17
	2 3– 4 3	48·72	10·30	·25
	4 3– 6 3	48·63	9·98	·34
	6 3– 8 6	42·08	12·02	·18
	8 6–10 3	41·43	10·47	·07
1690, 1100N	0 6– 2 6	48·18	14·13	·15
	2 6– 4 6	45·65	10·36	·24
	4 6– 6 6	49·56	8·35	·44
	6 6– 8 0	49·13	8·20	·37
	8 0–10 6	29·32	30·25	·08
1800, 700N	0 6– 2 6	39·73	13·59	·02
	2 6– 4 6	42·54	12·15	·02
	4 6– 6 6	38·80	13·81	·04
	6 6– 8 6	38·94	15·31	·04

* Analysis made on dry samples.

A complete analysis was made of the ore between 3 ins. and 10 ft. 3 ins. in the shaft at 1590E, 1100N.

Iron Ore, Wundowie Deposit.
Shaft 1590E, 1100N.
Depth 3 ins.—10 ft. 3 ins.

	%
SiO_2	9·92
Al_2O_3	10·46
Fe_2O_3	64·75
FeO	n.d.
Mn_2O_4	·03
MgO	·01
CaO	·03
Na_2O	·13
K_2O	·06
H_2O—	1·38
H_2O+	11·83
TiO_2	·28
CO_2	·07
P_2O_5	·48
SO_3 (acid sol.)	·04
SO_3 (water sol.)	·06
BaO	*Nil*
PbO	*Nil*
Cu	trace
As	*Nil*
Sb	*Nil*
Sn	*Nil*
Cr_2O_3	·07
V_2O_3	*Nil*
Co_2O_4	·04
Ni	trace
Zn	*Nil*
S	·04
Cl'	trace
Carbon	·17
	99·85
Fe	45·29
Mn	·02
S	·08
P	·20
Ti	·17

Analyst: J. D. Hayton.

The specific gravity of four typical lumps of iron-ore collected at Coate's Siding is:—2.89, 3.83, 3.76, 3.72. Decrepitation tests were made on this material with the following results:—

Temperature °C.	Weight lost on heating ore —20 +40 mesh. %	Weight lost on heating ore —40 mesh. %
200	3·46	1·30
300	6·74	4·16
400	10·94	3·96
500	12·02	4·20
600	12·66	6·46
700	12·90	7·90
800	13·10	9·46
900	13·00	11·90

A number of potential iron ores were analysed from various parts of the State. These included a sample of limonite from 13 miles south of Bridgetown (Fe 45.81%; SiO_2, 6.90; P, .50; TiO_2, 1.77%); Loc. 3120, Nelson (Fe, 50.10%; insol., 5.20; P, .11%); limonite and hematite from about a mile south of the old Londonderry mine (Fe, 60.81%; Mn, 0.44; insoluble, 4.16%); limonite from a quarry at Gillingarra (Fe, 54.38%; SiO_2, 3.87; P, 0.39; H_2O+, 14.23%); hematite from the Northam district (Fe, 52.40%; insol., 15.00; P, 0.08%); two limonites from Northam district (Fe, 58.47 and 56.53%; insol., 3.52 and 3.21%; P, .02 and .30%); 17 miles north of Wooleen Station, hematite and limonite (Fe, 63.35%; insol., 6.75%).

Beryl.—Increased demand for beryllium for use in beryllium-copper alloys resulted in a large number of parcels of commercial ore and specimens being forwarded for identification. The principal centres of production were Wodgina and Yinnietharra. The beryl at Wodgina occurs in the main tantalite lode in white masses at the northern end and grey masses farther south. The ore shipped from Wodgina has averaged 12.06 per cent. BeO. This beryl is massive, milk-white in colour and very seldom shows any crystal faces. There is very little difference in BeO content between the white and the grey. Beryl of several different colours, including some clear glassy beryl, white and pale green (aquamarine), has made up parcels from Yinnietharra. It occurs as large massive six-sided crystals which when broken give clean lumps of beryl often of a characteristic ice-green colour and showing clear and opaque patches. Blue and yellow varieties are not nearly so common. The parcels exported have averaged 13.19 per cent. BeO. A few tons of white glassy beryl have been obtained from the Felspar Quarry at Londonderry. A chip sample of four tons of beryl gave the following analysis:—

	%
SiO_2	63·80
Al_2O_3	17·26
BeO	12·58
Fe_2O_3	·80
CaO	·30
MgO	·02
Li_2O	·82
K_2O	·20
Na_2O	1·38
ign loss	2·30
	99·46

Analyst: C. R. LeMesurier.

Quartz Crystals.—As a strategic mineral quartz crystals have been much in demand in the Eastern States for the production of radio frequency control plates. Brazil is the chief producer of clear flawless quartz suitable for this purpose, but owing to the difficulty of shipment supplies have been curtailed and local sources have been investigated and prospectors and others encouraged to search for suitable crystals. This has resulted in numerous specimens being sent in for examination. The specifications require crystals to be flawless, free from twinning, to show prism faces and crown and to be large enough to yield a one-inch cube

of clear quartz. There has been some difficulty in finding large enough crystals and in crystals from certain localities complicated twinning has condemned specimens which otherwise appeared to be clear and flawless. Of the better crystals examined twinning and intergrowth structures were the chief faults. Where possibilities of obtaining usable crystal appeared to be hopeful additional specimens were asked for, and the specifications explained in detail.

Tantalum Ores.—There has been considerable activity in prospecting and producing tantalum ores during the year. Commercial parcels of high grade tantalite were produced from M.C. 1, Greenbushes. A new find was made at Kathleen Valley, near Mt. Sir Samuel, the original specimen containing 60 per cent. Ta_2O_5 and 24 per cent. Nb_2O_5 and a subsequent small sample 59 per cent. Ta_2O_5 and 25 per cent. Nb_2O_5. The mineral is brown to brownish-black with a somewhat resinous lustre and is manganotantalite. A number of odd specimens of tantalite and columbite were received from the Yinnietharra district. These varied somewhat in composition from a high grade tantalite with S.G. 7.63, FeO 13.10 per cent; Ta_2O_5 80 per cent.; Nb_2O_5 5 per cent. to columbite with S.G. 5.64, FeO 6.84 per cent; Ta_2O_5 19.6 per cent.; Nb_2O_5 60.8 per cent. Unfortunately, the specimens are not localised, but it appears that this district is a potential producer of tantalum ore, especially as during the past few years specimens have also come in from Dalgety Downs and Mooloo Downs Station.

The tantalite at Greenbushes from M.C. 1 (the old Enterprise Lease) is in comparatively coarse and in very fine pieces and is devoid of all crystal faces. One lump weighing about 25 lb. showed no cleavage and no crystal faces except some rather poorly defined pyramidal forms. It is generally high grade with Ta_2O_5 78-80 per cent., Nb_2O_5 2-7 per cent. In fine grains under the microscope the mineral is reddish-brown with a high refractive index and a fairly high birefringence. It is strongly pleochroic from pale yellow to deep reddish-brown and occasionally gives a uniaxial figure, indicating that it is tapiolite, the tetragonal iron tantalate. Tapiolite has previously been recorded from the northern part of the field. Variation in composition of the tantalum-bearing minerals in different parts of the field indicates that there are several different lodes or pegmatites present. Concentrates from a shaft on M.C. 9 quite close to M.C. 1 contained from 25-40 per cent. of columbite of average composition Ta_2O_5 49 per cent.; Nb_2O_5 34 per cent. Tantalite from about half a mile south of the railway station (North Greenbushes) contains Ta_2O_5 68 per cent.; Nb_2O_5 16 per cent.; it is associated with cassiterite and a little columbite. Another sample was columbite with Ta_2O_5 38.7 per cent. and Nb_2O_5 36.3 per cent. The commercial parcels exported have contained a little (2-3 per cent.) stibiotantalite, $Sb_2(Ta, Nb)_2O_6$, which has made the analysis difficult and may present certain difficulties in the production of pure tantalum metal from the ore. Stibiotantalite is a rare mineral which has only been found in two or three places in the world. At Greenbushes it is associated with the tantalite or tapiolite on M.C. 1 and it has also been recorded from Boronia Gully, two miles north-west of Greenbushes. It is probably not nearly as rare at Greenbushes as was thought previously and much has undoubtedly been discarded during the preparation of export parcels of tin and tantalum ores.

Manganotantalite samples from Pilgangoora were typical partially crystallised mineral characteristic of this area. The range in composition is from Ta_2O_5 55 per cent.; Nb_2O_5 28 per cent.; to Ta_2O_5 73 per cent.; Nb_2O_5 12 per cent.

A manuscript giving the chemistry of tantalum and niobium and the occurrence of the tantalum-niobium minerals of Western Australia was prepared by H. P. Rowledge and D. Carroll during the year for publication by the Mines Department at an early date.

Lithium Minerals.—Enquiries for sources of lithium in Australia resulted in the examination of a number of lithium-bearing minerals such as lepidolite (lithia mica), zinnwaldite (iron-lithia mica), petalite and spodumene.

Lepidolite samples examined during the year came from Kathleen Valley, Melville, Londonderry, Ravensthorpe.

At Kathleen Valley lepidolite is associated with cassiterite and in addition there are number of pegmatites with a high concentration of lepidolite, those recorded being 55 per cent. lepidolite, 90 per cent. (Li_2O, 2.64 per cent.), 65 per cent., 65 per cent., 35 per cent. The separate veins vary from 10 to 15 feet in width. Lepidolite from the "Basin" at Melville contains 4.18 per cent. Li_2O. A sample of massive scaly lepidolite outcropping on M.L. 93 at Londonderry contains 3.87 per cent. Li_2O and a zinnwaldite from M.L. 86, Tantalite Hill, about a mile north of the main felspar quarry contains 3.46 per cent.

A large tonnage of petalite, lithium aluminium silicate occurs in the felspar quarry at Londonderry. A chip sample of this collected by Mr. H. A. Ellis, of the Geological Survey, gave the following analysis:—

	%
SiO_2	77·70
Al_2O_3	16·92
Fe_2O_3	0·02
MnO	trace
MgO	0·09
CaO	0·02
BeO	0·04
Li_2O	4·20
K_2O	0·08
Na_2O	0·40
P_2O_5	*Nil*
H_2O	0·35
H_2O—	0·13
CO_2	0·02
TiO_2	*Nil*
	99·97

Analyst: C. R. LeMesurier.

A picked representative sample of spodumene from the pegmatite outcropping at Cattlin Creek about 1½ miles north of the Ravensthorpe Post Office, was analysed for Li_2O and found to contain 6.20 per cent. The spodumene is in fresh pale green crystals varying in size from 18 x 6 x 4 inches to crystals one quarter of an inch maximum dimension. According to a report by H. A. Ellis some patches of the pegmatite dyke contain about 20 per cent. by volume of spodumene but 10 per cent. is more usual.

Clays.—A number of small samples of clay were examined from Denmark, Northam, Donnybrook, Kulja, and other localities. The clay from Donnybrook was a refractory ball clay having a plasticity of 84/100 and it burnt to a good white colour at 1150°C and was under steel hard at that temperature. The Higginsville clays were of the halloysite type and carried over one and a half per cent. of common salt. A white burning kaolin was examined from Morawa West.

Limestone.—Limestone from the coastal limestone series at Wanneroo and Coogee were analysed and showed:—

	Wanneroo No. 1 Bulk Sample Quarry Face.	Wanneroo No. 2 Hand-picked Stone from Quarry Face.	*Coogee Bulk Sample of Quarry Face.
	%	%	%
SiO_2	14·38	6·06	2·32
Al_2O_3*	0·38	0·17	0·01
Fe_2O_3	0·37	0·29	
MgO	0·44	0·49	0·33
CaO	45·82	50·84	52·77
CO_2	36·26	40·14	41·73
P_2O_5	0·07	0·05	0·03
TiO_2	n.d.	n.d.	n.d.
Total loss on ignition	37·75	41·24	43·88

Analysts: J. D. Hayton, E. C. Hodgson.

* Includes any titanium present.

Cement.—A number of partial analyses and one complete analysis of cement were made for the Director of Public Works. The samples had already been tested at the University. The complete analysis gave:—

	%
SiO_2	22·75
Al_2O_3	5·02
Fe_2O_3	4·18
FeO	n.d.
Mn_2O_3	0·07
CaO	62·56
MgO	1·11
Na_2O	0·44
K_2O	0·16
TiO_2	0·36
P_2O_5	0·06
SO_3	1·33
Ign. loss*	2·30
	100·34

Analyst: C. R. LeMesurier.

* Includes CO_2, 0·29% ; uncombined lime, CaO, 2·14% ; insoluble residue, 1·21% (A.S.T.M. Method C114–40).

Consisting of:—	%
SiO_2	0·92
Fe_2O_3, Al_2O_3 (mainly Al_2O_3)	0·23
CaO	*Nil*
MgO	0·02
TiO_2	*Nil*
Probably present as:	
Quartz, SiO_2	0·83
Mullite, $Al_6Si_2O_{13}$	0·32

Foundry Sands.—A number of molding and parting sands were examined for dust hazard at the request of the Chief Inspector of Factories. It is generally recognised that the finest siliceous particles are those which are liable to cause silicosis if breathed over long periods of time. It was necessary, therefore, to separate out the particles measuring from 0-5 μ (μ = ·001 mm.) diameter, 5-10 μ, and 10-60 μ. It is considered that the 0-5 μ and 5-10 μ sizes are the most dangerous. Mechanical analyses were made of the sands and the fraction -200 I.M.M. was further subdivided into three fractions by sedimentation, where sufficient material was obtained the free and combined silica was determined on the 0-5 μ and 5-10 μ fractions and from this some estimate of the dust hazard could be obtained.

Fluorescence of Minerals.—A number of minerals, including the pegmatite or greisen at Mt. Mulgine, were examined with the "mineralight." These specimens showed no scheelite. The rock was crushed and the fragments showing fluorescence hand-picked and subjected to a spectrographic analysis by Mr. A. G. Turton. The following qualitative results were obtained:—

Present in some quantity: Sodium, silica, molybdenum, aluminium.

Present in small quantity: Potassium, calcium, magnesium, barium, strontium, iron, lead, boron, manganese, copper, titanium.

Elements searched for and not found: Lithium, phosphorus, beryllium, arsenic, caesium, rubidium, platinium, tin, silver, indium, zinc, vanadium, bismuth, cadmium, antimony, osmium, cobalt, nickel, gold, mercury, tantalum, thallium, tungsten.

As this fluorescent felspar was hand-picked from a molybdenite-bearing greisen another sample was treated with a dilute nitric acid to ascertain, if possible, whether molybdenum was present as contamination from the ore or in a solid solution in the felspar. Molybdenum was absent in the spectragram of this sample. It is therefore probable that the fluorescence is due in part to the presence of very minute finely divided powellite, $CaMoO_4$, which is readily removed by the acid treatment.

Coal.—Five samples of coal from a 12-ft. seam at the Griffin Mine at Collie were analysed and the calorific values were determined.

PROXIMATE ANALYSIS ON FRESHLY BROKEN COAL.

—	No. 1. Top 3 ft. 12–9 ft.	No. 2. 9–6 ft.	No. 3. 6–3 ft.	No. 4. Bottom 3 ft. 3 ft. floor	No. 5. General Sample of Seam.
	%	%	%	%	%
Moisture	33·09	24·55	24·30	24·08	25·95
Volatile Hydrocarbons	24·79	28·50	28·84	31·58	28·98
Fixed Carbon	39·35	44·47	44·50	41·89	42·66
Ash	2·77	2·48	2·36	2·45	2·41
	100·00	100·00	100·00	100·00	100·00
Moisture lost on air drying for 24 hours (in lump form)	11·77	5·74	4·96	4·87	6·27
Additional moisture lost on drying at 105°C. for ½-hour (coarse powder)	21·32	18·81	19·34	19·21	19·68
Total moisture	33·09	24·55	24·30	24·08	25·95

CALORIFIC VALUE.

	1	1	3	4	5
Freshly broken coal (B.T.U.)	8291	9493	9589	9670	9337
Air dried coal (B.T.U.)	9749	10215	10217	10290	10128
Ash and moisture free coal (B.T.U.)	12926	13010	13073	13162	13035
Ratio of fixed carbon to volatile hydrocarbons	1·59 : 1	1·56 : 1	1·54 : 1	1·33 : 1	1·47 : 1

ASH.

Colour of ash	Brown	Light brown	Light brown	Light brown	Teak
Phosphorus in ash (%)	2·81	·51	·21	·24	·96

ULTIMATE ANALYSIS.

—	Freshly broken coal.			Ash and moisture free coal.				
	S.	N.	P.	C.	H.	O.	S.	N.
	%	%	%	%	%	%	%	%
No. 1	·63	·97	·078	76·97	4·51	16·03	·98	1·51
No. 2	·35	1·02	·013	77·14	4·98	16·00	·48	1·40
No. 3	·42	1·01	·005	76·24	4·84	16·96	·58	1·38
No. 4	·54	1·02	·006	75·94	5·17	16·76	·74	1·39
No. 5	·47	1·02	·023	77·28	5·14	15·50	·66	1·42

Bauxite and Laterite.—A number of bauxites and laterites were examined during the year. Two samples from Boyup Brook consisting of a kaolin and gibbsite contained 37.8 per cent. and 49.8 per cent. of soda soluble alumina respectively. A sample of laterite from the foothills of the Darling Range at Kalamunda was partially analysed and found to be a low grade siliceous bauxite containing 22.42 per cent. total alumina.

Ochres.—Good quality pigments occur on P.A. 825 Opthalmia Range, about 26 miles south of Poonda Station. Three examined were soft hematite rocks yielding brown colours and forming dense paints. The compositions, colours, etc, are:—

Fe_2O_3.	In-soluble.	Colour.		Covering Capacity.	Remarks.
		Oil.	Water.		
%	%				
94·93	1·82	Bay	Brown	very good	Natural "burnt Sienna"
92·33	2·67	Bay	Blackish brown	good	Natural dark brown oxide
95·91	2·33	Chestnut	Dark brown	good	Natural dark brown oxide

A dark red oxide of good quality came from about four miles east of Yandicoogina. It gave a burnt sienna paint with oil and contained 81.00 per cent. Fe_2O_3 and 11.02 per cent. insoluble.

MINERAL NOTES.

Garnet.—A sample consisting of small somewhat rounded masses of detrital garnet about one inch in diameter from Yinnietharra was examined for its value as an abrasive in making sand paper. Quartz and mica impurities amounted to approximately 8-10 per cent. The garnet was found to be andradite and it crushed to a light brown, angular powder which was roughly graded and then tested in tubes for the capillary rise of water. This test indicated that this garnet should adhere well when prepared as sand paper.

Manganapatite.—This mineral was recorded for the first time from M.L. 17, Goodardy Tin Leases where it occurred in small green patches in an aplitic type of rock.

Anthophyllite.—Some of the anthophyllite asbestos at Bindi Bindi is being sold as "Amosite" by an Eastern States firm as it possesses many of the properties of South African amosite. It separates easily into very fine fibres which are tough, silky and slightly harsh to the touch. A partial analysis gave:--3A (mainly Fe) 9.14 per cent.; CaO 0.02 per cent.; MgO 28.95 per cent.; K_2O ± small. The fibres have straight extinction, length slow, low birefringence and refractive index just slightly above 1.61. The mineral is therefore anthophyllite.

Aragonite.—Radiating crystalline aragonite has been recorded during the year from Yinnietharra Station and from between Ora Banda and Grant's Patch. The specimen from the latter locality had S.G. 2.94; Ng 1.68; Np 1.53 and contained a very small quantity of strontium, equal to 0.33 per cent. of strontium carbonate (strontianite).

Chromite.—Dense brownish black chromite is associated with basic rocks about 10 miles south south-east of Byro Station. Specimens ranged from S.G. 4.52 (Cr_2O_3 61 per cent.) to S.G. 3.99 (Cr_2O_3 55 per cent.) and averaged about 57 per cent. Cr_2O_3. The chromite contains a little ceylonite, magnetite and limonite.

Graphite.—Partially concentrated samples of graphite from Kendenup and the Donnelly River near Manjimup contained the following amounts of graphite:—

Kendenup: 91.80, 89.98, 91.08, 90.37, 89.72%.
Donnelly River: 69.63, 70.75, 76.55, 77.87%.

The principal mineral associated with the Kendenup graphite is mica, and with the Donnelly River graphite, kaolin.

Particularly fine specimens of graphite from Munglinup and the Young River were presented for the collections by H. A. Ellis, Geological Survey.

Ilmenite.—Massive black ilmenite occurs on Green Vale Station about 140 miles south of Wyndham. It is stated to occur as a hill 250-300 feet high. The specimen examined consisted of 63 per cent. ilmenite with 33 per cent. limonite.

Kyanite.—Small boulders of dense finely crystalline kyanite from Smithfield consist of 93 per cent. kyanite, the remainder being made up of limonite, quartz, rutile and ilmenite. This kyanite is fresh and only slightly iron-stained, on the surfaces.

Magnesite.—A high grade magnesite suitable for use as a refractory came from loc. 15930, Kuminin. It contains 99 per cent. $MgCO_3$ with Fe_2O_3 + Al_2O_3 0.40 per cent., insoluble 0.32 and a trace of CuO.

Monazite.—A sample of detrital material sent in from Marble Bar but probably from Cooglegong contained 30 per cent. of monazite in typical pale brown fragments of grit and gravel sizes associated with cassiterite, magnetite, ilmenite, tantalite, yttrotantalite, limonite and garnet.

Prehnite.—This mineral was recorded for the first time at Londonderry where it was collected in the main felspar quarry by H. A. Ellis, where it is associated with quartz, halloysite and opal. One specimen has a radiating structure. A partial analysis gave SiO_2 43.7 per cent, 3A 25.8 per cent.; CaO 26.5 per cent. The refractive indices are Ng, 1.641-1.65; Nm 1.617-1.629; Np 1.608-1.617. The S.G. is 2.92.

Talc.—Samples of good commercial grade talc from G.M.L. 5916E at Mt. Monger were examined. The talc is massive and varies in composition from a mixture of tremolite and talc to almost pure talc. The massive type with tremolite (37 per cent.) when heated to 1,350° C. gave a hard uncracked body suitable for furnace linings. The other varieties were suitable for use in powdered form.

Topaz.—A new locality for topaz is in a quartz biotite rock from Martin's lode at Callie Soak. It occurs both in the lode where it is associated with wolframite and in the lode matrix which is a topaz-quartz-biotite rock.

Wavellite.—This mineral was identified many years ago in phosphatic material from the Dandaragan district and was recently identified again as veinlets in chalk from Emu Hill, Dandaragan. It occurs in colourless sheaf-like forms, which have straight extinction, positive elongation and Ng 1.550-1.560; Np 1.520-1.530. It gave much H_2O, Al_2O_3, P_2O_5 and was soluble in HCl or NaOH.

Soil Mineralogy.—The mineral grains present in the sand fraction (60-90 I.M.M.) of two series of soil samples collected by the Department of Agriculture from Mimegarra Station and the Gingin, New Norcia, Moora, Dandaragan and Toodyay districts were determined. This type of investigation is the first to be undertaken jointly by the Department of Agriculture and this laboratory in order to obtain fundamental information about local soils from the nutritional point of view.

Many of the soils in Western Australia have arisen directly from the underlying parent rock, and as the land is little dissected by streams with power to erode the surface the resulting soils can be traced by their mineral content to the type of rock giving rise to them. Much of the patchiness of soils can be traced to this cause.

At Mimegarra the soils are derived from marls sandstones and alluvial material from the Minyulo Brook. The minerals show evidence of more than one cycle of sedimentation and differences in nutritional status are probably due to the greater amount of clay in the drainage channel at Caro and Caro Swamp and a similar type at Mimegarra.

The mineralogy of soils from the second series (Moora, Dandaragan, etc.) has enabled the following types to be recognised, irrespective of field observations and previous knowledge of the geology of the areas concerned:—

1. Alluvial soils (West Swan, Bullsbrook).
2. Soils derived from a sedimentary series (in this instance the Cretaceous sediments). Gingin, Dandaragan.
3. Soils derived more or less directly from Pre-Cambrian rocks.

   (a) Those characterised by the abundance of amphiboles, epidote and sometimes pyroxene, which are derived from epidiorites, dolerites, basic schists and basic gneiss. Bindoon, New Norcia, Walebing, Berkshire Valley, Culham, Coondle, Toodyay.

   (b) Those characterised by the abundance of zircon, tourmaline, rutile and sometimes kyanite and andalusite, with subordinate amphibole and epidote, which derive from granites, gneisses, some types of meta-sediment and laterite. Yericoin, Calingiri, Calcarra, Baker's Hill, Kojedda, Wooroloo.

The details of this mineralogical examination have been prepared for publication in the Journal of the Department of Agriculture.

Mineral Collections.—During the year a new mineral collection was started with specimens of scientific interest which are received from various parts of the State. Extra space is now available in the mineral store in which the minerals are arranged alphabetically and in addition larger quantities of minerals are kept in a bulk store. In view of the increased demand for some minerals, *e.g.*, beryl, scheelite, wolfram, tantalite, etc., small sets of minerals were made up for the Cue and Mt. Magnet Road Boards for the use of prospectors and others interested. An effort has been made to secure bulk parcels of minerals so that specimens will be available for distribution.

West Pilbara Minerals.—A preliminary report by Mr. H. P. Rowledge on mineral occurrences in this area is given in an appendix to this report.

Publications.—H. E. Hill and L. J. H. Teakle—The Rotting of Superphosphate Bags, Journal of Department of Agriculture, Western Australia, Vol. 20, No. 2, 1943.

A. G. Turton, L. J. H. Teakle, H. K. Johns—Experiments with micro-elements, Part IX, Journal of Department of Agriculture, Western Australia, Vol. 20, No. 3, 1943.

A. G. Turton, L. J. H. Teakle—The Copper, Manganese and Zinc Content of Subterranean Clover and Oats in Western Australia, Journal of Department of Agriculture, Western Australia, Vol. 20, No. 3, 1943.

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APPENDIX I.

PRELIMINARY REPORT ON A MINERALOGICAL EXAMINATION OF PORTIONS OF THE PILBARA GOLDFIELD.

By Mr. H. P. Rowledge, A.A.C.I., A.W.A.S.M.

Tantalum and Niobium.

Wodgina.—The chief occurrence at Wodgina is in a pegmatite vein which has been extensively worked in the past for the production of tantalite. It outcrops for some distance approximately north and south on the westerly slopes of a rugged hill and has been weathered resulting in tantalite bearing detritus on the slopes.

The tantalum and niobium minerals occurring in this lode are confined almost solely to manganotantalite with a little manganocolumbite and ixiolite. The mineral distribution varies considerably over its whole length. Large masses of coarsely crystalline albite occur in places with but little silicate minerals other than small amounts of greenish mica. Large masses of quartz occur in other places. Segregations of green mica appear associated with albite, well crystallised spessartite and gahnite, and lithiophyllite altering to purpurite and psilomelane is present in fair amounts mainly at the north end close to the rosterite blow. Green beryl and lepidolite were noticed in the central portions. Granite occurs in places in bars and pockets with the felspar constituents microcline. The manganotantalite occurs in areas of enrichment and is found mainly in the albite and sometimes at the junction of albite and quartz and where small veins of greenish mica occur in the albite. In the past it appears to have been worked on the selective system the richer portions having been mined. It has been reported as occurring in large irregular masses up to several pounds in weight and in rectangular blocks.

At the south workings most of the manganotantalite was in the latter form in practically pure coarsely crystallised albite and occurred in the pillars and supports in the upper regions left from earlier mining. One rectangular block seen was about 4 in. by 2 in. by 1 in. in size and was closely associated with a radioactive uranium mineral, in pockets the size of a pea, in veinlets and sometimes coating the manganotantalite itself. A specific gravity determination showed this manganotantalite to contain approximately 64 per cent. Ta_2O_5.

Manganotantalite also occurs in the detritus and soil on the lower slopes. Samples obtained when concentrated showed the presence of a little cassiterite with the manganotantalite. No casserite was noticed in the lode itself but there are pegmatites adjacent which are cassiterite bearing so that it is probable that this mineral was shed from the latter.

Surface dumps of ore mined from these workings were examined and specimens obtained for future mineralogical examination.

Ore was being mined at a point just north of the north fault near the rosterite deposit where the pegmatite broadens in a depression. It was being obtained from an opencut running approximately north 50° west from the east slope across the pegmatite. The face of this opencut was examined after successive firings and samples and specimens obtained.

The face showed the formation to consist mainly of albite with small bands and veins of quartz in parts as well as fine scaly greenish mica and small bunches of greenish-brown mica. Spessartite was seen in the fine scaly micaceous portions. Dense lepidolite occurs in the north wall of the cut. In the albite itself were seen patches and eyes of much decomposed black material consisting of purpurite and psilomelane with brown and yellow alteration products, samples of which will be examined later.

Several specimens showing the occurrence of manganotantalite here were obtained. It was mainly in the form of tiny lath-shaped and hair-like crystals in the albite associated with small bunches of mica and showing dendritic manganese staining. One specimen showed a thin flat plate about 2 in. long and ¼ in. wide.

The richest specimens obtained were closely associated with bluish-green apatite and showed all the above forms with one crystal ¾ in. by ⅜ in., showing albite completely enclosed by plates of manganotantalite.

The manganotantalite as seen in this open-cut is sparsely distributed and appears to occur in areas of enrichment. There seemed to be much albite not showing any. Specimens containing manganotantalite were crushed and concentrated, yielding a concentrate of 1.5 per cent. It was mostly in the form of small flat tabular and thin rectangular crystals containing approximately 20 per cent. Nb_2O_5.

North of this location pegmatites can be seen outcropping both on the east and west slopes of the next hill. On the west slope they run for some considerable distance. A number of them have been opened up by potholes and small cuts, some of which are reported to contain tantalite and in some cases microlite.

At the "Rock Hole" about three-quarters of a mile north 75° west of the beryl workings at the extreme north end of the main lode are pegmatites running in the same general direction north and south. An examination of potholes showed them to be similar to the occurrence at the north workings already described inasmuch as the walls and faces consisted mainly of albite with patches and veins of quartz and small bunches of coarse mica. Softer veins of weathered albite with mica yielded manganotantalite on concentration and no cassiterite. Small amounts of spessartite similar to that at the main lode was also observed. The concentrate showed the manganotantalite to be in the form of tiny lath-shaped crystals similar to that occurring at the north working.

Manganotantalite was also seen in albite pegmatite associated with quartz and flat plates of spodumene in rugged hilly country in the Terra Nova lease south of the main workings at Wodgina.

Tabba Tabba.—Manganotantalite occurs in a pegmatite vein which runs for some distance approximately north 52° west outcropping on the northerly slopes of a low hill about three-quarters of a mile north-north-west of Tabba Homestead. It has been worked in a number of places where quartz is boldly outcropping. It is under this quartz which dips at a flat angle to the east that the manganotantalite, generally in a finely divided condition in much weathered felspathic material, has been mined.

On the lowest part of the slope at the south-east end of the workings there are a number of costeens and potholes which have been mined for tantalite. It can be seen in the quartz, from which the felspathic material has been removed, in fragments up to 1 in. in size. A fair amount of green curved mica was noted here associated with the quartz and albite.

Further up the slope to the north-west and on to the highest points of the outcropping pegmatite a fair amount of mining has been done by open-cuts, shafts and stoping. An interesting occurrence here underlying the outcropping quartz is the association of manganotantalite with well formed beryl crystals. The latter occur in a narrow band attached to the underside of the quartz, which is itself underlain by a selvedge of micaceous material containing grains of manganotantalite and in some places specimens show skins of compact granular manganotantalite one-sixteenth of an inch thick. Below this again occurs weathered felspathic material which has been largely mined for tantalite. Curved lepidolite and beryl crystals were seen in the dump.

A specific gravity determination showed the manganotantalite to contain approximately 76 per cent. Ta_2O_5. Parcels assayed from this locality have generally shown them to contain less niobium than those from Wodgina.

Microlite has also been reported from this locality but was seen principally at alluvial workings at Crawford's Tantalite Prospect about one mile north-north-east, specimens of which were given to me by Mr. Allan Crawford.

Further to the north-west again of the main tantalite workings simpsonite occurs in fragments up to three-quarters of an inch in size, associated with quartz grains and fragments in soft weathered felspathic material and mica. Specimens were picked out of the wall of a costeen underlying about three feet of quartz capping.

On the lower slopes on the other side of the hill further towards the north-west, manganotantalite occurs in a mica segregation in grains and small rectangular crystals. The mica segregation occurs as an aggregate of uniformly crystalline plates of greenish mica up to one-eighth of an inch in diameter and quartz grains. The specific gravity showed this manganotantalite to contain approximately 61 per cent. Ta_2O_5.

Manganotantalite has also been recorded from the detritus surrounding this pegmatite. It usually contains some cassiterite, probably derived from adjacent cassiterite bearing pegmatites, of which there are a number.

Strelley.—The pegmatite vein which is being mined for tantalite is situated several miles south-east of Strelley Homestead and about one mile north of the Port Hedland-Marble Bar railway. It is a wide vein outcropping on a low rise in flat country and running approximately in a north and south direction. The workings consist of irregular open-cuts, costeens and shafts more or less connected and mined to varying depth, the maximum of which would be about 20 feet. The richer portions are apparently being followed and worked.

It consists of soft weathered felspathic material interspersed with large irregular masses of quartz albite and in some places microcline. Mica is present in fissures and pockets and in larger segregations. Dense lilac-tinted mica was seen outcropping intermittently along the whole vein. No beryl was seen *in situ* but a few chips obtained from a panning dish and one small grey crystal from the ore bin feed were given me.

The manganotantalite is irregularly distributed throughout the lode, and specimens obtained from the softer weathered portions consisted of angular fragments varying in size up to about one inch. The mean specific gravity of the cleanest of these fragments was 7.55, showing it to have a high tantalum content, 79 per cent. Ta_2O_5. Specimens were also obtained of unweathered albite showing manganotantalite, a mica aggregate with grains and tiny rectangular crystals similar to that at Tabba Tabba, and fragments of manganotantalite altering to microlite. The manganotantalite has proved in the past to be generally high grade being associated with tapiolite and microlite.

Workings consisting of small potholes and costeens were examined about 2½ miles north of the main workings on the right hand side of the Port Hedland road in pegmatite veins, some of which were tantalum-bearing and others cassiterite-bearing. A number of small pieces collected from the dumps proved to be tapiolite with two or three pieces of cassiterite. The mean specific gravity of several pieces was 7.53, showing them to have a high tantalum content of approximately 79 per cent. Ta_2O_5.

Pilgangoora.—The area visited in this locality was from a point about one mile north-north-east of Trig CC32 to about three or four miles south as far as the Mt. York Tin Mine.

Numerous pegmatites occur in this belt of country on the flats and westerly slopes of a range of hills running approximately north and south, the pegmatites themselves having the same general trend.

No one was working on the field and little more than a surface inspection could be carried out as in only one case was a pegmatite seen opened up for tantalite, which was at Gilbert and Houston's shaft north-east of Trig CC32 on the lower slopes of the hills at the north end of the belt. A number had, however, been opened up for cassiterite, especially towards the south end.

In the past the detritus surrounding the pegmatites has provided most of the tantalite and there was evidence of this working. Not until the pegmatites themselves have been opened up and systematically sampled will it be possible to estimate the quantity and grade available.

At Gilbert and Houston's shaft manganotantalite occurs in partly weathered albite near its junction with quartz and is closely associated with greenish grey columnar bands of spodumene. It occurs in flat plates and rectangular crystals up to one inch in length, showing terminal faces. The mean specific gravity of a number of crystals was 6.56, showing it to contain approximately 52.2 per cent. Ta_2O_5 and 31.0 per cent. Nb_2O_5.

Manganocolumbite is known to occur in this district and one specimen, S.G. 5.42, weighing 260 grams, was given to me by Mr. Eades as coming from this locality.

Kangan.—On Kangan Station, close to the homestead in a direction N. 32° E., is an occurrence of tantalum-bearing pegmatites. These pegmatites run approximately east and west on the lower south slopes of a range of hills running in the same direction. They consist of quartz outcrops surrounded by rubbly brownish alluvial and detrital material, and where they have been opened up by costeens weathered albite and mica is seen. Enrichment appears to have taken place where the albite abuts the quartz for coarse fragments of grey and light brown "tantalite" have been recovered from the weathered material with black "tantalite" showing in the quartz face. Whether this mineral is tantalite or tapiolite altering to microlite has not yet been definitely determined but the form and appearance suggests the latter. Good specimens up to two inches in size were obtained, some showing crystal faces with specific gravities ranging from 6.40-7.29. Two pieces of black tantalite, one inch in size, stated to have come from the alluvial below the costeen, were collected. Tantalite twinned in rosette fashion and intergrown with albite and quartz was given to me as coming from a cross vein 300 yards east of the costeen. About one mile in a westerly direction, on the south slopes of the same range of hills, beryl was seen in a quartz outcrop. In the adjoining detrital material tantalite was obtained, some being twinned in rosettes and intergrown with albite and quartz, and others fragments of rectangular crystals. Arrow head shaped pieces of tantalite were obtained from alluvial about half-way between the beryl outcrop and the costeen. It would appear that tantalite may be found for some distance in the pegmatites on these slopes.

Conclusions.

In only three localities have the pegmatites been worked extensively for tantalite, namely at Wodgina, Tabba Tabba and Strelley, and in each of these places only one line of pegmatite has been worked to any extent. Much tantalite has been removed from these workings, and only by systematic sampling can any idea be formed of the quantity remaining.

Other pegmatites in these localities have been worked in a smaller way by prospectors and others who have fossicked in the alluvial and opened up small potholes where the pegmatite is exposed. Where tantalite has been found in the alluvial it seems certain that it will be found in the pegmatite adjacent to it. Tantalite occurs in areas of enrichment and only by systematic examination can the extent of its distribution in the pegmatites be estimated. This applies also to the Pilgangoora field where most of the tantalite in the past has been recovered from the alluvial and very little from the pegmatites.

Two places were seen where tantalum minerals were being obtained in a smaller way on Kangan and Tabba Tabba Station.

At Kangan good specimens of tantalite, tapiolite and microlite were being picked and collected from costeens. Tantalite was also obtained from the alluvial at two other places up to a mile away. This occurrence may be worth investigating and sampling.

Microlite was being collected from alluvial in coarse fragments at Crawford's Lease, Tabba Tabba. Sampling would show the extent to which it occurs.

Beryl.

Wodgina.—The only beryl deposit yet located at Wodgina is at the main workings of the Tantalite Mine, where a considerable tonnage is being produced. It is the caesium variety known as rosterite and occurs in the nature of a large blow as pale milk white irregular masses without any distinct crystalline form. In parts it is more vitreous and rose tinted. Surface fragments show black spots and dentritic markings of manganese staining. The pegmatite in the region of the deposit consists of segregations of quartz and albite containing a little mica and in one place the beryl penetrates a band of purpurite psilomelane where tantalite had previously been mined.

Translucent greyish green beryl without any crystalline form occurs over about 20 feet in old workings further south in the main lode.

Bulk samples of the white, rose and green varieties were collected.

Beryl fragments were being hand picked from the detritus on the slopes adjacent to the main deposit. Specimens were brought in from time to time for identification and guidance of the pickers.

Outcrops of a number of other pegmatites in the Wodgina area were followed and examined but in no case was beryl recognised. Keen interest in beryl was shown in the district, numerous samples being brought in for identification but in most cases the results proved negative.

No occurrence of beryl was seen at Wodgina other than that at the main workings of the tantalite mine.

Tabba Tabba.—The beryl in this locality occurs in a narrow band at the junctions of quartz and the tantalite bearing weathered felspathic material at the tantalite workings as described under "Tantalite."

A number of interesting specimens were obtained from the dump at the surface of the workings. Crystals were seen embedded at all angles in quartz. Most of them were ironstained and when cleaned they were seen to be translucent and milky white in colour. Of interest is the predominant basal development. One crystal on its side showed two bases and three prisms. It measured 1½in. from base to base and 1¼in. across the base. Another specimen showed two crystals the same size, ¾in. across the base, alongside one another. One showing the six sided base and the other two prism faces with perfect basal faces embedded in quartz. Larger stouter crystals of translucent milk white beryl not iron-stained were found attached to large boulders of quartz. They were easily removed and showed a perfect imprint of the crystal faces in the quartz. These crystals showed two bases and three prisms and were two inches across the base and two inches long. Another much larger ironstained crystal was found at the dump showing one six sided base five inches across and six prism faces.

The occurrence of beryl in these tantalite workings appears to be more of scientific interest than of commercial value.

Pilgangoora.—Broken crystals of green beryl were seen lying on the dump of a costeen about 80 yards west of the Wodgina-Lalla Rookh road about ¾ mile north of Trig CC32. It was coarsely crystalline showing base and prism faces with a predominant basal cleavage. It was associated with quartz and microcline. No beryl was seen in situ on examination of the walls and bottom of the costeen.

This occurrence does not seem to be of any size or importance. No other beryl is known or was seen in the district during a brief inspection.

Kangan.—An occurrence of beryl in this district about one mile west of the tantalite costeens on the south slopes of the range of hills was examined. It occurs in a quartz outcrop surrounded by detritus N60°W of the homestead. Boulders and fragments showing crystal development were seen in an area of about 50 yards square. The beryl found lying in the detritus was dull frosty brownish white in appearance and a microscopic examination showed it to be partially altered to kaolin, some of the crushed grains being much clouded with a R.I. of between 1.56 and 1.57. When the specimen was immersed in water it was

seen to be porous. The specimens obtained showed predominant vertical crystal striations of the parallel prism development with a basal parting.

This deposit would have to be opened up to decide the quantity present and whether fresh unaltered beryl would be found beneath the surface.

Mt. Francisco.—A number of beryl crystals were seen lying in the detritus of a pegmatite vein running N20°W at a point N75°E of Mt. Francisco and S20°E of a trig. station on a hill at the southern end of the Wodgina Hills.

This pegmatite which was outcropping on a low rise was much weathered and denuded. Quartz was boldly outstanding with some bands of microcline and albite and in some places large patches of large weathered flakes of muscovite. Surrounding the outcropping pegmatite was rubbly detrital material and it was in this that the beryl crystals were partly embedded. They were mostly ironstained with corroded surfaces and varied in size the largest seen being 15in. long and 10in. across the base, the smallest under 1in. They were mainly six sided prisms with imperfect bases. When broken the fresh surface was vitreous and pale green in colour with some vertical crystal striations. Some of the smaller pieces were fragments broken off larger crystals showing similar development on the faces.

Numbers of crystals could be picked up and gathered from the surface but there was no evidence seen of beryl in situ in the pegmatite. This deposit would have to be opened up to ascertain if it is present in any quantity in the pegmatite itself. I have recently been informed that beneath the detrital material beryl crystals were found standing vertical in position in the pegmatite in pinnacle fashion.

LITHIUM MINERALS.

Lepidolite.

Wodgina.—Lepidolite occurs at several places in the Wodgina district, namely in the pegmatite at the north end of the main tantalite workings, the north extension of this pegmatite, about the centre of the main workings and at West Wodgina.

At the north end of the main tantalite workings it was seen exposed over a length of about 20 feet in the north wall of the open cut mentioned under tantalite on the east slope. It was also seen outcropping 45 yards away N50°W at the top of the rise and again 35 yards further on in the same direction on the west slope. It is a dense compact fine scaly variety varying in colour from lilac, mottled dark grey and lilacs to light violet. Hand picked specimens collected in the open cut showed them to contain from 1.8 per cent. Li_2O in the lilac coloured material to .5 per cent. in the light violet. The samples collected from the surface outcrops have yet to be examined. Whilst there appears to be a substantial body of this material, it seems to be too low in Li_2O content to be of much value.

The extension of the pegmatite north of the north workings was followed for some distance along the west slope of the hill across a gully and up the southerly slopes of the next hill. On the westerly slopes of this hill is a bold quartz escarpment below which an outcrop of lepidolite occurs. Specimens obtained showed it to be a more scaly variety than that seen at the north workings and to be intimately associated with greenish quartz.

Lepidolite was also seen in the floor of an adit about the centre of the main tantalite workings.

At West Wodgina lepidolite occurs on the westerly slopes of the Wodgina Hills. It was seen outcropping associated with quartz and felspar over an area of about 20 yards square just north of an open cut worked for cassiterite at a position about 400 yards north of peg R at the mouth of an east-west running gorge in which is a government well. It was a dense compact variety similar to that seen at the north workings at Wodgina. The dump at the mouth of the open cut contained lepidolite in the form of long slender prisms, with eminent basal cleavage, in quartz specimens of which were obtained.

Lithiophyllite.

Lithiophyllite altering to purpurite and psilomelane occurs in eyes and patches throughout the lode at the tantalite workings. In one place at the north end near the beryl workings a larger concentration occurs which appears much altered. A similar occurrence was seen at the "Rock Hole" about ¾ mile to the north-west.

Spodumene.

Spodumene was seen in pegmatites at the dump on the old Terra Nova M.L. south of the main tantalite workings. It occurs as large flat plates ⅜in. thick in quartz boulders associated with albite and tantalite. It was too intimately associated with the quartz and did not appear to be in sufficient quantity to warrant further investigation. Specimens of similar spodumene were collected in very rugged country on the southerly slopes of the next hill south of Mt. Cassiterite where a number of pegmatites had been opened up in a small way. No considerable quantity however was seen.

Lepidolite.

Tabba Tabba.—Specimens of curved lepidolite in quartz and albite were obtained from the dump at the top of the rise of the tantalite workings.

On the south-east slope on the other side of the hill are a number of costeens, open-cuts and drives which have been worked for cassiterite. Lepidolite was seen at one place at the southerly end of these workings in the dump but was not seen in the faces of the workings. There does not appear to be any considerable amount. It occurs in both flat and curved flakes larger in size than most seen and in slender prisms associated with quartz and albite.

Strelley.—A lilac-tinted dense mica was noticed outcropping intermittently along the whole length of the lode at the tantalite workings alternating with bands of quartz and felspar. There appears to be a considerable amount of this material and a sample was collected for determination of the lithia content.

Pilgangoora.—Lepidolite occurs in this district in a pegmatite outcrop about one mile north-north-east of Trig CC32 on the flats between the Lalla Rookh road and the west slopes of a range of hills. It was seen outcropping in a number of places over an area of about 60 yards by 30 to 40 yards associated with microcline, albite and quartz. Specimens taken from the surface of the exposed outcrop appeared to be typical lilac scaly lepidolite, but examination in the laboratory showed it to contain under ½ per cent. Li_2O. It is possible that material below the surface may be of higher grade.

Spodumene.

Narrow columnar bands of spodumene were seen associated with tantalite in albite and quartz in an old small tantalite working, "Gilbert and Houston's," a few hundred yards south of the lepidolite outcrop and about 100 yards south of an east-west running creek bed. In this area the surface outcropping pegmatite shows flat plates in places similar in appearance and form to other spodumene seen but they were lilac in colour and micaceous. Examination in the laboratory of a specimen obtained showed it to be mica with only about 0.2 per cent. Li_2O. It is possibly altered spodumene and if so would indicate the presence of further spodumene below the surface.

At the southern end of the area examined and about three or four miles south of the above position, good specimens of spodumene were obtained from the dump at old workings of the Mt. York Tin Mine. The workings themselves could not be examined as the entrance had fallen in. It occurs in the characteristic form of large flat plates up to half an inch thick associated with quartz albite and crystalline cassiterite some of the latter being enclosed in the spodumene. The lithium content of one of the cleanest specimens was found to be 5·6 per cent. Li_2O.

Conclusions.

Lepidolite appears to occur in considerable quantities at Wodgina, Pilgangoora and Strelley. Hand specimens picked from the surface of the deposits at Wodgina and Pilgangoora were of low Li_2O content and consequently are doubtful propositions. The Li_2O content may improve at depth but only systematic sampling will give the quantity and grade. At Strelley the occurrence is a dense lilac mica, samples of which have yet to be determined.

Good specimens of lepidolite which appeared to be smaller occurrences were obtained from the north extension Wodgina, West Wodgina and Tabba Tabba.

The spodumene seen at Wodgina did not appear to be an occurrence of any extent, good specimens assaying 5·6 per cent. Li_2O were obtained from the surface dump of the Mt. York Tin Mine at the south end of the Pilgangoora field. No idea of the amount present in the workings could be obtained as the entrance had fallen in. It was also seen at Gilbert and Houston's tantalite shaft at the north end of the field. Surface indications point to the possibility that it may be fairly prevalent in this area.

Miscellaneous.

Scheelite.—An occurrence of scheelite was seen at West Wodgina, about one and a half miles south of the peg described under lepidolite and on the same westerly slopes of the Wodgina Hills. It was sparsely distributed over about 130 yards in quartz and softer kaolinised rock associated with biotite and tourmaline. Specimens showed the scheelite to be present in small pockets up to threequarters of an inch in size and light brown in colour in pale milky and dark grey quartz as well as colourless to white in small pockets and bands in kaolinised rock containing a little biotite.

Barite.—Barite occurs at Kangan Station in small seams up to two or three inches in width in grey banded rocks about 15 feet north of the costeens being worked for tantalite. About 100 yards due west are bigger seams up to four or five inches in width in similar country. The specimens obtained from the surface outcrop were stained brown by ironstaining.

Tourmaline.—Tourmaline was seen at three places in the Wodgina district, at the "Rock Hole," Mt. Cassiterite, and West Wodgina.

At the "Rock Hole" large boulders of black tourmaline up to one foot cube were seen lying at the dump of a small pothole about 50 yards from the water hole. They consisted mainly of aggregates of slender prismatic crystals, some of which are radiating associated with a little quartz and albite.

At the Mt. Cassiterite workings south of the main tantalite workings black boulders of tourmaline were seen at the dump consisting of crystal aggregates which when freshly broken are indigo blue in colour. There are also boulders of dense indigo blue minutely crystalline tourmaline.

No large individual crystals were seen at either of these two places.

At West Wodgina black tourmaline crystals were picked up in the alluvium on the flats at the foot of the westerly slopes below the scheelite occurrence. They varied in size up to two inches in length and showed well developed prism and pinacoid faces but no terminal ones. Some of them were partly corroded and ironstained.

Division VIII.

Annual Report of the Chief Inspector of Explosives for the Year 1943.

The Under Secretary for Mines.

I have the honour to submit for the information of the Honourable Minister for Mines, in compliance with Section 45 of the Explosives Act, 1895, my report on the workings of the Branch for the year 1943.

The quantity of explosives imported into the State during the year is shown in Table No. 1, and Table No. 2 gives a comparison of the quantities imported during the past five years.

Table No. 1.

Importation of Explosives into Western Australia during 1943.

	lbs.
Gelignite	2,230,800
Gelatine Dynamite	139,850
Permitted Explosives	265,900
Blasting Powder	67,500
Total	2,704,050
Detonators: Number	1,933,000
Fuse: Yards	3,861,600

Table No. 2.

Explosives.	1939.	1940.	1941.	1942.	1943.
	lbs.	lbs.	lbs.	lbs.	lbs.
Gelignite	2,307,750	5,236,050	5,131,650	2,219,900	2,230,800
Gelatine Dynamite	2,651,850	1,720,150	902,540	60,750	139,850
Permitted Explosives	145,950	250,050	239,800	115,500	265,900
Powder (Blasting and Pellet)	112,550	92,300	32,450	23,950	67,500
Detonators: Number	4,417,000	3,203,200	2,970,000	1,740,000	1,933,000
Fuse: Yards	8,952,000	8,815,200	7,044,000	2,822,400	3,861,600

The quantity of explosives used in the different classes of industry during the years 1942 and 1943 is given hereunder:—

	1942. lbs. used.	1943. lbs. used.
Gold Mining	3,296,150	2,006,250
Coal Mining	89,850	72,700
Agriculture	3,850	3,450
Quarrying	52,700	50,950
Mining and base metals	3,700	24,600
Miscellaneous	3,900	217,550
Government Departments	24,300	66,700
	3,474,450	2,442,200

The following tests were made during the year for the purpose of determining the suitability for use and the chemical stability of explosives:—

Explosives	1,056
Fuse	261

The following table shows the number of licenses issued during the year:—

Magazines on Government Reserves	16
Magazines used by Government Departments and on private property	78
Store Licenses Mode A	73
Store Licenses Mode B	1
Fireworks Licenses	1
Importation Licenses	2

During the year inspections were made of licensed premises and enquiries made with a view to ascertaining whether the requirements of the Act and Regulations were being complied with. As a result of these inspections and enquiries it was not found necessary to take proceedings against any holders of licenses, but the following explosives were destroyed:—

Date.	Place.	Kind.	Reason for Destruction.
15-2-43	York	1 lb. Gelignite	Owing to chemical deterioration.
16-2-43	Beverley	2 lbs. Gelignite	Owing to having absorbed moisture.
15-4-43	Yarloop	10 lbs. Gelignite	Owing to having absorbed moisture.
21-5-43	Guildford	5 lbs. Gelignite	Owing to having absorbed moisture.
28-5-43	Clackline	50 lbs. Mon. Powder	Owing to having absorbed moisture.
27-7-43	Fremantle	250 lbs. Gelignite	Owing to having absorbed moisture.
5-8-43	Laverton	750 lbs. Gel. Dyn.	Owing to having absorbed moisture.
10-8-43	Kalgoorlie	150 lbs. Gellgnite	Owing to having absorbed moisture.
8-11-43	Fremantle	19,750 lbs. Gelignite	Owing to having been damaged by water.
8-11-43	Fremantle	50 lbs. Gel. Dyn.	Owing to having been damaged by water.

I feel that I must express my appreciation for the able and willing assistance given throughout the year by Mr. Wood and Miss Hearne as so much time is taken up on work other than the ordinary routine required in the administration of the Explosives Act.

T. N. KIRTON,
Chief Inspector of Explosives.

26th April, 1944.

Division IX.

Report of the Chairman, Miner's Phthisis Board, and Superintendent, Mine Workers' Relief Act.

The Under Secretary for Mines.

I have the honour to submit for the information of the Hon. Minister for Mines, my report on this Branch of the Mines Department for the year 1943.

Under arrangements similar to previous years the Commonwealth Health Department continued the periodical examination of mine workers. The work being continuously carried on by the Health Laboratory at Kalgoorlie and by a mobile laboratory which visits the mining centres in the various Goldfields. The goldfields not visited by this unit during the year were the Ashburton, Gascoyne, Kimberley, Phillips River, West Kimberley and West Pilbara, which are remote and contain few mine workers:—

MINE WORKERS' RELIEF ACT.

Examinations under the Mine Workers' Relief Act during the year totalled 4,298 compared with 5,824 for the previous year, and 7,141 for 1941, further call-ups by the Military Authorities being responsible for the decreased number.

The results of the examinations for 1943 together with those for the previous years are shown in the tables annexed hereto. A graph is also attached illustrating the trend of the examinations since their inception. In explanation of these figures, I desire to make the following comments:—

Normals, etc.—These number 3,932, or 91.47 per cent. of the men examined and include men having first class lives or suffering from pneumoconiosis only. The figure for 1942 was 93.9 per cent. and for 1941, 95.785 per cent.

Early Silicosis.—These number 325 (the same as the previous year) of which 63 were new cases and 262 had previously been reported, the figures being 61 and 264 respectively for 1942, and 32 and 280 for 1941. Early silicotics represent 7.57 per cent. of the men examined, the figures for the two previous years being 5.563 per cent. and 3.921 per cent. respectively.

Advanced Silicosis.—Of the 32 cases reported 25 were men who advanced from early silicosis during the year, the other seven having been reported during previous years, but who nevertheless are sufficiently robust to continue in their employment. The number (32) represents 0.75 per cent. of the men examined, compared with 0.429 and 0.196 for the two previous years.

Silicosis plus Tuberculosis.—Five cases were reported compared with two and nil respectively for the two previous years.

Tuberculosis only.—Four cases were reported compared with three and seven respectively for the two previous years. This is not an industrial disease although sufferers are compensated under the Act. These men are always prohibited from employment in the mines, in order to prevent the spread of the infection.

General.—It will be noted that the percentages of both early and advanced silicotics show a further sharp increase which can be attributed to the combing out of men in normal health by the Commonwealth Authorities for military and other services.

The mobile x-ray unit continued to function fairly satisfactorily during the year, and owing to the closure of some of the mines in the outback centres, less than 12 months elapsed between visits to some of the localities, consequently a number of the men had two examinations during the year.

MINES REGULATION ACT.

Examinations under the Mines Regulation Act totalled 868. This was in addition to the 4,298 examined under the Mine Workers' Relief Act. These examinations showed a further substantial reduction when compared with the previous two years, when the figures were 1,360 (1942) and 2,918 (1941).

The 868 men comprise 479 new applicants for the initial certificate and 389 re-examinees for the initial certificate.

Particulars of the examinations are as follows:—

NEW APPLICANTS.

Normal	408
Pneumoconiosis	44
Silicosis early	4
Silicosis advanced	—
Query tuberculosis	7
Tuberculosis	2
Pneumoconiosis plus query tuberculosis	2
Pneumoconiosis plus tuberculosis	—
Silicosis early plus query tuberculosis	—
Silicosis early plus tuberculosis	—
Silicosis advanced plus query tuberculosis	—
Silicosis advanced plus tuberculosis	—
Other conditions	12
	479

Of the above applications for admission to the industry 408 received the initial certificate (Form 2), 32 received re-admission certificates (Form 6), 36 received special certificates (Form 9), one was issued with temporary rejection certificate (Form 3) and two were issued with rejection certificates (Form 4). Thus, of 479 applicants, 408 were eligible for employment anywhere on a mine, 68 were eligible for surface employment and three were not eligible for any employment on a mine. There is, however, no information as to how many of these new applicants actually entered the industry.

RE-EXAMINATIONS.

Normal	175
Pneumoconiosis	141
Silicosis early	20
Silicosis advanced	4
Query tuberculosis	24
Tuberculosis	1
Pneumoconiosis plus query tuberculosis	12
Pneumoconiosis plus tuberculosis	—
Silicosis early plus query tuberculosis	1
Silicosis early plus tuberculosis	1
Silicosis advanced plus query tuberculosis	—
Silicosis advanced plus tuberculosis	—
Other conditions	10
	389

These men had been previously examined and some were engaged in the industry prior to this examination. One hundred and seventy-five received the initial certificate (Form 2), five received rejection certificates (Form 4), 52 received re-admission certificates (Form 6), 156 received special certificates (Form 9), and two received prohibition certificates (Form 10). Thus, of 389 re-examinees, 175 were eligible for employment anywhere on a mine, 208 were eligible for surface employment, and seven were not eligible for any employment.

Grouping the two sets of figures discloses that the following certificates were issued under the Mines Regulation Act, 1906:—

Initial certificates (Form 2)	583
Rejection certificates (temp.) (Form 3) ..	1
Rejection certificates (Form 4)	7
Re-admission certificates (Form 6)	84
Special certificates (Form 9)..	191
Prohibition certificates (Form 10)	2
	868

The percentage of men of normal health to the number examined was 67·176, while for the two previous years the percentage was (1941) 86·156 and (1942) 72·647.

MINER'S PHTHISIS BOARD.

The amount of compensation paid during the year totalled £37,359 14s. 2d., compared with £41,126 for 1942, the reduction being due to the deaths of beneficiaries and the attainment of the age of 16 years by some of the dependent children.

The number of beneficiaries under the Miners' Phthisis Act now totals 278, being 70 ex-miners, 204 widows and four orphan children; the figures for 1942 being 288 (74, 210 and four respectively).

J. THOMAS,
Acting Chairman Miner's Phthisis Board and Superintendent Mine Workers' Relief Act.
24th February, 1944.

TABLE SHOWING RESULTS OF PERIODICAL EXAMINATION OF MINE WORKERS FROM INCEPTION OF EXAMINATIONS (1925) TO 31ST DECEMBER, 1942.

First Examination (1925–26).

			Per cent.
Normals, etc	3,239	=	80·5
Silicosis Early	459	=	11·4
Silicosis Advanced	183	=	4·5
Silicosis plus Tuberculosis	131	=	3·3
Tuberculosis only	11	=	·3
Total number of men examined	4,023	=	100·0

Second Examination (1927).

				Per cent.
Normals, etc—				
Previously reported as Normals, etc.	2,290			
New cases (*i.e.*, cases examined for the first time)	826			
		3,116	=	83·6
Silicosis Early—				
Previously reported as Early	348			
New cases	33			
		381	=	10·2
Silicosis Advanced—				
Previously reported as Advanced	85			
New cases	8			
		93	=	2·5
Silicosis plus Tuberculosis—				
Previously reported as Normals, etc.	13			
Previously reported as Silicosis Early	27			
Previously reported as Silicosis Advanced	62			
New cases	26			
		128	=	3·4
Tuberculosis only	10	=		·3
Total number of men examined	3,728	=		100·0

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Third Examination (1928).

				Per cent.
Normals, etc.—				
Previously reported as Normals, etc.	2,738			
New cases	239			
		2,977	=	85·5
Silicosis Early—				
Previously reported as Normals, etc.	47			
Previously reported as Silicosis Early	303			
New cases	12			
		362	=	10·4
Silicosis Advanced—				
Previously reported as Normals, etc.	1			
Previously reported as Silicosis Early	16			
Previously reported as Silicosis Advanced	79			
New cases	2			
		98	=	2·8
Silicosis plus Tuberculosis—				
Previously reported as Normals, etc.	10			
Previously reported as Silicosis Early	14			
Previously reported as Silicosis Advanced	10			
New cases	8			
		42	=	1·2
Tuberculosis only—				
Previously reported as Normals, etc.	3			
New cases	1			
		4	=	·1
Total number of men examined		3,483	=	100·0

Fourth Examination (1929).

				Per cent.
Normals, etc.—				
Previously reported as Normals, etc.	2,099			
New cases	21			
		2,120	=	81·9
Silicosis Early—				
Previously reported as Normals, etc.	100			
Previously reported as Silicosis Early	224			
New cases	2			
		326	=	12·6
Silicosis Advanced—				
Previously reported as Silicosis Early	34			
Previously reported as Silicosis Advanced	60			
		94	=	3·6
Silicosis plus Tuberculosis—				
Previously reported as Normals, etc.	8			
Previously reported as Silicosis Early	14			
Previously reported as Silicosis Advanced	19			
		41	=	1·6
Tuberculosis only—				
Previously reported as Normals, etc.	7			
		7	=	·3
Total number of men examined		2,588	=	100·0

Fifth Examination (1930).

				Per cent.
Normals, etc.—				
Previously reported as Normals, etc.	2,751			
New cases	34			
		2,785	=	81·9
Silicosis Early—				
Previously reported as Normals, etc.	133			
Previously reported as Silicosis Early	247			
New cases	3			
		383	+	11·3
Silicosis Advanced—				
Previously reported as Silicosis Early	22			
Previously reported as Silicosis Advanced	43			
New cases	2			
		67	=	2·0
Silicosis plus Tuberculosis—				
Previously reported as Normals, etc.	6			
Previously reported as Silicosis Early	60			
Previously reported as Silicosis Advanced	46			
New cases	2			
		114	=	3·3
Tuberculosis only—				
Previously reported as Normals, etc.	47			
New cases	3			
		50	=	1·5
Total number of men examined		3,399	=	100·0

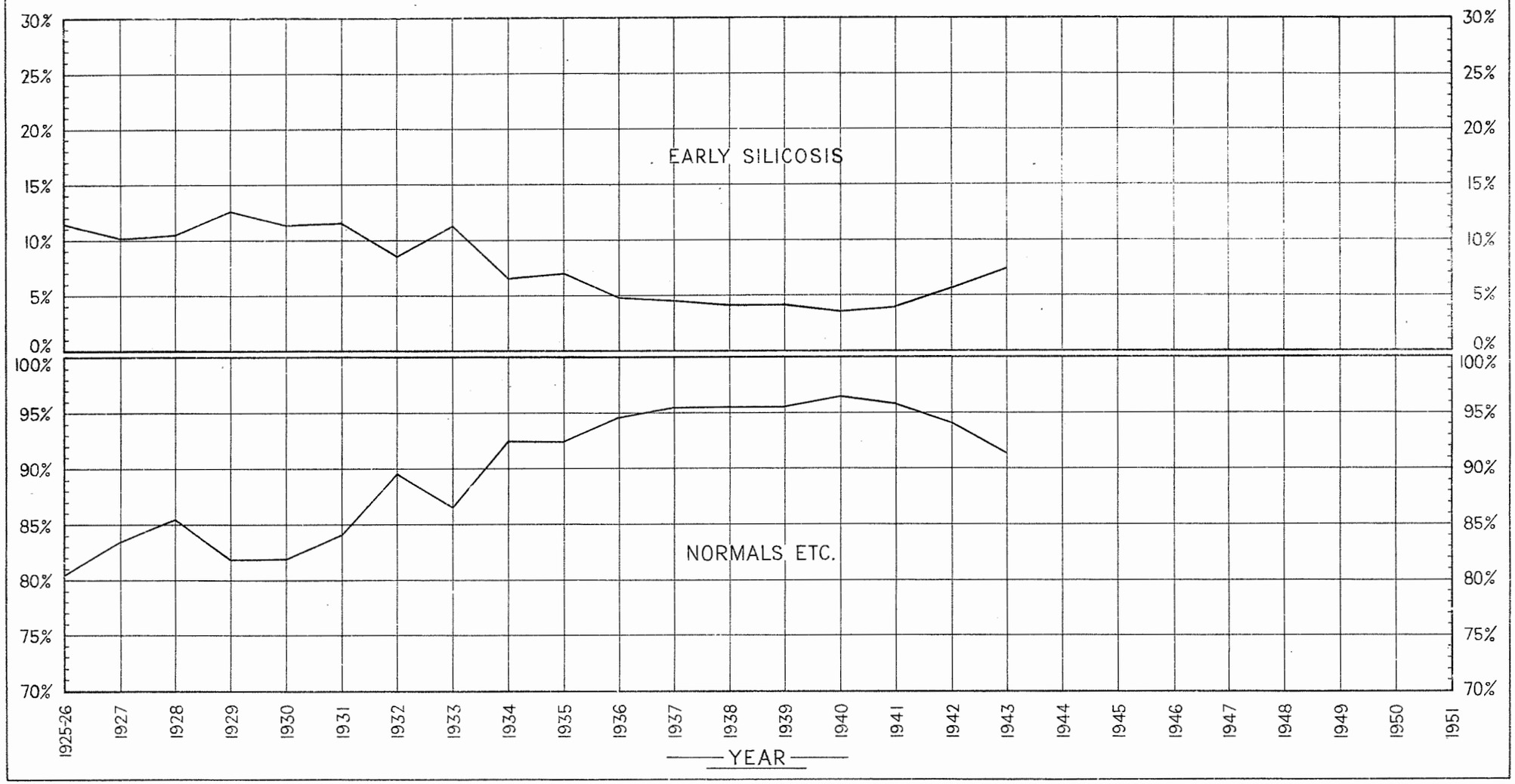
Sixth Examination (1931).

				Per cent.
Normals, etc.—				
Previously reported as Normals, etc.	2,530			
		2,530	=	84·0
Silicosis Early—				
Previously reported as Normals, etc.	94			
Previously reported as Silicosis Early	252			
		346	=	11·5
Silicosis Advanced—				
Previously reported as Silicosis Early	18			
Previously reported as Silicosis Advanced	35			
		53	=	1·8
Silicosis plus Tuberculosis—				
Previously reported as Normals, etc.	4			
Previously reported as Silicosis Early	35			
Previously reported as Silicosis Advanced	19			
		58	=	1·9
Tuberculosis only—				
Previously reported as Normals, etc.	25			
		25	=	·8
Total number of men examined		3,012	=	100·0

PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH No.1

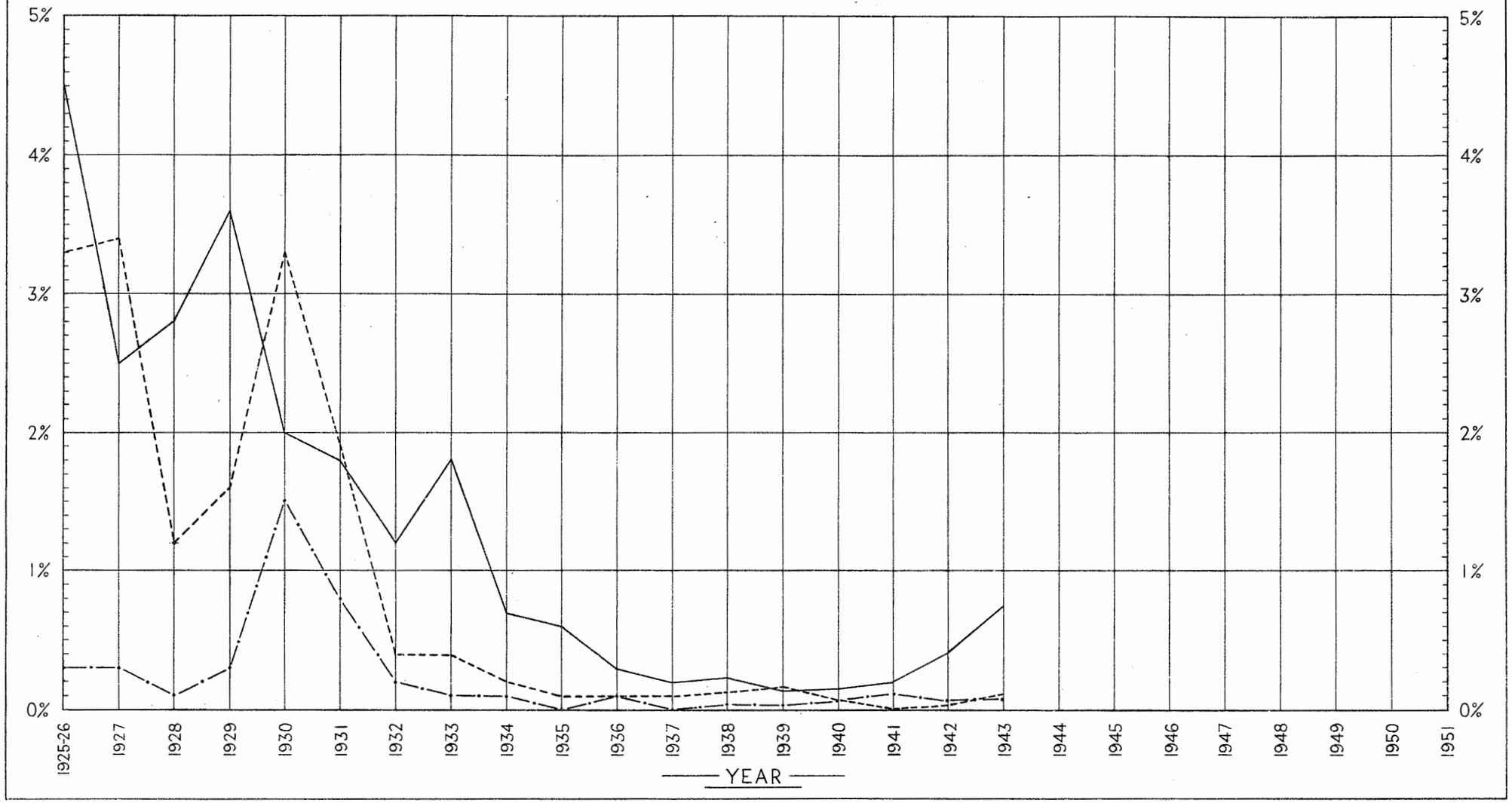
Showing Percentages of Normals and Early Silicotics, from 1925-26 onwards



PERIODICAL EXAMINATION OF MINE WORKERS

GRAPH Nº2

Showing Percentages of Silicosis Advanced, Silicosis plus Tuberculosis and Tuberculosis only, from 1925-26 onwards



PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Seventh Examination (1932).

			Per cent.
Normals, etc.	3,835	3,835 =	89·5
Silicosis Early—			
Previously reported as Normals, etc.	35		
Previously reported as Silicosis Early	338	373 =	8·7
Silicosis Advanced—			
Previously reported as Silicosis Early	6		
Previously reported as Silicosis Advanced	47	53 =	1·2
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	3		
Previously reported as Silicosis Early	9		
Previously reported as Silicosis Advanced	4	16 =	·4
Tuberculosis only—			
Previously reported as Normals, etc.		8 =	·2
Total number of men examined		4,285 =	100·0

Eighth Examination (1933).

			Per cent.
Normals, etc.	2,920	2,920 =	86·5
Silicosis Early—			
Previously reported as Normals, etc.	57		
Previously reported as Silicosis Early	322	379 =	11·2
Silicosis Advanced—			
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	15		
Previously reported as Silicosis Advanced	44	60 =	1·8
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	2		
Previously reported as Silicosis Early	9		
Previously reported as Silicosis Advanced	4	15 =	·4
Tuberculosis only—			
Previously reported as Normals, etc.		3 =	·1
Total number of men examined		3,377 =	100·0

Ninth Examination (1934).

			Per cent.
Normals, etc.	5,140	5,140 =	92·4
Silicosis Early			
Previously reported as Normals, etc.	54		
Previously reported as Silicosis Early	315	369 =	6·6
Silicosis Advanced—			
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	24		
Previously reported as Silicosis Advanced	12	37 =	·7
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	6		
Previously reported as Silicosis Advanced	6	12 =	·2
Tuberculosis only—			
Previously reported as Normals, etc.		5 =	·1
Total number of men examined		5,563 =	100·0

Tenth Examination (1935).

			Per cent.
Normals, etc.	4,437	4,437 =	92·3
Silicosis Early—			
Previously reported as Normals, etc.	35		
Previously reported as Silicosis Early	303	338 =	7·0
Silicosis Advanced—			
Previously reported as Silicosis Early	24		
Previously reported as Silicosis Advanced	2	26 =	·6
Silicosis plus Tuberculosis—			
Previously reported as Silicosis Early	5	5 =	·1
Tuberculosis only—			
Previously reported as Normals, etc.		2 =	·0
Total number of men examined		4,808 =	100·0

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Eleventh Examination (1936).

			Per cent.
Normals, etc.	6,972	6,972 =	94·7
Silicosis Early—			
Previously reported as Normals, etc.	29		
Previously reported as Silicosis Early	323	352 =	4·8
(Note.—Of the 352 cases of Early Silicosis reported, 23 were already suffering from Early Silicosis and 4 four Pneumoconiosis when re-admitted to the industry on the Re-admission Certificate under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	15		
Previously reported as Silicosis Advanced	4	20 =	·3
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	3		
Previously reported as Silicosis Early	8	11 =	·1
Tuberculosis only		8 =	·1
Total number of men examined		7,363 =	100·0

Twelfth Examination (1937).

			Per cent.
Normals, etc.	7,487	7,487 =	95·4
Silicosis Early—			
Previously reported as Normal, etc.	15		
Previously reported as Silicosis Early	319	334 =	4·3
(Note.—Of the 334 cases of Early Silicosis reported, 37 were already suffering from Early Silicosis when re-admitted to the industry on the Re-admission Certificate under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Silicosis Early	14		
Previously reported as Silicosis Advanced	4	18 =	·2
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	10	11 =	·1
Tuberculosis Only		2 =	·0
Total Number of men examined		7,852 =	100·0

Thirteenth Examination (1938).

			Per cent.
Normals, etc.	6,833	6,833 =	95·68
Silicosis Early—			
Previously reported as Normals, etc. ...	13		
Previously reported as Silicosis Early	266	279 =	3·91
(Note.—Of the 279 cases of Early Silicosis reported, 32 were already suffering from Early Silicosis and four from Pneumoconiosis when re-admitted to the industry on Re-admission Certificate under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normals, etc.	....		
Previously reported as Silicosis Early	15		
Previously reported as Silicosis Advanced	2	17 =	·24
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	8		
Previously reported as Silicosis Advanced	....	9 =	·13
Tuberculosis only—			
Previously reported as Normal, etc.		3 =	·04
Total number of men examined		7,141 =	100·00

Fourteenth Examination (1939)

			Per cent.
Normals, etc.	6,670	6,670 =	95·63
Silicosis Early—			
Previously reported as Normals, etc.	18		
Previously reported as Silicosis Early	264	282 =	4·04
(Note.—Of the 282 cases of Early Silicosis reported 28 were already suffering from Early Silicosis and one from Pneumoconiosis when re-admitted to the industry on Re-admission Certificates under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normals, etc.	....		
Previously reported as Silicosis Early	7		
Previously reported as Silicosis Advanced	3	10 =	·14
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.	1		
Previously reported as Silicosis Early	9		
Previously reported as Silicosis Advanced	1	11 =	·16
Tuberculosis only—			
Previously reported as Normals, etc.		2 =	·03
Total number of men examined		6,975 =	100·00

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Fifteenth Examination (1940).

			Per cent.
Normals, etc.	7,023	7,023 =	96·218
Silicosis Early—			
Previously reported as Normals, etc.	12		
Previously reported as Silicosis	245	257 =	3·521
(Note.—Of the 257 cases of Early Silicosis reported, 23 were suffering from Early Silicosis and 12 from Pneumoconiosis when re-admitted to the industry on Re-Admission Certificates under Regulation 7 of the Mines Regulation Act, 1906.)			
Silicosis Advanced—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	10		
Previously reported as Silicosis Advanced	1	11 =	·151
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	4		
Previously reported as Silicosis Advanced		4 =	·055
Tuberculosis only—			
Previously reported as Normals, etc.		4 =	·055
Total number of men examined		7,299 =	100·000

Sixteenth Examination (1941).

			Per cent.
Normals, etc.	6,840	6,840 =	95·785
Silicosis Early—			
Previously reported as Normals, etc.	32		
Previously reported as Silicosis Early	248	280 =	3·921
Silicosis Advanced—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	11		
Previously reported as Silicosis Advanced	3	14 =	·196
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early			
Previously reported as Silicosis Advanced			
Tuberculosis only—			
Previously reported as Normal, etc.	7	7 =	·098
Total number of men examined		7,141 =	100·000

PERIODICAL EXAMINATION OF MINE WORKERS—*continued.*

Seventeenth Examination (1942).

			Per cent.
Normals, etc.	5,460	5,460 =	93·905
Silicosis Early—			
Previously reported as Normals, etc.	61		
Previously reported as Silicosis Early	264	325 =	5·580
Silicosis Advanced—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	20		
Previously reported as Silicosis Advanced	5	25 =	0·430
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	2		
Previously reported as Silicosis Advanced		2 =	0·034
Tuberculosis only—			
Previously reported as Normals, etc.	3	3 =	0·051
Total number of men examined		5,824 =	100·000

Eighteenth Examination (1943).

			Per cent.
Normals, etc.	3,932	3,932 =	91·47
Silicosis Early—			
Previously reported as Normals, etc.	63		
Previously reported as Silicosis Early	262	325 =	7·57
Silicosis Advanced—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	25		
Previously reported as Silicosis Advanced	7	32 =	0·75
Silicosis plus Tuberculosis—			
Previously reported as Normals, etc.			
Previously reported as Silicosis Early	5		
Previously reported as Silicosis Advanced		5 =	0·12
Tuberculosis only—			
Previously reported as Normals, etc.	4	4 =	0·09
Total number of men examined		4,298 =	100·00

Men employed in the outlying districts were not examined during 1929 or 1931 ; only those employed in Kalgoorlie and surrounding district being examined. The increase in numbers diagnosed as Early Silicosis and Tuberculosis in 1930 was due to the improved plant and radiographic technique.

Only new miners and those whose previous diagnoses warranted review were examined in the outlying districts during 1933.

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TABLE I.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT AS REPORTED TO THE MINES DEPARTMENT DURING 1943. AND THE TOTAL PRODUCTION TO DATE.

(*Note.*—Lease numbers in brackets indicate that the holding was *voided* during the year.)

(*Note.*—* denotes mainly derived from treatment of tailings.)

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Kimberley Goldfield.												
Brockman... ...	109	Mt. Bradley	...	...	...	...	...	...	...	193·00	50·94	...
		Voided leases	...	...	...	...	...	...	...	1,352·75	1,404·40	...
		Sundry claims	...	...	...	...	...	7·62	7·62	2,484·00	1,871·92	...
Hall's Creek ...	...	Voided leases	...	...	...	...	...	...	...	423·00	477·76	...
		Sundry claims	...	...	81·00	52·08	...	27·73	...	204·55	159·68	...
Mt. Dockrell ...	95	Irish Lass	...	...	20·00	11·85	...	9·17	13·66	341·00	266·75	...
		Voided leases	...	...	...	...	...	...	...	832·70	939·34	93·00
		Sundry claims	...	...	...	...	...	...	20·03	160·00	89·64	...
Ruby Creek ...	(111)	Darcy's Mine	...	...	...	...	...	...	16·05	78·00	61·26	...
	98	Goliath	...	...	...	...	...	...	...	120·70	103·72	...
	97	Ruby Queen	...	...	354·00	198·28	...	...	...	2,799·25	1,556·85	...
	100	St. Lawrence	...	...	...	...	...	...	...	10·00	11·32	...
	96	West and Left	...	...	...	...	...	...	...	10·00	5·30	...
		Voided leases	...	...	...	...	...	...	...	12,683·50	9,438·22	...
		Sundry claims	...	...	...	...	...	...	...	273·25	177·27	...
The Mary ...	...	Voided leases	...	...	...	...	...	...	...	399·00	210·03	...
		Sundry claims	...	...	...	...	...	...	...	46·85	53·66	...
The Panton ...	...	Voided leases	...	...	...	...	...	...	...	34·70	138·70	...
		Sundry claims	...	...	...	...	...	...	...	6·15	18·01	...
		From Goldfields generally :— Reported by Banks and Gold Dealers	64·05	...	...	...	...	7,581·48	85·07	·75	1·54	...
		Totals	64·05	...	455·00	262·21	...	7,626·00	142·43	22,453·15	17,036·31	93·00
Pilbara Goldfield.												
MARBLE BAR DISTRICT.												
Bamboo Creek ...	856	Bulletin	...	...	78·00	17·01	...	...	8·36	2,971·00	954·36	...
	850	Federation	...	...	73·00	29·20	...	...	...	1,256·00	832·56	...
	866, 901 ...	Greater Bonnie Doon (1935) Limited ...	...	...	...	...	...	...	...	2,530·00	1,043·86	...
	866	(Bonnie Doon)	...	...	...	...	...	...	...	204·00	78·03	...

	707	Kitchener	...	...	116·00	68·87	...	...	...	9,395·00	13,543·13	...
	1010	Mickey	...	...	...	...	...	...	...	1,300·00	351·99	...
	740, 794, 878...	Mt. Prophecy Leases	...	...	28·00	18·39	...	...	...	8,090·50	8,262·79	...
	740	(Mt. Prophecy)	...	...	...	...	...	...	1·11	1,040·50	1,898·07	...
	794	(Perseverance)	...	...	...	...	...	...	...	290·50	584·21	...
	817	Prince Charlie	...	...	60·00	11·23	...	...	3·68	1,951·00	3,013·16	...
	924	True Blue	...	...	262·50	8·54	...	...	...	1,157·25	75·44	...
		Voided leases	...	...	...	...	...	13·54	550·72	18,375·85	25,744·37	...
		Sundry claims	...	...	29·00	18·51	...	8·97	307·83	4,743·35	2,903·36	...
Boodalyerrie ...	...	Voided leases	...	...	...	...	...	...	292·07	120·25	587·86	...
		Sundry claims	...	...	...	...	...	...	7·16	...	...	...
Lalla Rookh ...	...	Voided leases	...	...	...	...	...	...	4·78	3,612·00	4,696·33	574·01
		Sundry claims	...	...	...	...	...	...	...	7,943·00	7,675·09	...
Marble Bar ...	929, etc. ...	Comet Gold Mines, Limited	...	...	12,904·94	13,265·24	...	...	...	68,285·29	65,785·07	...
	1019	(Alethia)	...	...	...	...	...	...	...	586·75	23·70	...
	930, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	1,609·00	1,211·72	...
	912	Homeward Bound	...	...	258·00	132·72	...	...	...	4,441·00	2,280·18	...
	926	Leviathan	...	...	401·75	130·28	...	...	7·33	3,733·75	1,236·10	...
	929 (1023), (1034)	Ora Banda South Mines, N.L. ...	...	...	...	...	...	...	...	1,153·50	506·52	...
	929	(Tassy Queen)	...	...	...	...	...	...	...	2,323·50	1,534·75	...
	1062	Outward Bound East	...	...	30·00	15·00	...	...	...	30·00	15·00	...
	1058	Pariah	...	...	117·50	19·01	...	...	...	117·50	19·01	...
	1050	Stray Shot	...	...	...	...	...	...	...	59·50	35·19	...
	(1047)	William George	...	...	...	...	...	...	...	232·00	45·69	...
		Voided leases	...	...	...	...	...	...	189·08	31,852·00	36,548·98	...
		Sundry claims	...	69·49	296·50	138·99	...	67·08	251·27	19,106·14	12,076·49	...
North Pole ...	1040	Normay	...	...	...	...	...	...	...	69·00	31·07	...
		Voided leases	...	...	...	...	...	...	...	548·00	400·52	...
		Sundry claims	...	...	...	...	...	...	...	549·75	286·38	...
North Shaw ...	...	Voided leases	...	...	...	...	...	7·53	...	1,072·45	996·29	...
		Sundry claims	...	...	...	...	...	2·84	567·06	179·75	121·72	...
Pilgangoora ...	...	Voided leases	...	...	...	...	...	16·65	...	2,255·00	403·60	...
		Sundry claims	...	...	...	...	...	161·08	8·13	481·60	146·39	...
Sharks	1057	Edelweis	...	...	106·00	102·97	...	...	...	106·00	102·97	...
	868	Mount Ada	...	...	...	...	...	1·43	...	1,447·25	1,589·68	...
		Voided leases	...	...	...	...	...	...	...	78·00	222·02	...
		Sundry claims	...	6·69	35·75	66·18	...	162·10	41·42	1,062·00	1,577·37	...
Talga	...	Voided leases	...	...	...	...	...	...	93·15	1,799·00	1,760·68	...
		Sundry claims	...	...	...	...	...	64·70	79·74	1,967·90	1,498·10	...
Tambourah ...	...	Voided leases	...	...	...	...	...	...	73·90	1,576·50	1.882·29	...
		Sundry claims	...	...	...	...	...	89·52	294·75	3,742·25	2,689·78	...
Warrawoona ...	1046	Klondyke Queen	...	...	162·00	45·11	...	...	...	1,807·00	390·46	...
		Voided leases	...	...	...	...	...	...	16·99	10,708·80	18,253·32	...
		Sundry claims	...	31·78	100·00	50·50	...	70·98	623·67	6,068·04	4,164·92	...
Western Shaw ...	...	Voided leases	...	...	...	...	...	...	...	1,222·50	957·80	...
		Sundry claims	...	...	...	...	...	22·34	67·47	71·50	81·49	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

PILBARA GOLDFIELD—*continued.*

MARBLE BAR DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Wyman's Well ...	1002, 1003 ...	Copenhagen leases	...	...	...	...	...	...	...	785·75	39·29	...
	1002	(Copenhagen)	...	...	...	...	...	...	...	1,046·75	42·87	...
	1013	Trump	...	...	169·50	25·49	...	...	...	1,596·00	287·84	...
		Voided leases	...	...	...	...	...	...	42·86	1,144·79	1,176·28	...
		Sundry claims	...	...	...	...	...	1·14	51·52	2,371·11	1,193·65	...
Yandicoogina ...	... ...	Voided leases	...	...	...	...	...	...	140·76	3,159·20	6,218·83	...
		Sundry claims	...	...	...	...	...	4·32	239·89	565·75	630·87	...
	From District generally :—											
	Sundry parcels treated at:											
		Bamboo Creek State Battery	...	...	...	*301·53	...	...	...	40·00	*9,479·84	*181·04
		Marble Bar State Battery	...	...	...	*445·34	...	...	...	12·00	*9,203·82	...
		Ironclad Battery	...	...	...	...	...	...	...	...	*237·71	...
		The Great North-Western Gold Co., Ltd. ...	...	...	...	...	...	...	...	...	*244·30	...
		Various Works	...	...	...	...	...	...	...	237·95	*1,391·56	...
		Reported by Banks and Gold Dealers	11·60	...	...	...	...	14,002·52	435·76	...	·90	...
		Totals	**11·60**	**107·96**	**15,228·44**	**14,910·11**	...	**14,696·74**	**4,400·46**	**246,281·72**	**261,267·62**	**755·05**

NULLAGINE DISTRICT.

Eastern Creek ...	268L	Doherty's Reward	...	...	111·00	65·21	...	...	...	427·50	382·89	...
	276L	Rose	...	...	13·50	16·43	...	...	...	20·50	24·42	...
	253L	Shamrock	...	...	5·50	3·35	...	8·96	...	77·50	62·46	...
		Voided leases	...	...	...	...	...	...	8·19	4,696·00	9,069·61	11·77
		Sundry claims	...	...	...	...	...	...	12·74	1,403·60	1,593·97	16·90
Elsie	...	Voided leases	...	...	...	...	...	...	...	586·25	1,675·91	...
		Sundry claims	...	...	...	...	...	...	8·28	58·00	188·08	...
McPhee's Creek ...	...	Voided leases	...	...	...	...	...	...	...	113·00	137·92	...
		Sundry claims	...	...	...	...	...	...	...	134·00	197·09	...
Middle Creek ...	279L	All Nations	...	...	...	...	...	...	...	1,837·75	458·04	...
	229L	Barton	...	...	565·00	74·86	...	1·22	...	1,343·50	215·96	...
	231L, etc. ...	Blue Spec leases	...	...	125·00	20·08	...	...	...	3,307·50	1,906·29	...
	247L	Hopetoun North	...	...	...	...	...	...	...	213·00	51·43	...
	(258L)	Junction	...	...	...	...	...	...	...	77·50	12·43	...
	267L	Little Wonder	...	...	57·00	12·44	...	...	...	3,104·00	847·43	...
		Voided leases	...	...	...	...	...	...	...	9,939·90	9,477·25	...
		Sundry claims	...	...	77·00	22·68	...	...	...	4,379·60	1,971·39	...

Mosquito Creek ...	...	Voided leases	...	...	...	...	...	1·07	30·12	8,232·30	12,814·22	...
		Sundry claims	...	...	...	...	...	...	168·71	3,601·94	3,740·65	...
Nullagine	(252L)	Marjie	...	...	...	...	...	...	...	1,118·00	804·84	...
	270L	Valentine	...	...	...	...	...	...	...	135·00	64·34	...
		Voided leases	...	...	...	...	...	...	32·79	7,528·25	11,501·55	...
		Sundry claims	...	...	2·75	3·65	...	313·02	210·96	5,696·05	10,020·41	...
Twenty Mile Sandy	256L	Bill Jim	...	...	720·00	393·57	...	...	...	1,375·00	725·43	...
		Voided leases	...	...	...	...	...	...	3·20	5,221·20	7,971·21	...
		Sundry claims	...	...	25·50	56·81	...	33·10	30·50	7,062·35	5,786·20	...
		From District generally :—										
		Sundry parcels treated at :										
		Greig's Cyanide Plant	...	...	...	...	...	...	...	...	*121·93	...
		Simpson's Cyanide Plant (Twenty Mile Sandy)	...	...	...	...	...	...	...	...	*1,127·98	...
		Various Works	...	...	...	...	...	...	...	112·50	*6,218·62	...
		Reported by Banks and Gold Dealers	60·17	...	...	...	...	9,169·57	97·45	...	24·77	...
		Totals	**60·17**	...	**1,702·25**	**669·08**	...	**9,526·94**	**602·94**	**71,801·69**	**89,194·72**	**28·67**

Ashburton Goldfield.

Belvedere ...	...	Voided leases	...	...	...	...	...	...	9·88	1,560·00	435·86	176·48
Dead Finish ...	47	Star of the West	...	...	35·00	27·51	...	...	...	448·50	293·64	...
		Voided leases	...	...	...	...	...	...	...	281·50	279·51	...
		Sundry claims	...	...	...	...	...	...	11·89	78·75	235·31	...
Melrose	...	Voided leases	...	...	...	...	...	...	...	2,704·00	840·26	213·11
		Sundry claims	...	...	...	...	...	12·41	21·88	562·00	262·78	6·40
Mt. Edith ...	...	Sundry claims	...	...	...	...	...	...	...	5·00	3·97	...
Mt. Mortimer ...	...	Sundry claims	...	...	...	...	...	364·63	315·64	44·50	40·25	74·47
Uaroo	...	Voided leases	...	...	...	...	...	...	...	...	...	7,713·22
		From Goldfield generally :—										
		Reported by Banks and Gold Dealers	17·10	...	...	...	...	8,843·94	47·10	...	7·12	...
		Totals	**17·10**	...	**35·00**	**27·51**	...	**9,220·98**	**406·39**	**5,684·25**	**2,398·70**	**8,183·68**

Gascoyne Goldfield

Bangemall ...	...	Voided leases	...	...	...	...	...	...	6·22	350·70	313·82	...
		Sundry claims	...	...	...	...	...	88·97	33·55	36·30	203·47	...
		From Goldfield generally :—										
		Reported by Banks and Gold Dealers	...	...	...	...	...	588·55	1·80	...	...	...
		Totals	...	...	...	...	...	**677·52**	**41·57**	**387·00**	**517·29**	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

Peak Hill Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Egerton	556P	Pegasus	...	...	54·00	108·84	...	...	...	970·00	2,264·13	...
		Voided leases	...	...	...	...	...	60·86	30·91	5,077·25	2,842·45	...
		Sundry claims	...	...	...	...	...	235·35	23·51	1,431·77	765·74	...
Horseshoe ...	561P	Nathan Bitter	...	...	60·00	32·87	...	...	...	191·00	92·73	...
		Voided leases	...	...	...	...	...	15·57	1,962·66	1,860·88	2,147·36	2·00
		Sundry claims	...	...	...	...	...	20·12	829·58	1,794·55	673·36	...
Jimble Bar ...	...	Voided leases	...	...	...	...	...	...	172·75	7,526·25	2,561·95	·58
		Sundry claims	...	...	...	...	...	13·79	65·95	1,048·05	574·16	...
Mt. Fraser ...	...	Voided leases	...	...	...	...	...	...	...	389·50	320·96	...
		Sundry claims	...	...	...	...	...	88·28	40·61	400·75	341·14	...
Mt. Seabrook ...	...	Voided leases	...	...	...	...	...	...	5·05	620·25	428·26	...
		Sundry claims	...	...	...	...	...	...	...	1,038·10	791·51	...
Peak Hill ...	562P	Anti-Axis	...	...	104·00	56·41	...	...	...	201·00	105·50	...
	512P	Atlantic	1·69	2·87	...	...	...	1·69	2·87	4,128·75	515·53	...
	552P	Bobby Dazzler	...	...	11·00	12·26	...	·63	...	505·50	258·87	...
	511P	Commercial	...	...	...	...	...	...	...	2,702·75	470·23	...
	448P	Evening Star	...	...	...	...	...	...	70·17	6,906·00	4,849·87	...
	553P	Morning Star	...	...	...	...	...	...	4·43	2,474·25	308·83	...
	506P	No. 1 North	...	23·12	...	...	...	...	23·12	5,714·70	1,270·12	...
	492P	North Star	...	...	175·00	25·29	...	23·20	69·63	12,354·50	1,867·56	...
		Voided leases	...	...	...	...	...	6·76	850·04	512,763·83	241,638·21	2,285·63
		Sundry claims	...	...	...	...	...	61·51	275·61	33,734·85	8,803·33	...
Ravelstone ...	...	Voided leases	...	...	...	...	...	...	101·64	4,219·85	3,117·68	...
		Sundry claims	...	...	...	...	...	...	...	553·60	283·17	...
Wilgeena	...	Voided leases	...	...	...	...	...	...	23·54	128·50	146·79	...
Wilthorpe ...	...	Voided leases	...	...	...	...	...	...	...	47·00	20·93	...
		Sundry claims	...	...	...	...	...	...	...	89·00	25·71	...
Yowereena ...	...	Voided leases	...	...	...	...	...	...	...	19·50	36·46	...
		Sundry claims	...	...	...	...	...	...	...	117·25	203·16	...
	From Goldfield generally :—											
	Sundry parcels treated at :											
	State Battery, Peak Hill		...	...	...	*176·08	...	...	3·05	15·00	*6,431·91	...
	Smith's Cyanide Plant		...	...	...	*30·59	...	...	...	...	*970·78	...
	Various Works		...	...	...	...	...	...	...	30·00	*5,661·37	23·12
	Reported by Banks and Gold Dealers		7·64	...	...	1·97	...	2,833·93	443·21	...	1·97	...
	Totals		**9·33**	**25·99**	**404·00**	**444·31**	...	**3,361·69**	**4,998·33**	**609,054·18**	**290,791·73**	**2,311·33**

East Murchison Goldfield.

LAWLERS DISTRICT.

Kathleen Valley ...	1330	Beth-Heno	...	...	...	...	...	...	...	503·00	216·47	...
	(1321)	Yellow Aster	...	...	24·00	14·92	...	...	...	318·50	178·50	...
		Voided leases	...	...	...	...	...	...	144·85	78,505·50	47,995·98	...
		Sundry claims	...	...	31·50	9·43	...	14·37	526·03	5,043·00	2,077·65	...
Lawlers	1336	Caroline East	...	...	26·00	14·41	...	...	...	117·00	65·95	...
	1236, 1240, etc.	Emu Gold Mines, Ltd.	...	...	28,566·68	7,048·98	...	...	...	231,551·68	56,777·40	452·00
	1236, 1240, 1249	Prior to transfer to present holders	...	...	...	...	...	13·02	...	168·50	1,216·93	...
	(1317)	Tallon Doon	...	...	40·00	5·54	...	...	...	317·00	138·57	...
		Voided leases	...	...	...	...	...	...	690·66	1,284,182·72	490,881·99	14,350·93
		Sundry claims	...	...	99·50	67·53	...	399·86	388·51	16,308·48	8,984·70	268·34
Sir Samuel ...	1333	Vanguard	...	...	...	...	...	...	...	1,462·00	181·69	...
		Voided leases	...	...	...	...	...	...	359·03	273,477·55	141,386·56	10,227·52
		Sundry claims	...	...	150·50	79·97	...	53·89	64·96	7,013·25	4,364·68	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Sir Samuel		...	...	...	*9·74	...	...	...	53·50	*2,257·00	...
	McPherson's Cyanide Plant		...	...	...	...	...	2·12	...	12·03	*4,265·25	...
	Norwood, Vickery, and Lewis		...	...	...	*116·37	...	...	...	...	*352·19	·12
	Vanguard Cyanide Plant		...	...	...	...	...	...	...	4·00	*700·47	...
	Westralian Tailings Treatment, Limited ...		...	...	...	*1,321·81	...	...	...	5·00	*5,643·48	44·64
	Various Works		...	...	...	...	...	...	2·35	1,699·50	*26,067·02	936·09
	Reported by Banks and Gold Dealers		...	...	...	...	...	6,372·43	101·09	·05	9·84	...
	Totals		...	...	**28,938·18**	**8,688·70**	...	**6,855·69**	**2,277·48**	**1,900,742·26**	**793,762·32**	**26,279·64**

WILUNA DISTRICT.

Coles	662J	Black Adder	...	...	...	...	...	...	...	1,108·50	520·33	...
	665J	New Venture	...	...	...	...	...	...	...	49·00	6·30	...
		Voided leases	...	...	...	...	...	...	...	767·25	149·14	...
		Sundry claims	...	...	...	...	...	...	12·77	3,783·00	1,469·83	...
Corboy's	670J	Black Jack	...	...	259·00	98·94	...	...	...	259·00	98·94	...
	435J	Old Toscana	...	...	12·00	4·84	...	5·24	...	759·00	571·32	...
	669J	Vinaurum	...	...	142·00	165·45	...	...	...	142·00	165·45	...
	(433J)	Waratah leases	...	...	38·00	58·89	...	...	...	1,226·04	627·83	...
	(433J, 434J) ...	(Waratah Gold Mines, Limited, N.L.) ...	...	...	...	...	...	...	...	359·00	587·92	...
		Voided leases	...	...	...	...	...	...	1·25	10,095·25	7,197·64	5·60
		Sundry claims	4·22	...	137·00	62·93	...	21·58	...	6,920·35	4,246·68	...
Gum Creek ...	...	Voided leases	...	...	...	...	...	20·75	...	1,380·00	595·73	...
		Sundry claims	...	...	...	...	...	...	1·36	379·25	120·89	...
Mt. Eureka ...	...	Voided leases	...	...	...	...	...	...	...	142·25	96·36	...
		Sundry claims	...	...	...	...	...	...	...	783·75	548·56	...
Mt. Keith ...	...	Voided leases	...	...	...	...	...	...	44·54	20,259·50	13,551·08	...
		Sundry claims	...	...	...	...	...	4·81	227·29	3,855·00	2,472·34	...
New England ...	...	Voided leases	...	...	...	...	...	5·74	95·70	5,336·25	3,471·17	...
		Sundry claims	5·83	...	157·00	169·67	...	5·83	5·78	4,396·75	2,803·59	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued

EAST MURCHISON GOLDFIELD—*continued.*

WILUNA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Wiluna	631J	Brilliant Reduced	...	...	...	...	...	...	...	1,756·75	243·35	...
	552J	Coolgardie Brilliant, N.L.	...	...	...	12·14	...	...	...	21,267·00	6,838·76	...
	552J	Prior to transfer to present holders	...	...	...	*286·34	...	...	...	7,257·00	2,202·75	12·40
	607J	Coolgardie Brilliant, N.L.	...	...	...	...	...	...	...	1,140·00	1,152·53	...
	607J, (663J) ...	Linden (W.A.) Gold, N.L.	...	...	...	...	...	...	...	21,619·00	6,024·02	...
	607J	Prior to transfer to present holders	...	...	...	...	...	...	...	1,156·75	655·83	...
	10J, 37J, etc. ...	Moonlight Wiluna Gold Mines, Limited	...	...	100,577·14	17,790·00	...	...	...	753,659·83	185,780·40	1,213·00
	10J, 37J, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	36,975·50	14,174·75	...
	(666J)	Mystery	...	...	...	...	...	...	...	3·75	6·45	...
	6J, etc. ...	Wiluna Gold Mines, Limited	...	...	479,069·00	52,376·78	...	...	...	6,465,532·00	1,208,222·21	1,213·99
	6J, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	341,730·57	133,457·92	89·32
		Voided leases	...	...	...	...	...	...	574·76	140,804·00	79,746·67	124·00
		Sundry claims	...	...	19·00	8·78	...	105·39	215·79	23,938·55	9,925·55	·33
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Wiluna		...	...	...	*199·49	...	...	...	592·00	*22,148·86	218·70
	Black Adder Battery		...	...	...	...	...	...	...	...	*85·93	...
	Toscana Cyanide Plant		...	...	...	*67·46	...	...	...	...	*2,445·85	...
	Waratah Cyanide Plant		...	...	...	...	...	...	...	...	*527·22	...
	Various Works		...	...	...	...	...	...	...	...	*1,237·68	12·68
	Reported by Banks and Gold Dealers		2·55	...	...	7·16	...	49·27	56·58	...	51·48	...
	Totals		**12·60**	...	**580,410·14**	**71,308·87**	...	**218·61**	**1,235·82**	**7,879,433·84**	**1,714,229·31**	**2,889·42**

BLACK RANGE DISTRICT.

Barrambie ...	972B, 976B ...	Sheelite leases	...	...	37·00	39·76	...	...	...	537·50	611·42	...
	972B	(Sheelite)	...	...	...	...	...	...	...	105·50	108·88	...
	976B	(Sheelite North)	...	...	...	...	...	...	...	92·75	92·83	...
		Voided leases	...	...	...	...	...	...	22·49	17,359·42	16,200·76	125·60
		Sundry claims	...	...	...	...	...	5·07	168·10	833·55	915·51	...
Bellchambers ...	...	Voided leases	...	...	...	...	...	...	111·80	3,437·27	1,758·90	...
		Sundry claims	...	...	...	...	...	...	...	619·80	386·08	...
Birrigrin	...	Voided leases	...	...	...	...	...	...	820·68	12,042·93	15,086·09	...
		Sundry claims	...	...	...	...	...	...	179·92	2,487·55	1,238·22	...
Curran's Find ...	...	Voided leases	...	...	...	...	...	18·24	222·89	7,252·25	3,116·68	...
		Sundry claims	...	...	...	...	...	...	29·38	2,158·75	827·18	...

Erroll's	...	Voided leases	...	...	...	...	...	14·17	152·29	14,170·50	9,328·92	...
		Sundry claims	...	...	...	...	...	6·53	399·11	964·75	595·45	...
Hancock's ...	1074B	Apples	...	...	78·50	181·54	...	...	431·08	557·00	587·56	...
	1050B	Duke of Windsor	...	...	...	...	...	...	·78	649·25	334·39	...
	(1077B) ...	Hill View	...	...	10·50	3·71	...	...	...	72·50	23·84	...
		Voided leases	...	...	...	...	...	...	6,523·59	31,902·75	33,075·10	55·72
		Sundry claims	...	...	...	...	...	4·21	142·89	8,255·10	3,143·35	...
Maninga Marley ...	...	Voided leases	...	...	...	...	...	...	195·20	60,833·48	48,494·40	22·55
		Sundry claims	...	...	...	...	...	...	158·16	3,071·40	1,764·28	...
Montague ...	967B, 998B ...	North End leases	...	...	15·00	7·83	...	...	...	35,372·95	4,871·16	...
		Voided leases	...	...	...	...	...	...	100·17	39,672·65	16,888·02	...
		Sundry claims	...	...	50·00	8·00	...	...	71·09	5,018·60	3,147·93	...
Nungarra	...	Voided leases	...	...	...	...	...	25·94	952·34	10,395·75	5,015·04	...
		Sundry claims	...	...	...	...	...	50·27	1,458·06	7,494·15	2,930·91	...
Sandstone ...	959B, etc. ...	Atlas Gold Mines, Limited	...	...	...	...	...	...	...	959·00	168·60	...
		Prior to transfer to present holders	...	...	...	...	...	...	136·06	537·75	686·59	...
	1076B	Black Range Gold Mines, Ltd.	...	...	...	...	...	...	...	84·00	14·34	...
	1075B	Doolette South	...	...	138·50	142·31	...	...	217·54	398·25	455·49	...
	958B	Lady Mary	...	...	358·00	197·25	2·28	...	...	5,409·75	4,822·96	2·28
	1069B	Sonny Boy	...	170·52	19·75	40·02	...	...	170·52	130·25	58·78	...
		Voided leases	...	...	...	...	...	4·75	3,615·71	692,204·07	443,769·55	11,754·22
		Sundry claims	...	...	...	...	...	44·95	1,421·07	14,669·45	6,619·32	...
Youanme	1046B	Canberra	...	...	...	...	...	...	...	1,501·00	443·13	...
	960B, etc. ...	Youanmi Gold Mines, Ltd.	...	...	...	195·48	29·79	...	...	370,977·77	96,279·42	5,865·55
	960B, etc. ...	(Youanmi)	...	...	...	...	...	...	...	38·50	3·91	...
		Voided leases	...	...	...	...	...	·36	126·92	358,978·78	176,882·54	4,608·55
		Sundry claims	...	...	...	...	...	1·07	18·79	6,258·55	1,814·66	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Sandstone	...	...	...	*154·64	...	...	...	266·00	*21,995·28	59·53
	State Battery, Youanme	...	...	...	...	...	...	...	40·00	*5,461·83	...
	North End Cyanide Plant	...	...	...	*38·87	...	...	...	...	*4,911·99	...
	Various Works	...	...	...	...	...	...	...	37·00	*6,505·69	...
	Reported by Banks and Gold Dealers	...	...	...	...	...	1,441·81	50·84	...	20·38	...
	Totals	...	**170·52**	**707·25**	**1,009·41**	**32·07**	**1,617·37**	**17,897·47**	**1,717,848·22**	**941,457·36**	**22,494·00**

Murchison Goldfield.

CUE DISTRICT.

Big Bell	2050, etc. ...	Big Bell Mines, Ltd.	...	...	26,354·00	4,219·92	757·61	...	...	2,226,219·00	290,615·52	99,156·65
	2050	(Little Bell)	...	...	...	...	...	...	4·49	579·75	60·95	...
	2219	Pindar	...	...	...	...	...	...	...	65·00	79·35	...
		Voided leases	...	...	...	...	...	...	...	274·75	278·83	...
		Sundry claims	...	...	...	...	...	·39	6·32	338·50	308·97	...
Cuddingwarra ...	...	Voided leases	...	...	...	...	...	10·59	132·46	102,020·41	56,131·93	100·71
		Sundry claims	...	...	11·00	3·42	...	12·15	354·57	8,059·39	4,714·12	9·00

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

CUE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Cue	2236	Hill View	...	...	135·50	256·44	...	...	...	321·50	561·78	...
		Voided leases	...	...	...	...	...	106·75	580·59	287,720·44	220,011·47	66·63
		Sundry claims	24·27	33·52	147·00	53·11	...	236·44	891·10	41,013·99	18,783·25	...
Eelya	...	Voided leases	...	...	...	...	...	...	8·78	1,069·00	1,811·26	...
		Sundry claims	...	...	...	...	...	6·20	101·86	842·90	739·93	...
Mindoolah ...	...	Voided leases	...	...	...	...	...	3·07	2·54	9,380·28	5,672·31	42·97
		Sundry claims	...	...	...	...	...	...	29·30	2,963·85	2,169·26	...
Reedy	1977, etc. ...	Triton Gold Mines, N.L.	...	...	...	...	...	...	...	604,070·00	191,041·46	17,791·92
		Prior to transfer to present holders	...	...	...	...	...	...	...	14,492·50	7,073·36	5·00
	2071, 2191 ...	Western Gold Mines, N.L.	...	...	...	...	...	...	...	1,846·00	398·14	...
		Voided leases	...	...	...	...	...	1·46	214·65	6,552·93	10,128·90	1·22
		Sundry claims	...	13·20	15·00	12·91	...	170·71	120·73	4,940·05	2,252·12	...
Tuckabianna ...	2130	Garibaldi	...	...	...	...	...	...	45·22	298·88	544·36	...
	2237	Gidgie	...	...	478·25	327·26	...	...	...	478·25	327·26	...
	(2233)	Goldie	...	...	155·75	46·15	...	...	...	393·00	119·24	...
	2235	Uranus	...	...	150·25	53·60	...	...	...	303·50	133·79	...
	2234	Winston	308·66	...	...	...	...	323·31	31·31	80·50	186·98	...
		Voided leases	...	...	...	...	...	...	176·55	11,726·35	6,307·12	...
		Sundry claims	51·50	...	85·00	25·48	...	91·87	480·56	4,054·60	2,438·56	...
Tuckanarra ...	2079	Batchelor	14·53	...	...	...	...	67·66	75·39	450·25	381·43	...
	2238	Last Chance	...	85·94	10·25	18·44	...	...	85·94	10·25	18·44	...
		Voided leases	...	...	...	...	...	14·65	3,349·77	19,023·75	22,418·32	172·77
		Sundry claims	...	...	...	...	...	115·23	757·71	9,829·55	10,189·33	...
Weld Range ...	2183	Joy Long	...	...	32·00	6·49	...	...	...	901·50	308·28	...
		Voided leases	...	...	...	...	...	...	23·64	545·75	486·41	...
		Sundry claims	...	...	...	...	...	...	3·90	1,148·50	750·54	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Cue		...	...	...	*940·71	...	...	...	12·75	*19,510·30	91·93
	State Battery, Tuckanarra		...	...	...	...	...	...	...	518·50	*5,501·84	...
	J. C. Zadow's Treatment Plant		...	...	233·00	*11·85	...	...	...	233·00	*11·85	...
	Various Works		...	...	...	...	...	...	...	6,925·52	29,375·96	1,147·77
	Reported by Banks and Gold Dealers		45·61	...	...	...	...	3,257·68	92·43	...	22·62	...
	Totals		**444·57**	**132·66**	**27,807·00**	**5,975·78**	**757·61**	**4,418·16**	**7,569·81**	**3,369,704·64**	**911,865·54**	**118,586·57**

Abbotts	...	Voided leases	...	...	...	...	...	...	26·45	36,841·35	38,775·28	...		
		Sundry claims	...	...	...	...	...	...	5·29	3,661·27	2,237·83	...		
Burnakura ...	1849N	New Alliance	...	...	...	...	...	...	...	132·25	114·39	...		
		Voided leases	...	...	...	...	...	...	3,247·59	39,040·45	30,775·77	26·90		
		Sundry claims	...	...	...	...	...	17·03	129·24	1,992·55	1,071·97	1·54		
Chesterfield ...	...	Voided leases	...	...	...	...	...	29·02	420·32	6,869·26	7,483·76	·80		
		Sundry claims	...	...	...	...	...	...	42·19	888·55	714·20	...		
Gabanintha ...	1854N	Golden Star	...	...	...	...	...	...	...	203·25	251·06	...		
	1844N	Mab	...	...	170·00	49·31	...	...	...	788·50	197·39	...		
	1725N	New Brew	...	...	131·00	195·85	...	...	...	1,037·10	1,283·19	...		
		Voided leases	...	...	...	...	...	11·79	28·82	22,974·25	13,816·35	815·57		
		Sundry claims	...	...	48·75	52·60	...	16·78	147·72	3,497·00	2,200·74	...		
Garden Gulley ...	...	Voided leases	...	...	...	...	...	26·36	74·91	30,238·32	21,847·71	1,102·59		
		Sundry claims	...	...	...	...	...	...	7·51	2,843·69	1,677·23	...		
Gum Creek ...	...	Voided leases	...	...	...	...	...	25·27	91·96	3,893·08	3,819·91	...		
		Sundry claims	...	...	...	...	...	4·37	84·86	727·25	636·85	...		
Holden's	1551N	New Waterloo	...	...	...	...	...	...	·99	1,468·00	918·92	...		
		Voided leases	...	...	...	...	...	...	18·00	16,593·00	6,401·50	...		
		Sundry claims	...	...	...	...	...	164·95	49·07	425·15	279·25	...		
Jillawarra ...	1871N	Werribie	...	...	48·00	95·15	...	...	128·85	298·25	598·46	...		
		Voided leases	...	...	...	...	...	...	1,134·68	1,499·55	2,801·53	...		
		Sundry claims	...	...	...	...	...	173·02	150·04	366·50	346·48	...		
Meeka Pools ...	...	Voided leases	...	...	...	...	...	...	...	111·58	82·27	...		
		Sundry claims	...	...	...	...	...	...	2·84	233·57	205·38	...		
Meekatharra ...	1861N	Adele May	...	...	...	...	...	...	...	9·00	4·37	...		
	1883N	Coffee Pot	...	...	...	...	...	...	...	99·00	45·92	...		
	1855N	Commodore	...	...	...	...	...	...	...	575·75	181·96	...		
	1553N	Consols North	...	...	208·00	755·09	...	...	...	581·00	1,241·10	...		
	477N	Fenian	...	...	297·50	400·40	...	...	...	23,895·75	23,373·10	...		
	477N, 814N ...	Fenian leases	...	...	...	...	...	...	...	313,485·94	254,989·70	...		
	1884N	Fortune Teller	...	...	93·25	11·33	...	...	7·09	794·00	102·63	...		
	1559N	Ingliston	...	...	...	...	...	...	476·76	1,705·05	1,519·62	...		
	1542N	Ingliston Alberts	...	...	...	...	...	...	...	279·50	416·89	...		
	1542N, (1566N), (1575N)	Ingliston Albert's leases	...	...	...	...	...	...	...	2,983·70	1,283·06	...		
	475N, etc. ...	Ingliston Consols Extended leases	...	...	313·75	586·67	...	...	...	873,616·47	356,895·21	...		
	475N	Prior to transfer to present holders	...	...	...	...	...	...	...	1,536·25	4,248·25	·30		
	1539N	Ingliston South Gold Development, N.L.	...	...	...	...	...	...	...	1,217·75	1,949·96	...		
		Prior to transfer to present holders	...	...	...	...	...	...	...	16,274·61	12,815·17	...		
	1547N	Lady Central	...	...	...	...	...	...	...	32·75	26·05	...		
	533N	Marmont	...	...	...	...	...	...	89·33	60,119·95	42,798·54	...		
	580N	Marmont Extended	...	...	...	...	...	...	...	1,667·95	1,562·40	...		
	580N, (888N) ...	Marmont Extended leases ...	...	...	...	...	...	...	...	152·00	129·61	...		
	(1576N), 1547N	Meekatharra Central Gold, N.L. ...	...	...	...	...	...	...	5·29	4,842·25	2,463·30	...		
		Prior to transfer to present holders		...	...	...	...	...	11·06	2,951·42	5,198·33	...		
	1633N	Micky Doolan	...	...	...	...	...	...	...	29·75	38·13	...		
	1577N	Mopoke	...	...	...	...	...	...	12·47	1,315·25	788·59	...		
	1860N	New Gwalia	...	...	...	...	...	...	...	421·75	56·44	...		

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MEEKATHARRA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
	1571N	Phar Lap	...	...	712·75	685·19	...	...	...	5,515·25	3,720·91	...
	1529N, etc. ...	Prohibition Gold Mining Co., N.L. ...	...	...	530·00	347·14	...	...	...	24,844·25	4,533·85	11·83
	1529N	Prior to transfer to present holders	...	...	...	...	...	...	...	29,422·00	4,971·30	...
		Voided leases	...	...	...	...	...	3·88	1,316·68	375,328·62	203,047·10	2,454·74
		Sundry claims	...	...	212·75	241·28	...	229·71	574·17	21,987·70	8,877·39	...
Mistletoe	...	Voided leases	...	...	...	...	...	4·15	1,000·24	417·00	486·21	...
		Sundry claims	...	...	...	...	...	119·14	71·85	19·75	2·03	...
Mt. Maitland ...	...	Voided leases	...	...	...	...	...	...	...	88·00	80·11	...
		Sundry claims	...	...	...	...	...	...	...	420·75	240·86	...
Munara Gully ...	...	Voided leases	...	...	...	...	...	...	...	13,283·50	6,559·93	...
		Sundry claims	...	...	...	...	...	...	34·23	1,009·75	373·74	...
Nannine	1872N	Blue Pedro	...	...	...	9·21	...	...	...	7,003·75	1,650·12	...
	1580N	Caledonian	...	...	...	5·42	...	...	...	1,025·10	492·72	...
	1879N	Called Back	...	...	...	...	...	...	29·96	4·25	34·36	...
		Voided leases	...	...	...	...	...	37·25	796·62	113,287·32	72,331·89	167·45
		Sundry claims	...	...	...	...	...	116·99	1,248·76	6,007·68	4,647·29	...
Quinns	...	Voided leases	...	...	...	...	...	7·30	1,186·50	33,356·91	13,464·37	90·70
		Sundry claims	...	...	...	...	...	15·07	1,289·65	3,829·17	2,716·66	...
Ruby Well ...	...	Voided leases	...	...	...	...	...	...	43·46	7,461·00	4,046·70	...
		Sundry claims	...	...	...	...	...	1,015·87	409·39	520·25	629·60	...
Stake Well ...	...	Voided leases	...	...	...	...	...	...	200·12	21,362·00	9,566·18	...
		Sundry claims	...	...	...	...	...	31·91	34·73	1,003·60	584·54	...
Star of the East...	...	Voided leases	...	...	...	...	...	...	...	27,244·00	20,305·40	...
		Sundry claims	...	...	...	...	...	...	...	127·62	94·97	...
Yaloginda ...	1853N	Bluebird	...	...	...	...	...	...	...	4,002·00	1,219·21	...
		Voided leases	...	...	...	...	...	19·03	1,972·23	28,067·04	14,541·80	8·68
		Sundry claims	...	...	12·50	10·11	...	61·89	647·51	9,794·42	4,443·05	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Meekatharra		...	...	...	*860·82	...	...	...	68·50	*22,304·33	19·00
	Various Works		...	...	...	...	...	...	...	172·75	*6,729·60	342·17
	Reported by Banks and Gold Dealers		39·85	...	...	...	...	12,055·94	176·36	13·50	20·80	...
	Totals		**39·85**	**...**	**2,778·25**	**4,305·57**	**...**	**14,186·72**	**17,425·79**	**2,221,897·99**	**1,263,382·77**	**5,042·27**

DAY DAWN DISTRICT.

Day Dawn ...	652D	Creme D'Or	...	...	28·50	37·79	...	...	...	157·75	110·26	...
	(647D) ...	Klondike	...	8·15	83·25	36·31	...	...	95·11	2,135·78	2,130·89	...
	573D	Mountain View	...	...	512·50	1.586·17	...	...	94·05	3,739·03	4,476·88	...
	576D	New Fingall...	...	...	...	...	...	6·12	6·84	2,961·50	1,058·07	...
		Voided leases	...	...	...	...	...	160·64	710·98	1,919,523·08	1,223,242·40	169,210·44
		Sundry claims	17·52	...	81·25	33·06	...	96·42	410·31	12,277·76	6,092·05	...
Lake Austin ...	656D	Eureka	11·08	12·31	61·75	38·94	...	11·08	12·31	223·00	108·37	...
		Voided leases	...	...	...	...	...	601·92	3,067·31	36,607·95	50,925·92	...
		Sundry claims	...	...	...	...	...	59·07	915·27	3,085·44	1,189·62	...
Mainland	...	Voided leases	...	...	...	...	...	·41	3,296·77	7,575·62	25,026·07	...
		Sundry claims	...	...	...	...	...	16·57	746·58	1,337·95	701·31	...
Pinnacles	...	Voided leases	...	...	...	...	...	4·90	1,213·68	18,117·00	9,869·29	...
		Sundry claims	16·59	...	19·60	16·30	...	62·93	446·50	4,183·67	1,603·20	...
	From District generally :—											
	Sundry parcels treated at :											
	Various Works		...	...	...	...	...	...	16·61	940·75	1,967·72	...
	Reported by Banks and Gold Dealers		7·86	...	...	...	...	1,969·02	33·97	...	·77	...
		Totals	**53·05**	**20·46**	**786·25**	**1,748·57**	...	**2,989·08**	**11,066·29**	**2,012,866·28**	**1,328,502·82**	**169,210·44**

MOUNT MAGNET DISTRICT.

Jumbulyer ...	1410M	Gold Bug	...	...	...	...	...	...	...	67·75	119·79	...
	1406M	Granites	...	...	...	...	...	...	...	12·25	26·45	...
		Voided leases	...	...	...	...	...	...	13·37	660·35	328·81	...
		Sundry claims	...	...	30·50	17·57	...	18·45	116·27	1,035·45	760·56	...
Lennonville ...	1405M	Banker	...	6·68	15·25	2·63	...	...	7·85	181·00	174·61	...
	1308M	Empress	...	...	...	...	...	...	...	385·00	143·95	...
	1379M	Galtee Moore	...	...	210·00	111·40	...	...	...	4,788·00	1,216·10	...
	1378M	Gambier Lass	...	...	...	...	...	...	5·85	419·00	101·26	...
	1374M	Souvenir	...	...	54·50	249·65	...	...	2·90	197·50	518·96	...
		Voided leases	...	...	...	...	...	...	3,209·58	143,676·55	125,312·10	458·82
		Sundry claims	...	...	...	...	...	19·14	108·82	13,532·77	5,126·58	...
Mt. Magnet ...	1382M	Corona	...	...	430·00	334·44	...	...	...	3,472·65	2,722·09	...
	(1394M) ...	Eclipse	...	...	22·00	7·42	...	...	6·53	507·75	625·61	...
	1255M	Edward Carson leases	...	...	840·00	469·62	...	...	...	16,828·50	12,168·45	7·00
	1286M	Evening Star	...	...	97·25	6·24	...	...	36·37	2,480·07	1,107·97	...
	1428M	George Caunter	...	...	16·25	6·38	...	...	...	16·25	6·38	...
	1287M	Havelock	...	...	28·50	6·17	...	...	11·05	4,313·75	834·92	...
	1424M	Havilah	...	...	...	...	...	...	...	9·25	9·23	...
	1282M, etc. ...	Hill 50 Gold Mine, N.L.	...	...	36,459·00	10,053·87	113·62	...	...	209,861·90	63,517·29	164·44
	1361M	Jupiter	...	...	...	...	...	...	·83	307·00	102·98	...
	1411M	Leap Year	...	...	58·00	21·37	...	...	...	401·25	305·35	...
	1416M	Myra Lydia	...	...	...	...	...	...	...	45·25	2·83	...
	1246M	Neptune	...	...	...	95·15	...	...	829·41	8,787·65	4,094·37	...
	1281M, etc. ...	Saturn leases	...	...	...	...	...	...	101·24	37,413·00	5,741·32	...
	1251M, etc. ...	Swan Bitter G.M. Co., N.L.	...	...	...	...	...	...	15·25	13,641·50	4,733·84	...
	1251M	Prior to transfer to present holders	...	...	...	...	...	...	320·12	6,081·25	3,180·61	...
	1322M	Three Boys	...	...	...	...	...	...	229·73	480·28	664·00	...
	1388M	Top-not	...	...	...	...	...	...	...	344·75	251·78	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MURCHISON GOLDFIELD—*continued.*

MOUNT MAGNET DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Mt. Magnet—*contd.*	(1357M) ...	Wind Bag	...	...	32·75	9·30	...	...	...	2,622·25	1,162·25	...
	1426M	Zenith	...	...	...	...	...	...	...	31·50	31·51	...
		Voided leases	...	...	...	...	...	29·26	9,091·61	762,978·01	290,497·14	851·37
		Sundry claims	...	6·31	80·25	24·35	...	120·63	2,539·52	55,054·10	27,490·89	...
Mt. Magnet, East	...	Voided leases	...	...	...	...	...	63·29	764·53	5,522·28	2,811·75	...
		Sundry claims	...	...	...	...	...	...	37·22	418·25	428·29	...
Moyagee	1355M, (1398M)	Moyagee leases	...	...	1,073·00	1,002·67	44·85	...	...	4,641·00	5,015·78	326·80
	1355M	Moyagee	...	...	...	...	...	...	...	2,547·50	4,198·30	347·04
		Voided leases	...	...	...	...	...	...	23·59	5,107·60	7,575·88	...
		Sundry claims	...	...	...	...	...	2·83	157·10	1,484·00	1,677·51	...
Paynesville ...	...	Voided leases	...	...	...	...	...	...	1,613·34	449·77	1,116·15	...
		Sundry claims	...	...	...	...	...	3·36	540·21	882·57	1,372·00	...
Winjangoo ...	...	Voided leases	...	...	...	...	...	·99	191·88	72·00	69·98	...
		Sundry claims	...	...	...	...	...	...	223·32	162·78	55·50	...
		From District generally .—										
		Sundry parcels treated at :										
		State Battery, Boogardie	...	...	...	*159·42	...	...	...	125·26	*32,821·41	...
		Welcome Cyanide Works	...	...	...	...	...	...	...	10·00	*941·39	...
		Various Works	...	...	...	...	...	...	...	43·06	*17,428·06	1·00
		Reported by Banks and Gold Dealers	12·48	5·71	...	7·07	...	2,193·76	79·92	...	53·89	...
		Totals	**12·48**	**18·70**	**39,447·25**	**12,584·72**	**158·47**	**2,451·71**	**20,277·41**	**1,312,099·60**	**628,645·87**	**2,156·47**
Yalgoo Goldfield.												
Bilberatha ...	1139	Blaney's Gold Mine	...	...	...	...	...	1·27	90·94	1,888·00	1,265·01	...
		Voided leases	...	...	...	...	...	...	...	1,263·00	491·84	...
		Sundry claims	...	...	...	...	...	...	6·64	3,075·05	1,401·56	...
Carlaminda ...	...	Voided leases	...	...	...	...	...	1·28	3·39	2,056·57	862·42	3·30
		Sundry claims	...	...	...	...	...	...	...	1,368·50	600·68	...
Field's Find ...	907	Brown's Reward	...	...	...	...	...	...	...	300·00	75·91	...
	907, etc. ...	Brown's Reward leases	...	...	...	...	...	...	...	4,540·55	3,800·16	...
	(1114), 1119 ...	Field's Find Central West ...	...	...	...	...	...	...	...	4,625·00	1,074·53	56·69
	1192	Rose Marie	...	...	104·50	93·07	...	...	...	452·50	594·47	...
		Voided leases	...	...	...	...	...	...	226·72	40,147·30	28,032·74	...
		Sundry claims	...	...	21·50	3·91	...	5·77	179·54	5,415·25	1,759·04	...

Goodingnow ...	1063	Ark	...	...	...	...	...	...	1·23	807·50	376·04	...
	1102	Astor	...	...	567·00	177·99	...	...	...	5,374·75	2,900·55	...
	1198	Astor South	...	...	...	...	...	...	...	401·00	96·69	...
	1025	Carnation	...	...	1,025·00	542·88	...	...	...	15,749·05	11,588·82	...
	1175	Marigold	...	...	122·00	23·22	...	...	...	3,040·25	1,268·99	...
	1145	Oversight	...	...	339·75	102·75	...	...	...	772·85	243·93	...
	1085	Sweet William	...	...	...	...	...	...	2·97	792·00	249·45	...
		Voided leases	...	...	...	...	...	146·70	273·40	45,490·31	44,910·49	...
		Sundry claims	·43	...	21·00	13·22	...	152·96	169·70	9,837·75	5,043·00	...
Gullewa	1189, etc. ...	King Solomon's Mines, Limited ...	...	...	...	...	...	...	...	5,445·10	2,234·66	32·28
	1047	Mugga King	...	6·04	183·00	61·02	·40	...	7·76	8,427·50	2,622·26	69·80
		Voided leases	...	...	...	...	...	...	11·29	25,536·00	15,882·93	·04
		Sundry claims	...	...	...	...	...	...	170·45	4,391·25	1,918·24	...
Kirkalucka ...	...	Voided leases	...	...	...	...	...	...	...	61·25	45·10	...
		Sundry claims	...	...	11·25	4·16	...	...	17·79	257·30	126·29	...
Messenger's Patch	1197	Gnow's Nest	...	...	...	8·80	...	...	...	6·00	*126·12	...
		Voided leases	...	...	...	...	...	...	349·71	39,721·51	28,314·92	1,083·01
		Sundry claims	...	...	...	...	...	463·12	333·98	1,585·35	583·39	...
Mt. Farmer ...	...	Voided leases	...	...	...	...	...	...	...	64·00	40·19	...
		Sundry claims	...	...	...	...	...	...	...	462·90	145·06	...
Mt. Gibson ...	...	Voided leases	...	...	...	...	...	...	6·44	526·50	888·70	...
		Sundry claims	...	...	...	...	...	1·03	44·72	973·10	409·48	1·00
Ninghan	...	Voided leases	...	...	...	...	...	...	...	10·00	1·41	...
		Sundry claims	...	...	...	...	...	...	...	324·75	123·28	...
Noongal	1137	City of Melbourne	...	...	...	...	...	...	...	2,046·50	860·05	...
	1201	Hard to Find	...	...	6·00	5·12	...	...	...	74·00	107·77	...
		Voided leases	...	...	...	...	...	7·88	31·96	9,023·25	4,666·85	...
		Sundry claims	...	...	...	...	...	36·16	310·31	8,497·30	3,556·78	...
Nyounda	...	Voided leases	...	...	...	...	...	...	217·63	416·00	183·91	...
		Sundry claims	...	...	...	...	...	...	26·59	701·00	177·19	...
Pinyalling ...	...	Voided leases	...	...	...	...	...	...	93·80	2,296·35	959·50	...
		Sundry claims	...	...	33·75	7·27	...	3·13	134·09	1,405·50	621·23	...
Retaliation ...	1046	Alma May	...	...	287·00	141·31	...	...	...	1,623·75	684·72	...
		Voided leases	...	...	...	...	...	...	...	3,220·00	1,110·85	...
		Sundry claims	...	...	...	...	...	...	...	778·25	304·71	...
Rothsay	...	Voided leases	...	...	...	...	...	...	...	40,490·75	10,729·58	...
		Sundry claims	...	...	...	...	...	...	·73	6,469·50	2,562·03	...
Wadgingarra ...	...	Voided leases	...	...	...	...	...	...	...	691·11	650·63	...
		Sundry claims	...	...	...	...	...	...	...	2,131·30	559·83	...
Warda Warra ...	...	Voided leases	...	...	...	...	...	...	...	10,760·50	5,862·04	...
		Sundry claims	...	...	...	...	...	...	...	933·75	369·87	...
Warriedar ...	...	Voided leases	...	...	...	...	...	...	...	13,661·50	4,607·88	7·30
		Sundry claims	...	...	...	...	...	...	2·84	8,782·85	1,892·46	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued

YALGOO GOLDFIELD—*continued.*

MINING CENTRE.	NUMBER OF LEASE.	REGISTERED NAME OF COMPANY OR LEASE.	TOTAL FOR 1943.					TOTAL PRODUCTION.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Yalgoo	...	Voided leases	...	...	...	...	...	...	3·23	6,314·50	9,965·18	...
		Sundry claims	...	...	...	...	...	...	23·56	2,615·25	998·46	...
Yuin	...	Voided leases	...	...	...	...	...	...	127·12	68,139·50	27,908·57	130·13
		Sundry claims	...	...	...	...	...	...	4·70	335·50	67·53	...
		From Goldfield generally :—										
		Sundry parcels treated at :										
		State Battery, Payne's Find	...	...	...	*94·53	...	...	...	38·50	*4,422·91	...
		State Battery, Warriedar	...	...	...	...	...	...	...	...	*6,503·21	...
		State Battery, Yalgoo	...	...	...	...	...	...	...	...	*1,193·63	...
		Various Works	...	...	...	...	...	9·42	...	664·00	*2,958·99	26·67
		Reported by Banks and Dealers	2·21	...	...	...	...	907·54	49·86	...	34·44	...
		Totals	**2·64**	**6·04**	**2,721·75**	**1,279·25**	**·40**	**1,736·26**	**2,923·09**	**427,300·10**	**254,619·15**	**1,410·22**

Mt. Margaret Goldfield.

MOUNT MORGANS DISTRICT.

Australia United...	...	Voided leases	...	...	...	...	...	...	1,911·63	15,913·69	23,305·76	1·76
		Sundry claims	...	...	...	...	...	...	580·98	1,307·50	2,227·65	...
Eucalyptus ...	...	Voided leases	...	...	...	...	...	...	2,878·56	1,603·85	3,251·01	...
		Sundry claims	...	...	6·00	1·99	...	...	588·28	1,971·30	1,864·50	...
Linden	522F	Ailsa	...	...	161·50	83·74	...	...	...	804·50	292·71	...
	528F	Blue Peter	...	...	27·00	8·20	...	...	...	141·00	37·04	...
	508F	Coronation	...	...	3·00	·85	...	...	...	306·75	2,320·32	...
	539F	Democrat	...	...	231·00	249·82	...	...	...	708·50	576·89	...
	(517F)	Dunns' Reward	...	...	18·00	5·52	...	...	10·97	101·50	169·79	...
	544F	Happy Days	...	...	110·00	189·71	...	...	...	110·00	189·71	...
	494F	Local Lady	...	...	115·00	119·45	...	...	1·65	1,370·50	1,240·27	...
	521F	North Democrat	...	...	186·00	431·22	...	...	...	1,434·75	3,209·27	...
	529F	Second Fortune	...	...	...	...	...	...	...	427·50	233·46	...
	(542F)	Stalingrad	...	...	23·00	67·84	...	...	...	23·00	67·84	...
		Voided leases	...	...	...	...	...	7·53	553·16	57,080·06	42,698·54	·68
		Sundry claims	...	...	190·00	341·12	...	132·11	233·36	17,692·60	12,972·15	...
Mt. Margaret ...	M.A. 12F ...	Mt. Margaret Mission Station ...	...	...	...	1·09	...	113·08	18·87	403·00	131·47	·09
		Voided leases	...	...	...	...	...	12·13	1·89	8,900·39	5,291·51	12·55
		Sundry claims	...	...	...	...	...	25·22	102·12	1,701·35	652·62	...
Mt. Morgans ...	399F, etc. ...	Morgans Gold Mines Limited	...	...	44·50	209·16	...	...	...	4,427·05	*13,742·56	...
		Prior to transfer to present holders	...	...	...	...	...	...	16·66	779,578·43	354,225·86	5,552·63

	547F	Vodice	...	...	238·75	34·07	...	...	...	238·75	34·07	...
		Voided leases	...	...	...	...	...	17·95	148·79	60,503·25	34,541·15	77·86
		Sundry claims	...	...	167·50	35·18	...	34·47	360·33	4,653·82	3,153·57	...
Murrin	395F	Arthur Rymer	...	...	...	...	...	...	8·42	3,848·25	744·25	...
	482F	Hill End	...	...	...	...	...	...	...	3,666·75	1,570·74	...
		Voided leases	...	...	...	...	...	10·43	222·93	129,376·47	101,692·22	29·60
		Sundry claims	...	24·91	29·00	18·16	...	51·15	538·29	6,195·98	4,337·60	...
Redcastle	...	Voided leases	...	...	...	...	...	4·49	436·54	4,107·20	4,043·41	...
		Sundry claims	...	...	...	...	...	...	113·84	806·07	562·29	...
Yundamindra ...	510F	Landed at Last	...	...	30·00	15·02	...	...	...	4,332·00	683·02	...
	509F	New Golden Treasure	...	...	...	*22·54	...	...	22·83	979·00	378·27	...
	540F	Vera	...	...	...	...	...	...	...	70·00	27·61	...
		Voided leases	...	...	...	...	...	...	88·10	72,413·85	48,461·93	5·82
		Sundry claims	...	4·23	120·00	65·54	...	3·01	271·93	6,379·35	4,682·25	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Linden		...	...	3·00	*482·66	...	...	9·16	266·29	*10,581·29	...
	C. C. Crocker (M.A. 14F)		...	...	10·00	11·45	...	...	...	10·00	14·06	...
	Hill End Cyanide Plant		...	...	...	...	...	...	...	...	*556·95	...
	Rymers' Cyanide Plant		...	...	...	...	...	...	...	...	*1,159·90	
	A. E. Smith (M.A. 1F)		...	...	...	...	...	...	...	7·25	1·39	...
	D. F. Turbett's Cyanide Plant		...	...	...	*195·68	...	...	...	...	*857·71	...
	Various Works		...	...	...	...	...	...	...	1,257·81	*5,587·24	99·97
	Reported by Banks and Gold Dealers		32·34	...	...	37·45	...	2,855·64	124·62	10·30	94·14	·68
	Totals		**32·34**	**29·14**	**1,713·25**	**2,627·46**	...	**3,267·21**	**9,243·91**	**1,195,129·61**	**692,465·99**	**5,781·64**

MOUNT MALCOLM DISTRICT.

Cardinia	1795c	Rangoon	...	...	...	...	...	...	...	250·00	106·64	...
		Voided leases	...	...	...	...	...	13·87	1,591·66	4,600·24	3,979·15	...
		Sundry claims	...	...	136·00	18·41	...	4·25	119·83	1,762·50	560·61	...
Diorite	1806c	Little Puzzle	...	...	92·50	39·56	...	...	...	92·50	39·56	...
	1786c	Puzzle	...	...	130·00	141·77	...	...	...	1,040·00	951·95	...
		Voided leases	...	...	...	...	...	...	945·65	36,010·53	32,296·42	33·18
		Sundry claims	...	...	14·00	14·07	...	11·21	329·32	4,584·55	4,394·61	...
Dodger's Well ...	...	Voided leases	...	...	...	...	...	...	57·90	1,373·30	1,936·52	...
		Sundry claims	...	...	...	...	...	·95	28·32	1,440·25	904·23	...
Lake Darlot ...	1784c	British King West	...	...	23·50	39·60	...	...	...	237·50	233·27	...
		Voided leases	...	...	...	...	...	...	4,482·18	68,013·46	49,993·88	...
		Sundry claims	...	...	...	...	...	67·68	557·70	7,144·34	4,786·99	2·60
Leonora	1754c	Gold Blocks	...	...	32·00	346·34	...	...	...	1,375·00	1,096·73	20·75
	1594c	Leonora Central G.M. Co., N.L.	...	...	...	...	...	...	...	8,621·00	853·23	...
	1788c	Little Gwalia	...	...	...	...	...	...	...	635·00	15·62	...
	980c, etc. ...	Sons of Gwalia, Limited	...	...	75,774·00	24,002·79	2,045·24	...	...	4,944,320·67	2,053,895·66	142,994·81
		Prior to transfer to present holders	...	...	...	...	...	...	...	109,081·00	55,989·21	8·66
	1557c	Tower Hill	...	...	...	1·39	...	...	·58	526·55	119·52	...
		Voided leases	...	...	...	...	...	...	1,866·28	164,241·45	88,210·02	10·71
		Sundry claims	...	3·22	372·00	39·00	...	30·31	333·89	17,568·55	11,380·37	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

MT. MARGARET GOLDFIELD—*continued.*

MOUNT MALCOLM DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Malcolm	...	Voided leases	...	...	...	...	...	...	47·07	62,656·53	47,560·70	...
		Sundry claims	...	...	...	...	...	5·75	33·39	4,274·47	2,631·37	...
Mertondale ...	...	Voided leases	...	...	...	...	...	...	...	89,024·75	60,935·32	1,497·58
		Sundry claims	...	...	34·00	13·40	...	1·82	85·74	3,103·66	2,242·85	...
Mt. Clifford ...	(1725c) ...	Bannockburn	...	...	...	20·85	...	...	9·61	2,788·50	828·52	...
		Voided leases	...	...	...	...	...	...	1,613·74	6,768·46	15,663·65	...
		Sundry claims	...	...	30·00	10·41	...	53·98	351·65	5,481·70	3,468·07	...
Pig Well	...	Voided leases	...	...	...	...	...	...	...	13,587·32	14,676·58	63·68
		Sundry claims	...	...	...	...	...	...	34·61	2,896·65	1,225·46	...
Randwick ...	1794c	Mighty Splash	...	1·26	120·00	14·75	...	...	7·27	495·00	57·23	...
		Voided leases	...	...	...	...	...	...	239·49	10,141·65	9,653·78	...
		Sundry claims	...	...	...	...	...	66·57	164·02	2,464·64	1,299·14	...
Webster's ...	...	Voided leases	...	...	...	...	...	30·30	...	22,167·50	14,377·65	...
		Sundry claims	...	10·96	...	...	...	...	36·84	695·68	2,227·40	1,499·81
Wilson's Creek ...	...	Voided leases	...	...	...	...	...	...	...	333·50	168·27	...
		Sundry claims	...	...	...	...	...	·70	4·24	316·00	261·12	...
Wilson's Patch ...	...	Voided leases	...	...	...	...	...	...	99·38	28,863·35	13,050·19	1·05
		Sundry claims	...	...	...	...	...	4·68	50·57	1,488·91	1,357·77	...
		From District generally :—										
		Sundry parcels treated at :										
		State Battery Reserve, Darlot	...	...	...	...	...	...	...	10·00	*145·97	...
		Park and Hunt's Cyanide Plant	...	...	...	*25·69	...	...	...	...	*951·64	...
		Reefer Cyanide Plant	...	...	...	*251·54	...	...	...	20·00	*2,554·34	22·38
		Various Works	...	...	...	...	...	...	...	789·50	20,984·71	123·15
		Reported by Banks and Gold Dealers	8·20	16·69	...	...	...	3,396·50	244·28	21·50	45·17	...
		Totals	**8·20**	**32·13**	**76,758·00**	**24,979·57**	**2,045·24**	**3,725·41**	**13,994·05**	**5,632,839·38**	**2,527,383·50**	**144,778·55**
		MOUNT MARGARET DISTRICT.										
Burtville	2446T	Boomerang	...	...	53·50	60·01	...	...	...	254·00	2,014·00	21·54
	2476T	Happy Find	...	...	...	...	...	...	...	73·00	316·95	...
	2480T	Mocking Bird	...	...	...	...	...	...	...	24·50	66·89	...
	2138T	Nil Desperandum	...	...	21·75	40·13	...	...	5·30	1,379·12	3,028·52	...
	2412T	Sailor Prince	...	...	...	...	...	...	...	467·25	89·16	...
		Voided leases	...	...	...	...	...	2·29	413·80	68,523·68	104,615·47	275·27
		Sundry claims	...	...	27·50	43·73	...	2·65	208·27	7,165·91	5,332·85	...

Duketon	(2479T) ...	Mulga Queen	...	...	...	*8·09	...	...	...	26·00	26·04	...
		Voided leases	...	...	...	...	...	5·35	3,216·10	31,831·42	22,458·45	...
		Sundry claims	...	79·14	98·50	105·27	...	...	528·26	2,247·40	2,036·02	29·76
Eagle's Nest ...	...	Voided leases	...	...	...	...	...	...	145·34	534·50	1,238·22	...
		Sundry claims	...	3·62	7·50	10·14	...	11·89	459·72	943·00	316·08	...
Erlistoun	2842T	Marloo	...	...	...	8·97	...	...	...	...	8·97	...
	2141T	King of Creation Gold Mines, Ltd. ...	...	...	...	...	...	...	...	6,358·00	1,288·92	11·00
		Prior to transfer to present holders	...	...	...	...	...	...	...	13,723·00	3,199·66	...
	2345T	Western Mining Corporation, Limited ...	...	...	...	...	...	...	...	106,009·00	75,816·25	4,316·81
		Prior to transfer to present holders	...	...	...	...	...	...	...	119·25	140·97	...
	2458T	Westralia	...	...	57·00	20·65	...	...	...	87·00	84·46	...
		Voided leases	...	...	...	...	...	10·07	393·41	29,693·15	20,119·23	...
		Sundry claims	...	...	18·75	53·42	...	1,181·65	148·23	5,419·59	3,662·07	...
Euro	...	Voided leases	...	...	...	...	...	...	65·14	91,821·50	37,678·25	...
		Sundry claims	4·18	26·52	...	85·61	...	4·87	73·04	1,270·25	785·52	...
Laverton	2216T	Beria Main Lode	...	...	...	...	...	...	...	6,550·35	1,397·27	...
	2408T, etc. ...	Gladiator Gold Mines Limited	...	...	...	...	...	...	...	103,538·00	25,965·35	...
	2433T	Ida H. Extended	...	...	7·00	18·18	...	8·30	...	25·50	26·96	...
	2229T	Ida H.	...	...	...	...	...	...	...	531·50	469·46	...
	2229T. (2230T)	Ida H. leases	...	...	...	...	...	...	...	2,683·75	379·62	...
	2245T	Lancefield Extended West ...	...	...	4·00	8·17	...	...	...	472·00	786·46	...
	2478T	Lancefield North	...	...	...	*30·17	...	...	...	17·25	88·96	...
		Voided leases	...	...	...	...	...	20·29	2,024·11	1,961,643·52	784,754·06	56,923·16
		Sundry claims	...	...	...	*13·91	...	210·18	1,475·35	16,683·75	8,931·38	...
Mt. Barnicoat ...	(2477T) ...	South Ida	...	23·08	10·00	14·59	...	...	23·08	33·00	37·88	...
	2254T	Ulalla	...	...	...	...	...	...	...	392·50	92·44	...
		Voided leases	...	...	...	...	...	...	...	1,343·25	521·06	...
		Sundry claims	...	...	...	...	...	...	·68	1,058·00	796·57	...
Mt. Shenton ...	...	Voided leases	...	...	...	...	...	...	...	15·00	26·65	...
		Sundry claims	...	...	...	...	...	...	...	279·25	209·67	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Laverton		...	...	...	*3·53	...	...	...	97·50	*7,211·05	15·64
	D. Cable (L.T.T. 978H, 979H)		...	...	...	*363·61	...	...	...	...	*486·13	...
	G. E. Gray Cyanide Works		...	...	...	*27·50	...	...	...	...	*5,505·89	...
	J. Shepherd (M.A. 23T)		...	...	...	*4·40	...	...	...	...	*4·40	...
	Various Works		...	...	...	...	...	...	...	159·50	*12,335·88	...
	Reported by Banks and Gold Dealers		7·10	...	...	...	...	2,471·80	105·20	...	26·76	...
	Totals		**11·28**	**132·36**	**305·50**	**920·08**	...	**3,929·34**	**9,285·03**	**2,463,494·14**	**1,134,376·85**	**61,593·18**

North Coolgardie Goldfield.

MENZIES DISTRICT.

Comet Vale ...	5476Z	Sand Queen-Gladsome Mines, N.L. ...	...	...	...	...	...	...	...	42,096·75	14,578·62	6·45
		Prior to transfer to present holders	...	...	...	...	...	...	...	75,754·50	59,007·25	1,505·65
		Voided leases	...	...	...	...	...	...	419·74	148,635·97	119,408·22	3,839·28
		Sundry claims	...	...	10·00	4·37	...	...	40·19	1,696·91	885·75	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH COOLGARDIE GOLDFIELD—*continued.*

MENZIES DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Goongarrie ...	...	Voided leases	...	...	...	...	...	·94	1,378·20	29,771·54	17,966·00	...
		Sundry claims	...	6·06	19·00	22·39	...	46·46	1,954·08	2,276·52	2,768·44	...
Menzies	5703z	Aspacia	...	...	...	...	...	...	...	970·50	876·11	5·24
	5543z	Black Swan	...	...	...	...	...	...	...	967·63	1,486·32	9·08
	(5718z) ...	Blow	...	...	10·50	7·90	...	...	...	38·50	80·70	...
	5694z	Dark Horse	...	...	...	...	...	...	...	83·00	293·76	...
	5511z, etc. ...	First Hit Gold Mines (1934) Limited ...	...	...	4,260·00	3,099·00	...	...	...	55,175·20	39,433·13	6,608·73
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,672·75	4,687·69	...
	5542z	Good Block leases	...	...	...	...	...	...	7·32	1,425·00	1,759·23	...
	5549z	Lady Harriet	...	...	...	...	...	...	...	253·00	78·37	...
	5520z	Mignonette	...	...	...	...	...	...	...	168·50	209·47	...
	5697z	New Florence	...	6·56	219·00	64·57	...	...	6·56	910·00	328·34	...
	5663z	Springfield	...	...	10·00	3·55	...	...	...	132·00	47·98	...
	5484z	Warrior	...	...	...	...	...	...	...	2,747·00	1,323·08	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	285·96	132·77	...
	5671z	Woolgar Gold Mines Limited	...	...	...	...	...	...	...	42·00	8·85	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	151·50	174·25	...
		Voided leases	...	...	...	...	...	45·42	1,095·38	927,930·04	722,049·09	13,581·15
		Sundry claims	...	...	34·00	31·57	...	49·50	590·32	30,693·94	23,638·33	776·49
Mt. Ida	5658z	Carida	...	...	...	...	...	...	...	277·95	361·69	...
	5668z	Federation	...	...	...	...	...	...	...	389·50	425·20	...
	5551z, etc. ...	Goldfields Australian Development Co., Limited (Mt. Ida Gold Mines Limited)	...	...	5,251·00	3,195·01	172·91	...	...	24,519·50	12,090·94	808·89
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,512·75	737·95	...
	5707z	Quin Hills	...	...	...	...	...	...	12·52	809·00	181·19	...
		Voided leases	...	...	...	...	...	...	79·69	67,254·72	71,711·06	106·63
		Sundry claims	...	24·64	126·25	39·63	...	48·14	201·73	15,551·91	7,890·07	·12
Twin Hills ...	...	Voided leases	...	...	...	...	...	...	...	552·30	568·87	...
		Sundry claims	...	...	...	...	...	...	...	97·80	86·69	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Mt. Ida		...	...	...	2·94	...	...	...	1,866·25	*6,829·04	...
	Gold Tailings Limited, Cyanide Plant ...		...	...	...	...	...	...	...	...	*345·87	5·84
	Lady Harriet Cyanide Plant		...	...	...	*462·11	...	...	...	279·50	*15,311·50	30·00
	Menzies Consolidated Cyanide Plant		...	...	...	*363·93	...	...	...	...	*3,140·66	...
	B. W. Sanders' Cyanide Plant		...	...	...	...	...	...	...	...	*489·41	575·81
	Various Works		...	...	...	...	...	...	...	2,512·30	*34,165·28	1,877·50
	Reported by Banks and Gold Dealers		8·72	3·74	...	...	...	1,422·16	382·80	35·00	7·72	...
	Totals		**8·72**	**41·00**	**9,939·75**	**7,296·97**	**172·91**	**1,612·62**	**6,168·53**	**1,439,537·19**	**1,165,564·89**	**29,736·86**

ULARRING DISTRICT.

Davyhurst ...	1102U	Lights of Israel	...	...	...	...	...	...	...	...	1,075·00	169·85	...
	1016U	New Callion	...	...	...	...	...	...	...	...	5,293·30	2,002·37	119·67
	(1110U) ...	Remarc	...	·20	78·50	13·50	...	...	...	·20	955·25	179·22	...
		Voided leases	...	...	...	...	...	2·93	144·42	163,298·07	125,417·41	5,408·47	
		Sundry claims	...	...	257·00	54·65	...	...	37·98	12,482·44	5,257·36	...	
Morley's	1101U	Emerald	...	...	...	...	...	...	...	296·50	683·85	...	
	1094U	First Hit	...	...	71·00	143·84	...	...	...	618·75	2,212·66	...	
	1081U	Mabel Gertrude	...	...	15·00	13·26	...	...	...	348·00	426·55	...	
	1089U	Paramount	...	...	6·00	21·15	...	...	...	660·50	901·33	...	
	1078U	Rabbit	...	...	10·00	13·39	...	...	265·66	277·50	687·47	...	
	1074U	Two Chinamen	...	...	16·00	4·61	...	...	3,409·54	784·50	2,881·45	...	
		Voided leases	...	...	...	...	...	...	121·96	443·50	754·84	...	
		Sundry claims	...	...	49·50	72·95	...	2·16	932·23	1,253·75	2,232·21	...	
Mulline	1107U	Ajax West	...	...	...	...	...	...	1·37	282·75	547·89	...	
	1069U	Riverina Gold Mines, Limited ...	...	...	...	...	...	...	...	32,058·00	11,662·42	...	
		Voided leases	...	...	...	...	...	...	274·09	102,556·22	103,327·32	530·75	
		Sundry claims	...	...	26·00	36·79	...	...	178·19	10,301·89	8,456·61	1·10	
Mulwarrie ...	1113U	Oakley	...	...	...	...	...	...	...	151·00	191·83	...	
		Voided leases	...	...	...	...	...	...	165·29	19,480·68	26,369·21	38·47	
		Sundry claims	...	...	...	...	...	·80	282·29	2,981·33	2,574·59	...	
Ularring	...	Voided leases	...	...	...	...	...	...	563·34	9,771·60	13,907·76	...	
		Sundry claims	...	...	...	...	...	...	...	671·50	309·48	...	
	From District generally—												
	Sundry parcels treated at :												
	State Battery, Mulline	...	...	...	...	...	...	...	...	639·99	*16,459·89	...	
	State Battery, Mulwarrie	...	...	...	...	...	...	...	...	613·18	*6,564·16	...	
	E. Rowe (M.A. 13)	...	...	...	*21·01	...	...	...	...	...	*21·01	...	
	Waihi Cyanide Plant	...	...	5·00	*76·15	...	...	...	...	5·00	*260·14	...	
	Waihi-Golden Pole Cyanide Plants ...	...	...	...	...	...	...	...	...	...	*936·58	...	
	Prior to Amalgamation	...	...	...	...	...	...	...	...	...	*5,032·24	...	
	Various Works	...	...	...	...	...	...	...	15·82	215·15	*1,779·65	...	
	Reported by Banks and Gold Dealers	...	...	...	...	...	...	101·15	63·08	100·00	22·67	...	
	Totals	...	·20	**534·00**	**471·30**	...	**107·04**	**6,455·46**	**367,615·35**	**342,230·02**	**6,098·46**		

NIAGARA DISTRICT.

Desdemona ...	...	Voided leases	...	...	...	...	...	...	7·12	9,809·00	7,555·81	12·04	
		Sundry claims	...	...	...	...	...	...	8·99	2,225·45	892·48	...	
Kookynie	911G	Cosmopolitan South	...	...	...	...	...	...	...	600·00	293·91	...	
		Voided leases	...	...	...	...	...	3·35	347·30	744,223·21	393,923·63	5,375·97	
		Sundry claims	...	...	...	...	...	56·74	99·84	7,670·80	5,924·24	...	
Niagara	913G	New Gladstone	...	...	...	...	...	...	...	639·00	269·99	...	
		Voided leases	...	...	...	...	...	...	104·54	85,237·50	52,095·06	...	
		Sundry claims	...	...	117·00	27·39	...	28·10	97·22	14,119·66	7,985·46	...	
Tampa ...	902G	Grafter	...	...	...	3·61	...	...	...	192·00	20·30	...	
		Voided leases	...	...	...	...	...	...	41·58	50,285·57	23,267·41	174·24	
		Sundry claims	...	...	10·00	6·82	...	32·60	281·02	8,016·33	4,100·19	...	

TABLE 1.—*Production of Gold and Silver from all sources, etc.*—continued.

NORTH COOLGARDIE GOLDFIELD—*continued.*

NIAGARA DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
		From District generally :—										
		Sundry parcels treated at :										
		Grafter Battery	...	...	...	...	...	...	...	...	*137·63	...
		P. J. Ward—Permit	...	...	...	...	...	...	...	...	*10·08	...
		Various Works	...	...	...	...	...	...	...	1,220·50	*16,226·67	41·17
		Reported by Banks and Gold Dealers	...	...	...	...	...	1,583·86	823·66	...	63·53	...
		Totals	...	...	**127·00**	**37·82**	...	**1,704·65**	**1,811·27**	**924,239·02**	**512,766·39**	**5,603·42**
		YERILLA DISTRICT.										
Edjudina	1122R, etc. ...	Paget Gold Mines of Edjudina, Ltd. ...	...	...	...	...	...	...	...	841·50	187·51	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	738·75	559·80	...
		Voided leases	...	...	...	...	...	...	18·44	33,943·45	42,627·48	37·79
		Sundry claims	...	...	...	...	...	...	26·89	6,807·58	4,761·31	...
Patricia	...	Voided leases	...	...	...	...	...	...	...	4,158·50	5,396·40	25·40
		Sundry claims	...	...	...	...	...	...	...	35·00	17·76	...
Pinjin	...	Voided leases	...	...	...	...	...	...	48·34	17,463·30	10,742·77	...
		Sundry claims	...	...	...	...	...	...	154·86	5,623·59	3,466·70	...
Yarri	1211R	Margaret	...	...	...	...	...	...	...	590·00	131·18	...
	1126R, etc. ...	Porphyry (1939) G.M., Limited ...	...	...	3,337·00	554·83	16·37	...	...	66,648·00	9,855·05	261·86
	1126R	Edjudina Gold Mining Co., N.L. ...	...	...	...	...	...	...	...	30,220·00	5,409·93	507·51
		Prior to transfer to present holders	...	...	...	...	...	...	...	124·50	38·89	...
		Voided leases	...	...	...	...	...	6·30	87·08	43,095·25	20,835·58	2·00
		Sundry claims	...	...	...	...	...	·87	5·93	13,669·80	5,208·23	...
Yerilla	...	Voided leases	...	...	...	...	...	...	3,107·25	16,161·93	12,733·54	13·93
		Sundry claims	...	...	...	...	...	19·30	32·84	2,695·58	1,538·19	...
Yilgangie	1221R	Golden Hill	...	...	...	...	...	...	...	120·00	66·13	...
	1176R	Western Mining Corporation, Ltd. ...	...	...	...	...	...	...	...	646·75	446·89	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,244·75	1,830·28	...
		Voided leases	...	...	...	...	...	...	9·94	1,342·75	949·08	...
		Sundry claims	...	...	...	...	...	121·67	90·48	2,841·30	1,666·56	...
		From District generally :—										
		Sundry parcels treated at :										
		State Battery, Yarri	...	...	...	1·17	...	...	...	271·50	*7,494·16	3·50
		State Battery, Yerilla	...	...	...	...	...	...	...	...	*43·52	...

Various Works	...	...	...	...	...	2·17	...	642·25	*6,049·24	...
Reported by Banks and Dealers	·14	...	...	...	...	1,160·63	160·08	...	4·11	...
Totals	**·14**	...	**3,337·00**	**556·00**	**16·37**	**1,310·94**	**3,742·98**	**249,926·03**	**142,060·29**	**851·99**

Broad Arrow Goldfield.

Bardoc	2102w	Despatch	...	...	...	...	...	...	...	432·00	140·60	...
	2198w	Ellen Pearce	...	...	...	...	...	...	...	1,040·75	743·72	...
	2219w ...	Gippslander	...	...	14·50	15·14	...	...	...	26·00	26·76	...
	2199w ...	Zoroastrian	...	...	2·50	4·44	...	...	...	936·25	149·31	...
		Voided leases	...	...	...	...	...	...	2,335·41	82,272·09	54,441·19	203·60
		Sundry claims	...	...	8·50	2·70	...	54·95	1,193·45	14,157·28	7,365·78	...
Black Flag ...	2190w ...	Bell Bird	...	...	30·75	7·14	...	...	1·55	149·25	44·00	...
		Voided leases	...	...	...	...	...	27·81	404·35	48,058·54	28,105·53	...
		Sundry claims	...	...	66·25	214·65	...	712·92	250·76	7,205·71	4,513·31	...
Broad Arrow ...	2217w ...	Dreamer	...	10·99	23·00	26·82	...	...	22·64	31·00	37·93	...
	2039w ...	Golden Arrow	...	...	25·00	33·79	...	...	...	4,023·50	622·96	...
	1958w ...	Grace Darling	...	...	193·25	140·92	...	...	1·67	3,422·50	2,461·01	...
	2215w ...	Haglands' Hill	...	...	...	...	...	...	10·11	...	...	...
	2216w ...	Kimra	...	...	341·00	301·10	...	...	...	801·00	1,036·43	...
	2148w ...	Lady Betty	...	...	...	...	...	...	...	390·80	79·43	...
	2206w ...	Lady Betty Extended	...	...	...	...	...	...	...	155·00	37·48	...
	2218w ...	Lady Betty North	...	...	35·00	6·90	...	...	...	101·00	20·20	...
	(2225w) ...	New Venture	...	...	14·00	4·79	...	...	...	14·00	4·79	...
	2223w ...	North Bulletin	...	...	152·25	85·24	...	...	...	152·25	85·24	...
	1771w ...	North Duke	...	...	...	...	...	...	1,533·79	192·80	628·42	...
	1933w ...	Oversight Tara United	...	...	16·75	9·88	...	...	1,144·69	837·29	909·72	...
	2221w ...	Undersight	...	...	35·00	7·88	...	...	...	95·00	15·82	...
		Voided leases	...	...	...	...	...	70·32	7,405·47	139,070·35	111,379·31	20·23
		Sundry claims	...	...	...	...	...	1,005·82	2,605·65	29,970·14	15,527·18	·11
Cane Grass ...	...	Voided leases	...	...	...	...	...	...	27·77	669·82	460·72	...
		Sundry claims	...	...	...	...	...	...	227·55	706·70	502·29	...
Carnage	...	Voided leases	...	...	...	...	...	176·04	659·31	2,402·00	2,170·67	...
		Sundry claims	...	...	...	...	...	...	6·61	1,774·58	861·61	...
Cashman's ...	...	Voided leases	...	...	...	...	...	67·51	813·76	8,172·15	7,090·91	...
		Sundry claims	...	...	...	...	...	...	39·55	997·27	313·75	...
Christmas Reef ...	2175w ...	New Mexico...	...	...	...	...	...	...	...	281·50	515·35	...
	2211w ...	New Years Gift	...	...	...	...	...	...	...	11·25	9·03	...
		Voided leases	...	...	...	...	...	...	29·68	783·52	207·21	...
		Sundry claims	...	...	6·00	9·51	...	...	307·15	2,683·39	2,525·73	...
Fenbark	2188w ...	Golden Penny	...	...	282·25	73·04	...	...	...	2,084·25	324·80	...
	2228w ...	New Fenbark	...	...	75·75	23·16	...	...	...	75·75	23·16	...
		Voided leases	...	...	...	...	...	...	4·42	3,291·50	1,955·85	...
		Sundry claims	...	...	52·75	20·94	...	...	51·96	2,525·52	935·75	...
Grants' Patch ...	2227w ...	Magpie	...	...	35·75	101·12	...	...	...	35·75	101·12	...
	1962w, etc. ...	Ora Banda Amalgamated Mines, N.L.	...	...	16,230·00	4,109·00	...	...	...	152,188·00	56,661·88	175·00
		Prior to transfer to present holders	...	...	...	...	...	...	...	12,424·50	9,540·07	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

BROAD ARROW GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Grants' Patch—*continued.*	2208w ...	Wentworth	...	...	...	...	...	...	...	453·25	110·69	...
		Voided leases	...	...	...	...	...	...	258·52	14,501·60	4,560·62	...
		Sundry claims	...	...	...	...	...	...	351·24	4,560·29	2,323·86	...
Ora Banda ...	1336w, etc. ...	Associated Northern Ora Banda, N.L.	...	...	...	...	...	...	...	2,727·50	406·53	4·87
		Prior to transfer to present holders	...	...	...	...	...	...	...	315,958·95	123,252·22	1,664·70
	1943w, etc. ...	Ora Banda United Mines, Ltd. ...	...	...	...	...	...	...	...	2,182·25	74·80	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	76,612·22	14,630·93	...
		Voided leases	...	...	...	...	...	...	829·75	24,532·10	12,526·19	...
		Sundry claims	...	38·99	86·00	58·05	...	...	212·99	11,958·00	4,023·22	...
Paddington ...	2195w ...	Lockinvar Gold Mines, Limited ...	...	...	75·00	52·18	...	...	...	790·50	184·89	...
	2114w ...	Lone Oak	...	...	24·00	19·68	...	8·58	...	413·00	294·54	...
	2105w ...	Minnie Palmer	...	...	47·00	28·83	...	...	...	9,722·50	804·15	...
	2122w ...	Pakeka	...	...	...	...	...	...	...	1,901·90	633·49	...
		Voided leases	...	...	...	...	...	5,557·72	463·31	178,566·41	83,131·57	18·96
		Sundry claims	...	...	...	...	...	1,714·16	279·49	15,388·48	8,869·25	...
Riches' Find ...	...	Voided leases	...	...	...	...	...	...	7·01	7,357·09	5,283·87	71·36
		Sundry claims	...	...	...	...	...	...	212·26	1,460·55	1,660·28	·13
Siberia	...	Voided leases	...	...	...	...	...	1·07	2,581·31	28,854·47	31,364·62	...
		Sundry claims	...	...	6·50	5·88	...	289·06	1,178·64	20,010·29	12,337·78	...
Smithfield ...	2193w ...	King of Kings	...	...	...	...	...	...	...	2,143·75	532·78	...
		Voided leases	...	...	...	...	...	...	...	2,091·96	590·34	...
		Sundry claims	...	...	...	...	...	...	123·37	2,393·09	910·21	...
		From Goldfield generally—										
		Sundry parcels treated at:										
		State Battery, Ora Banda	...	...	...	*648·87	...	...	...	128·05	*15,810·91	...
		Brearley's Cyanide Plant	...	...	...	...	...	...	...	...	*2,374·39	1,227·68
		Golden Arrow Battery	...	...	...	*273·08	...	...	...	26·00	*2,617·13	...
		Minnie Palmer Cyanide Plant	...	...	...	*101·03	...	...	...	...	*2,746·36	...
		Various Works	...	...	...	...	...	2,275·66	1·24	16,896·02	*43,952·35	1,875·77
		Reported by Banks and Gold Dealers	10·43	3·89	4·25	5·36	...	9,885·91	127·21	61·68	90·35	...
		Totals	**10·43**	**53·87**	**17,883·00**	**6,391·12**	...	**21,847·53**	**25,703·64**	**1,266,283·85**	**688,675·34**	**5,262·41**

North-East Coolgardie Goldfield.

KANOWNA DISTRICT.

Gindalbie	1540x	Lady Betty	...	40·77	23·25	50·18	...	...	301·95	197·00	432·46	...
		Voided leases	...	...	...	...	...	...	19·94	44,077·78	39,512·90	38·31
		Sundry claims	...	...	...	·49	...	...	713·92	4,770·27	2,724·02	...
Gordon	1532x	Sirdar	...	...	215·00	200·21	...	...	79·84	4,078·25	2,855·24	61·79
		Voided leases	...	...	...	...	...	...	589·88	48,723·78	16,562·53	...
		Sundry claims	...	...	...	...	...	...	177·38	1,918·20	1,130·74	...
Kalpini	...	Voided leases	...	...	...	...	...	...	38·73	13,463·50	6,739·57	·07
		Sundry claims	...	...	...	21·81	...	24·70	252·83	1,437·00	1,010·42	...
Kanowna	1541x	Three of Diamonds	...	...	...	...	...	...	...	174·00	22·80	...
		Voided leases	...	...	...	...	...	24·94	4,511·34	684,818·35	380,125·24	2,482·24
		Sundry claims	...	...	42·00	17·28	...	100·03	2,123·37	23,603·27	10,992·11	1·50
Mulgarrie	...	Voided leases	...	...	...	...	...	...	1,216·63	6,902·26	4,197·98	...
		Sundry claims	...	...	...	...	...	...	16·78	1,261·75	631·40	...
Six Mile	1549x	Two Clubs	...	8·09	...	...	...	...	8·09	...	...	...
		Voided leases	...	...	...	...	...	...	1,595·63	559·00	767·72	...
		Sundry claims	...	...	...	...	...	...	54·14	668·50	215·28	...
	From District generally :—											
	Sundry parcels treated at :											
	Peat's Cyanide Plant		...	...	...	*71·86	...	...	...	16·00	267·70	...
	Various Works		...	...	...	...	...	330·42	867·52	158,919·05	152,894·97	...
	Reported by Banks and Gold Dealers		53·38	...	...	...	...	105,892·32	35·04	·50	101·55	...
	Totals		**53·38**	**48·86**	**280·25**	**361·83**	...	**106,372·41**	**12,603·01**	**995,588·46**	**621,184·63**	**2,583·91**

KURNALPI DISTRICT.

Jubilee	...	Voided leases	...	...	...	...	...	...	145·13	2,122·50	1,465·16	...
		Sundry claims	...	...	...	...	...	25·57	13·52	1,219·25	511·63	...
Kurnalpi	(454K) ...	Surprise Packet	...	28·54	3·50	16·84	...	...	28·54	3·50	16·84	...
		Voided leases	...	...	...	...	...	371·18	3,138·26	4,049·01	3,940·87	6·27
		Sundry claims	...	153·01	14·00	41·26	...	317·61	724·26	4,245·11	2,053·80	...
Mulgabbie ...	...	Voided leases	...	...	...	...	...	...	1,402·66	226·75	7,845·87	4·95
		Sundry claims	...	...	...	...	...	8·06	2,722·64	1,171·45	2,185·53	...
	From District generally :—											
	Sundry parcels treated at :											
	Various Works		...	...	...	...	...	...	...	101·50	388·63	...
	Reported by Banks and Gold Dealers		...	·85	...	...	...	12,097·08	68·38	...	2·35	...
	Totals		...	**182·40**	**17·50**	**58·10**	...	**12,819·50**	**8,243·39**	**13,139·07**	**18,410·68**	**11·22**

East Coolgardie Goldfield.

EAST COOLGARDIE DISTRICT.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Binduli	6025E	Red Star	...	...	67·25	6·10	...	...	...	67·25	6·10	...
		Voided leases	...	...	...	...	...	...	...	803·10	385·19	...
		Sundry claims	...	...	102·00	126·06	...	...	13·01	4,583·27	1,585·57	...
Boorara	5486E	Olympian	...	...	38·50	57·30	...	...	...	1,306·00	738·90	...
		Voided leases	...	...	...	...	...	...	459·07	306,930·82	171,842·83	408·36
		Sundry claims	...	...	...	...	...	·49	145·56	2,616·84	1,390·96	...
Boulder	5862E	Albert Adventure	...	...	...	...	...	...	...	1,460·50	258·77	...
	5630E	Argennum	...	...	...	...	...	...	...	454·50	130·63	...
	5465E	Birthday Gift	...	...	...	...	...	...	...	5,244·89	1,366·30	...
	5690E	Boulder Perseverance, Limited ...	...	...	81,964·91	22,984·80	9,156·99	...	...	1,661,706·63	736,799·50	213,131·37
		Prior to transfer to present holders	...	...	...	...	...	...	...	3,306,942·88	1,841,159·00	203,821·43
	5964E	Croesus Extended	1·07	...	...	2·32	...	1·07	...	67·75	5·22	...
	5472E	Golden Key	...	...	...	...	...	18·27	19·72	415·00	158·96	...
	5692E, etc. ...	Gold Mines of Kalgoorlie, Limited ...	...	...	87,928·00	21,609·74	8,395·36	...	...	788,921·86	245,274·40	86,540·52
		Prior to transfer to present holders	...	...	...	...	...	...	545·23	527,790·53	568,643·05	4,844·50
	5696E, (9E), etc.	Great Boulder Proprietary G.M's., Ltd.	...	...	283,201·00	63,301·54	21,173·45	...	1·53	7,212,861·97	4,562,693·21	731,717·10
	5485E	Happy Returns	...	...	...	...	...	...	...	186·50	45·78	...
	5345F, etc. ...	Kalgoorlie Enterprise Mines, Limited ...	...	...	54,026·90	16,109·76	1,074·56	...	...	360,346·78	114,304·50	11,311·49
		Prior to transfer to present holders	...	...	...	...	...	...	...	15,320·68	8,957·01	...
	5708E, (15E), etc	Lake View and Star, Limited	...	...	260,720·00	87,195·73	8,550·02	...	...	6,221,647·30	2,130,908·94	140,288·18
		Prior to transfer to present holders	...	...	...	...	...	...	8·49	15,792,500·38	9,149,223·80	1,348,055·82
	5159E	Lake View South (G.M.K.), Ltd. ...	...	...	2,151·00	528·76	...	...	...	62,278·38	21,536·66	...
	5700E, (22E), etc.	North Kalgurli (1912), Limited ...	...	...	78,180·79	25,720·88	8,810·39	...	111·55	1,423,801·10	518,816·67	137,744·67
	5700E, (22E), etc.	North Kalgurli (1912), Limited, Croesus Pty. Group	...	...	...	...	...	...	51·20	90,159·00	19,261·22	...
	5891E	(New Croesus)	...	...	...	...	...	...	...	193·00	48·74	...
	5700E. (22E), etc.	Prior to transfer to present holders	...	...	...	...	...	43·99	...	4,018,436·01	2,815,911·21	97,625·03
	5429E, etc. ...	North Kalgoorlie United Mines, Ltd. ...	...	...	...	...	...	...	...	4,661·51	928·18	232·93
		Prior to transfer to present holders	...	...	...	...	...	...	...	131·74	76·74	...
	5539E	Oroya East	...	...	...	...	...	...	...	906·25	107·22	...
	5853E, etc. ...	Paringa Junction leases	...	...	...	...	...	...	5·12	946·00	448·72	...
	5853E	(Paringa Junction)	...	...	...	...	...	...	...	123·75	17·77	...
	5854E	(Paringa Junction North) ...	...	...	...	...	...	...	...	60·50	10·64	...
	5855E	(Paringa Junction South) ...	...	...	...	...	...	...	...	1,473·25	228·42	...
	5456E, etc. ...	Paringa Mining and Exploration Co., Ltd.	...	...	74,108·00	17,103·76	46·33	...	...	484,572·06	121,502·68	8,684·00
	5556E	(Brown Hill Extended)	...	...	...	...	...	...	...	638·00	74·44	...
	5716E	(Two B's)	...	...	...	...	...	...	...	645·52	180·88	...
	5456E, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	52,670·76	23,503·73	...
	5808E, etc. ...	South Kalgurli Consolidated, Ltd. ...	...	...	63,064·92	19,135·37	1,986·49	...	...	2,288,250·17	928,098·17	17,125·51
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,344,254·70	531,792·77	17,722·97

	5466E	South Star	...	...	...	...	...	...	233·46	4,237·43	1,450·78	...
		Prior to transfer to present holders	...	...	...	...	...	...	5·22	1,835·75	748·78	...
		Voided leases	...	...	...	...	...	109·90	11,998·25	621,233·84	472,550·60	6·83
		Sundry claims	...	...	...	...	...	24·58	201·30	11,402·99	4,229·63	...
Cutter's Luck ...	...	Voided leases	...	...	...	...	...	...	20·83	12·25	9·13	...
		Sundry claims	...	25·40	...	...	...	7·67	383·14	677·90	300·78	...
Feysville	...	Voided leases	...	...	...	...	...	...	110·93	561·30	394·24	...
		Sundry claims	...	2·26	19·25	8·98	...	...	195·80	1,096·35	618·03	...
Hampton Plains	P.P.L. 9 ...	Celebration Gold Mine Co., N.L. ...	...	...	...	...	...	...	...	61,399·75	15,206·00	...
	P.P.L. 1 ...	Consolidated Gold Areas, N.L. ...	...	...	8,126·80	2,275·82	228·16	...	...	140,098·73	36,987·04	5,835·85
	P.P.L. 86 ...	Golden Hope, N.L.	...	...	...	...	...	...	...	5,964·00	2,006·14	...
	P.P.L. 192 ...	Golden Hope North	...	...	...	...	...	...	...	353·00	201·02	...
	P.P.L. 12 ...	Junction Extended	...	...	1,305·75	251·63	...	...	...	2,296·25	358·67	...
	P.P.L. 252, 289	Mount Martin	...	...	...	*16·75	...	...	...	14,953·75	5,643·07	...
	P.P.L. 279 ...	Mutooroo	...	...	...	...	...	...	...	6,151·88	1,087·26	...
	P.P.L. 277 ...	New Hope	...	...	...	32·27	...	...	17·23	53,993·55	10,127·09	...
	P.P.L. 81 ...	Villers Brettaneaux	...	...	...	...	...	...	...	3,562·02	1,435·55	...
		Voided leases	...	...	...	...	...	4,565·62	203·94	49,092·69	20,871·27	69·60
		Sundry claims	...	...	...	...	...	2·68	70·85	46,273·16	8,445·96	...
Kalgoorlie... ...	5735E	Bonnie Lass...	...	...	...	...	...	...	...	250·50	74·67	...
	5449E, etc. ...	Broken Hill Proprietary Co., Ltd. ...	...	...	695·00	440·77	...	...	3·99	272,314·01	113,598·98	1,843·28
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,027·75	166·81	...
	5331E	Cassidy's Hill	...	...	...	...	...	...	·79	243·50	135·04	...
	6030E	Churchill	...	...	54·75	6·71	...	...	...	54·75	6·71	...
	5867E	Concord	...	...	...	...	...	...	8·64	169·25	65·54	...
	5839E	Coronation	...	...	...	...	...	...	...	40·00	9·03	...
	5913E	Devon Consols	...	5·68	...	...	...	...	73·05	844·21	356·72	...
	5924E	Federal	...	...	8·00	1·91	...	...	...	36·25	4·51	...
	5510E	Golden Dream	...	...	...	...	...	...	...	530·74	149·77	...
	5737E	Golden Mile Channel	...	...	...	...	...	...	·97	2,534·50	199·41	...
	6020E	Golden Mile North...	...	...	26·75	3·07	...	...	...	87·50	20·42	...
	6019E	Golden Seam	...	...	201·00	161·16	...	...	...	201·00	161·16	...
	5904E	Great Patience	...	...	35·25	11·17	...	...	...	133·50	46·61	...
	5519E	Hannan's Enterprise	...	...	...	...	...	...	...	362·00	79·80	...
	5878E	Lady May	...	...	488·00	127·83	...	...	...	1,471·00	287·00	...
	5549E	Maritana Hill	...	...	...	...	...	...	...	381·50	42·12	...
	4547E, etc. ...	Mount Charlotte Gold Mines, Limited	...	...	...	...	...	...	...	1,234·00	252·17	...
		Prior to transfer to present holders	...	...	...	...	...	...	5·72	48,292·60	13,930·79	...
	5437E	North End Extended	...	57·60	...	1·35	...	...	753·97	226·30	388·81	...
	5852E	Pedestal	...	...	...	...	...	...	...	1,608·75	444·93	...
	5468E	Phar Lap	...	...	15·00	4·65	...	...	...	403·75	324·21	...
	5415E	Return	...	...	...	...	...	...	5·64	3,670·50	638·42	...
	5934E	Sceptre	...	...	...	...	...	...	...	28·00	4·63	...
	6024E	Trident	...	...	58·75	36·67	...	...	...	58·75	36·67	...
		Voided leases	...	...	...	...	...	242·48	9,558·67	963,254·45	397,399·16	44,017·12
		Sundry claims	...	...	190·75	22·70	...	232·41	1,053·03	58,910·04	22,883·50	...
Wombola	5688E	Caledonian	...	...	349·50	240·35	...	...	...	3,191·50	2,561·70	...
	5497E	Daisy...	...	...	206·50	197·48	...	...	...	3,433·75	3,351·84	...
	5872E	Everley	...	...	...	...	...	...	...	34·00	25·13	...
	5962E	G.D.M.	...	68·71	14·00	33·37	...	...	68·71	39·50	102·59	...
	5689E	Haonia	...	...	859·50	584·49	...	...	...	5,085·00	3,785·34	...
	5500E	Happy Go-Lucky	...	...	...	...	...	...	...	2,075·25	1,675·85	...
	5961E	Loganberry	...	...	42·00	29·39	...	...	...	288·25	101·02	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

EAST COOLGARDIE GOLDFIELD—*continued.*

EAST COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Wombola—*contd.*	5829E	Lurgan	...	...	...	...	...	...	·69	854·75	476·59	...
	5798E	Maranoa	...	12·44	10·00	18·71	...	...	32·17	2,033·00	1,038·25	...
	5493E, etc. ...	New Milano, N.L.	...	...	1,608·75	587·30	36·01	...	·25	17,030·75	10,548·97	479·00
	5493E	(Milano)	...	...	...	...	...	...	...	4,012·75	11,676·72	...
	5616E	(Leslie)	...	...	...	...	...	...	...	602·00	939·10	...
	5967E	North Caledonian	...	...	...	...	...	...	...	10·75	4·16	...
	5850E	Pauline	...	...	...	...	...	...	...	237·00	287·95	...
	4766E	Pericles Gold Mines, Limited	...	...	...	...	...	...	358·11	4,728·03	19,305·86	...
	6022E	Proprietary	...	...	148·75	234·34	...	...	...	203·25	274·38	...
	(6018E) ...	Reggio	...	·43	...	...	...	...	·43	47·50	10·95	...
	5866E	Rosemary	...	...	15·00	20·07	...	...	...	32·50	67·19	...
	5925E	Tangney	...	...	...	...	...	...	...	12·00	4·46	...
	5795E	Transvaal	...	...	...	...	...	...	...	504·75	102·14	...
	5525E	Xmas Flat	...	...	...	...	...	...	...	330·25	264·74	...
		Voided leases	...	...	...	...	...	...	2,003·68	19,037·31	18,386·22	...
		Sundry claims	...	...	20·00	50·69	...	...	398·62	20,189·93	12,606·59	...
	From District generally :—											
	Sundry claims		...	...	...	...	...	11,014·57	465·61	5,440·46	2,541·10	...
	Sundry Parcels treated at :											
	Kalgoorlie State Battery		...	...	...	*772·44	...	...	...	279·45	*19,594·70	...
	Cavalier Treatment Works		...	...	...	...	...	...	...	10·50	*31·43	...
	Prior to transfer to present holders		...	...	...	...	...	...	...	...	*1,538·16	1,507·65
	Bowden Bros. Cyanide Works		...	...	...	...	...	...	...	...	*286·50	...
	Golden Horseshoe (New), Ltd.		...	...	...	*10,693·96	17,810·83	...	...	...	*239,691·58	194,186·21
	S. Irwin & W. J. Heydon Treatment Works ...		...	...	...	*10·73	...	...	...	...	64·05	...
	Pericles Cyanide Plant		...	...	...	*384·51	...	...	...	...	*1,569·22	...
	Polkinghorne's Cyanide Plant		...	...	...	...	...	...	...	...	*149·38	...
	J. F. Poynton (M.A.I)		...	...	9·50	6·06	...	...	...	9·50	6·06	...
	Various Works		...	...	...	...	...	384·36	64·70	41,096·27	*263,842·67	12,606·81
	Reported by Banks and Gold Dealers		47·77	·52	20·00	448·35	...	16,504·52	9,699·75	355·63	2,353·96	...
	Totals		**48·84**	**173·04**	**1,000,081·82**	**291,597·80**	**77,268·59**	**33,152·61**	**39,358·62**	**48,501,148·40**	**26,272,068·66**	**3,279,806·23**

BULONG DISTRICT.

Balagundi ...	...	Voided leases	...	...	...	...	...	...	2,408·98	1,110·68	1,473·73	12·92
		Sundry claims	...	...	...	...	...	3·51	280·53	656·76	456·17	...
Bulong	1311Y	Blue Quartz	...	...	...	...	...	...	...	571·50	159·49	...
	1315Y	Lady Gwen	...	...	62·00	21·80	...	...	...	62·00	21·80	...
	1308Y	Southern Cross	...	...	...	...	...	...	1·30	1,144·75	161·40	...

		Voided leases	...	...	...	...	...	107·54	8,490·35	104,142·55	85,090·08	...
		Sundry claims	...	8·27	307·25	41·41	...	1,655·86	1,581·44	14,498·98	17,376·35	...
Majestic	...	Voided leases	...	...	...	...	...	19·45	63·91	1,317·94	647·62	...
		Sundry claims	...	...	...	...	...	42·88	150·67	1,894·05	936·32	...
Morelands ...	...	Sundry claims	...	...	...	...	...	...	·13	183·00	58·51	...
Mt. Monger ...	...	Voided leases	...	...	...	...	...	...	2,771·39	1,437·85	1,256·10	...
		Sundry claims	...	...	...	...	...	215·60	...	379·05	308·48	...
Randall's	...	Voided leases	...	...	...	...	...	...	60·04	33,099·85	11,089·30	...
		Sundry claims	...	...	...	...	...	20·70	8·11	4,691·56	1,188·34	...
Taurus	...	Voided leases	...	...	...	...	...	2·06	3·70	1,765·10	909·84	...
		Sundry claims	...	...	...	...	...	112·69	51·88	2,597·35	1,036·33	...
Trans Find ...	P.P.L. 308 ...	Dawn of Hope	...	...	...	...	...	...	2·87	792·25	286·93	...
		Voided leases	...	...	...	...	...	...	...	983·92	865·71	...
		Sundry claims	...	...	...	...	...	...	5·93	699·25	312·08	...
	From District generally —											
	Sundry parcels treated at Various Works		...	...	...	...	...	...	...	6,102·15	6,675·38	...
	Reported by Banks and Gold Dealers		5·11	...	...	...	...	25,183·72	69·44	·01	28·44	...
	Totals		**5·11**	**8·27**	**369·25**	**63·21**	...	**27,364·01**	**15,950·67**	**178,130·55**	**130,338·40**	**12·92**

Coolgardie Goldfield.

COOLGARDIE DISTRICT.

Bonnievale ...	5596	Jenny Wren	...	...	...	...	...	...	141·17	575·00	603·32	4·17
	4600	Melva Maie	...	...	9·00	41·66	...	...	...	1,461·65	3,128·52	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	614·50	1,099·21	11·63
	5321	Westralia Extended	...	...	...	...	...	...	...	164·50	37·54	...
		Voided leases	...	...	...	...	...	...	25·00	352,443·84	188,746·25	...
		Sundry claims	...	...	9·00	5·89	...	...	158·69	5,928·93	4,485·38	...
Bullabulling ...	...	Voided leases	...	...	...	...	...	...	...	776·81	668·19	...
		Sundry claims	...	...	...	...	...	5·21	15·98	1,308·26	558·48	...
Burbanks	5605	Burbanks Deeps	...	...	...	...	...	...	...	103·00	53·46	...
	5443	New Gift	...	...	...	...	...	...	2·00	601·00	206·10	...
	5250	Vice Regal	...	...	...	...	...	...	1·91	3,966·00	1,250·21	...
		Voided leases	...	...	...	...	...	14·90	372·17	415,584·71	304,569·63	521·06
		Sundry claims	...	...	8·00	3·19	...	55·05	461·78	13,824·10	8,347·96	...
Cave Rocks ...	5645	Goldcoin	...	...	...	...	...	...	...	242·75	39·30	...
	5665	Nornadeen	...	...	...	...	...	...	...	214·00	68·63	...
		Voided leases	...	...	...	...	...	...	...	2,302·05	588·18	...
		Sundry claims	...	...	...	...	...	...	50·00	3,415·65	785·28	...
Coolgardie ...	5679	Ada	...	...	122·00	17·67	...	...	...	122·00	17·67	...
	5637	Caledonia	...	...	...	...	...	...	7·30	1,471·50	225·75	...
	5297, etc. ...	Consolidated G.Ms. of Coolgardie, Ltd.	...	...	32,983·00	5,126·96	591·63	...	...	260,925·70	48,197·73	4,680·11
		Prior to transfer to present holders	...	...	...	...	...	...	4·55	1,946·35	547·45	3·22

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

COOLGARDIE GOLDFIELD—*continued.*

COOLGARDIE DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Coolgardie—*contd.*	5653	Gleesons	...	...	...	...	...	...	...	1,925·00	922·37	...
	5680	Greenhills	...	...	16·00	8·48	...	...	...	16·00	8·48	...
	5638	Grey's Hill	...	...	...	...	...	...	...	129·00	87·50	...
	5577	Iron Duke	...	...	...	...	...	...	...	826·00	589·23	...
	5598	King Solomon	...	...	32·00	4·04	...	2·69	...	593·50	90·36	...
	5643	Lloyd George South	...	...	...	...	...	...	...	...	10·25	...
	5622	Lucky Hit	...	...	60·00	39·21	...	...	...	592·50	229·24	...
	5239, etc. ...	Phoenix Gold Mines, Ltd	...	...	24,719·00	6,695·28	...	...	...	111,977·00	31,860·56	2·54
		Prior to transfer to present holders	...	...	...	...	...	...	2·74	167·56	237·80	...
		Voided leases	...	...	...	...	...	1,299·02	4,665·92	570,910·43	326,346·17	·96
		Sundry claims	1·29	11·20	98·50	30·55	...	203·33	2,666·92	63,264·78	23,377·00	...
Eundynie	5624	Eundynie	...	...	...	...	...	...	...	54·00	71·56	...
		Voided leases	...	...	...	...	...	·92	16·09	31,697·20	16,423·28	1·75
		Sundry claims	...	...	...	...	...	...	10·18	630·19	311·52	...
Gibraltar	5217	Lloyd George	...	...	300·00	85·87	...	...	18·69	6,232·88	3,491·58	...
		Voided leases	...	...	...	...	...	...	15·28	31 849·75	16,424·07	...
		Sundry claims	...	...	...	...	...	1·39	50·76	2,823·20	1,259·75	...
Gnarlbine ...	...	Voided leases	...	...	...	...	...	...	13·95	2,731·75	1,341·60	...
		Sundry claims	...	...	...	...	...	...	4·90	1,186·10	504·18	...
Hampton Plains	P.P.L. 119 ...	Golden Eagle	...	...	...	...	...	...	7·63	2,807·59	2,548·42	...
	P.P.L. 319 ...	Lady May	...	...	...	...	...	...	...	20·00	24·75	...
	P.P.L. 315 ...	Malvern Star	...	...	...	...	...	...	...	16·00	10·14	...
	P.P.L. 316 ...	Surprise G.M.	...	...	981·00	646·62	...	...	...	5,229·00	2,781·69	...
		Voided leases	...	...	...	...	...	...	403·05	8,588·25	7,820·86	...
		Sundry claims	...	...	...	...	...	...	132·06	1,717·25	780·47	...
Higginsville ...	5647	Fair Play Gold Mine	...	...	1,930·00	270·39	...	...	...	5,076·00	1,060·87	...
	5616	Milesi Deeps	...	...	...	...	...	...	60·39	56·30	54·20	·65
	5662	Sons of Erin	...	...	...	...	...	...	...	68·05	139·85	...
	5293	Two Boys	...	...	...	*67·09	...	...	...	7,248·00	*3,542·28	...
	5666	War Time lease	...	26·28	20·00	43·59	...	...	26·28	20·00	43·59	...
		Voided leases	...	...	...	...	...	...	287·26	37,773·25	17,105·03	158·79
		Sundry claims	...	...	20·00	6·32	...	...	149·47	3,594·73	1,907·79	...
Larkinville ...	...	Voided leases	...	...	...	...	...	22·77	46·48	2,098·91	3,198·09	...
		Sundry claims	...	...	...	...	...	...	147·20	400·78	697·01	...
Logan's Find ...	5324, etc. ...	Spargo's Reward G.M. (1935), N.L. ...	...	...	...	...	...	...	...	105,397·50	26,318·11	...
		Voided leases	...	...	...	...	...	...	...	1,182·31	531·33	...
		Sundry claims	...	...	40·70	83·95	...	...	128·95	1,517·60	828·21	...

Londonderry ...	...	Voided leases	...	...	...	...	...	...	93·13	29,817·35	20,886·19	...
		Sundry claims	...	...	...	...	...	16·68	38·72	2,995·67	2,406·90	22·42
Mungari	...	Voided leases	...	...	...	...	...	...	17·71	735·00	331·78	...
		Sundry claims	...	...	...	...	...	1·77	151·34	1,104·44	433·74	...
Paris	5311, 5500 ...	Lister's G.M.	...	...	769·00	453·16	...	...	...	9,691·00	5,334·19	...
	5514	(Paris)	...	...	...	...	...	...	...	696·00	337·87	3·24
	5500	(Paris Central)	...	...	...	...	...	...	...	113·00	24·16	...
		Voided leases	...	...	...	...	...	...	4·30	463·00	209·47	...
		Sundry claims	...	...	...	...	...	...	...	2,037·25	501·81	...
Red Hill	...	Voided leases	...	...	...	...	...	14·87	1,551·81	40,797·40	31,070·65	...
		Sundry claims	...	...	...	...	...	15·29	90·11	1,306·52	704·47	...
Ryan's Find ...	...	Voided leases	...	...	...	...	...	...	...	54·16	151·69	...
		Sundry claims	...	...	...	...	...	...	·44	101·69	228·66	...
St. Ive's	(5593)	Catherine	...	4·61	...	...	...	...	41·74	222·90	218·66	...
	(5617), 5628, 5629	Ives' Reward leases	...	...	...	...	...	...	...	1,617·00	450·47	...
		Voided leases	...	...	...	...	...	61·90	105·13	37,377·56	15,384·93	...
		Sundry claims	...	...	...	...	...	211·25	944·85	4,078·56	1,441·72	...
Wannaway ...	...	Voided leases	...	...	...	...	...	...	19·10	1,813·35	1,047·89	...
		Sundry claims	...	...	...	...	...	...	175·11	1,101·42	1,150·43	...
Widgiemooltha ...	5451	Host Group	...	...	...	...	...	...	...	1,601·00	434·38	...
	5658	Iron Knob	...	5·14	145·00	45·76	...	...	6·02	145·00	52·19	...
	5664	Three Black Cats	...	...	28·25	10·94	...	...	...	154·25	42·70	...
		Voided leases	...	...	...	...	...	9·42	1,108·92	20,208·45	11,249·94	·17
		Sundry claims	...	2·78	81·75	38·94	...	46·49	415·81	15,145·71	6,506·29	...
	From District generally :—											
	Sundry parcels treated at :											
	State Battery, Coolgardie...		...	...	...	*383·56	...	...	...	771·01	*29,961·89	9·65
	Australian Machinery and Investment Company's Cyanide Plant		...	...	...	*63·65	...	...	...	...	*2,905·79	86·31
	Frank's Cyanide Plant		...	...	...	...	...	...	...	...	*1,343·17	...
	Imperial Cyanide Plant		...	...	...	...	...	...	...	26·00	*340·76	...
	Lister's Cyanide Plant		...	...	...	...	...	...	...	...	*269·23	...
	Paris Central Cyanide Plant		...	...	...	...	...	...	...	...	*77·64	...
	Parry's Cyanide Plant		...	...	...	...	...	...	...	...	*1,356·32	...
	Widgiemooltha Cyanide Plant		...	...	...	*9·35	...	...	...	...	*1,165·31	...
	Various Works		...	...	...	...	...	7·75	...	3,871·61	*25,133·42	223·06
	Reported by Banks and Gold Dealers		47·83	...	...	...	...	14,615·54	715·02	48·25	64·91	...
	Totals		**49·12**	**50·01**	**62,372·20**	**14,182·12**	**591·63**	**16,606·24**	**15,574·01**	**2,256,505·21**	**1,220,363·05**	**5,729·73**

KUNANALLING DISTRICT.

Carbine	970s	Carbine	...	...	...	...	...	...	...	13,820·00	7,047·96	...
	970s, etc. ...	Carbine leases	...	...	...	...	...	...	687·98	51,991·86	39,862·25	...
		Voided leases	...	...	...	...	...	...	...	20,116·00	5,470·81	...
		Sundry claims	...	...	...	...	...	136·08	93·96	5,851·53	1,946·07	...
Chadwin	1014s	Magdala	...	...	...	...	...	...	...	285·50	116·84	...
	1020s	Question Mark	...	...	236·00	272·69	...	...	...	283·00	393·87	...

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

COOLGARDIE GOLDFIELD—*continued.*

KUNUNALLING DISTRICT—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Chadwin—*continued*		Voided leases	...	...	...	...	...	...	...	3,578·55	3,691·68	2·50
		Sundry claims	...	...	...	...	...	14·28	53·82	4,405·55	2,447·80	...
Dunnsville ...	...	Voided leases	...	...	...	...	...	...	828·58	17,489·60	8,642·30	...
		Sundry claims	...	...	9·25	9·84	...	2·82	1,020·90	2,300·81	1,697·01	...
Jourdie Hills ...	...	Voided leases	...	...	...	...	...	...	18·00	28,009·74	19,401·09	28·45
		Sundry claims	...	...	...	...	...	1·86	49·81	1,648·75	811·80	1·05
Kintore	...	Voided leases	...	...	...	...	...	18·70	169·33	54,044·64	39,197·31	677·88
		Sundry claims	...	...	26·00	24·46	...	111·91	94·93	2,776·13	1,992·53	...
Kunanalling ...	987s	Premier	...	...	560·00	383·61	...	·23	...	3,431·00	1,744·80	...
	919s, 987s ...	(Eureka leases)	...	...	...	...	...	...	...	7,172·50	6,288·07	12·78
	988s	Premier North	...	...	100·00	54·43	...	...	...	410·00	288·08	...
		Voided leases	...	...	...	...	...	85·90	1,734·92	117,678·66	91,323·50	27·99
		Sundry claims	...	...	8·00	4·98	...	216·53	808·12	12,710·32	8,863·66	...
Kundana	...	Voided leases	...	...	...	...	...	...	...	465·00	68·12	...
		Sundry claims	...	...	...	...	...	...	...	305·25	34·63	...
		From District generally :—										
		Sundry parcels treated at:										
		Goldfields Australian Development Treatment Works	...	...	...	*199·70	...	...	...	...	*363·63	...
		Various Works	...	...	...	...	...	42·23	...	1,782·26	*5,061·33	...
		Reported by Banks and Gold Dealers	13·17	...	...	...	...	850·29	17·93	...	5·85	·49
		Totals	**13·17**	...	**939·25**	**949·71**	...	**1,480·83**	**5,578·28**	**350,556·65**	**246,760·99**	**751·14**

Yilgarn Goldfield.

Blackbornes ...	...	Voided leases	...	...	...	...	...	...	...	1,282·50	341·37	...
		Sundry claims	...	...	...	...	...	...	...	340·50	74·59	...
Bullfinch	4020	Birthday	...	...	...	...	...	...	·95	8·00	60·05	...
	4042	Birthday South	...	1 03	...	...	...	...	1·03	15·00	50·50	...
	3345, etc. ...	Copperhead	...	...	...	...	...	...	...	7,427·32	2,076·32	...
	3378	Copperhead Deeps	...	...	...	...	...	...	...	13,554·65	4,102·83	...
	3337, 3458 ...	Easter Gift leases	...	...	...	...	...	...	...	1,597·00	472·43	...
		Prior to transfer to present holders	...	...	...	...	...	...	48·03	3,594·26	1,169·82	...

	3400, etc. ...	Frances May	...	...	...	...	...	...	7·74	8,683·55	3,341·69	...
	3397	Goldfinch	...	...	...	...	...	...	6·73	6,456·03	2,634·10	...
	4009	Reynold's Find	...	...	...	...	...	...	...	241·00	114·95	...
	3350	Rising Sun	...	...	...	...	...	...	2·30	37,059·53	10,837·80	...
		Voided leases	...	...	...	...	...	...	10·14	489,929·07	185,333·68	27,958·41
		Sundry claims	...	...	25·00	3·16	...	8·47	37·04	7,284·75	3,949·16	...
Corinthian ...	3398, 3425 ...	Corinthian leases	...	...	10·00	24·03	...	...	...	3,081·83	1,770·09	...
	3398	(Corinthian)	...	...	...	...	...	...	...	7,383·75	2,543·16	...
	3425	(Corinthian North)	...	...	...	...	...	...	...	3,951·00	1,934·78	...
	3415	Deliverance	...	...	...	...	...	...	...	3,019·40	3,173·07	...
		Voided leases	...	...	...	...	...	...	...	135,095·00	30,011·76	...
		Sundry claims	...	...	...	...	...	...	·68	1,022·35	557·63	...
Eenuin	4067	Lone Pine	...	...	76·75	16·55	...	...	...	106·75	29·41	...
	4060	Star of Eenuin	...	2·33	249·25	174·08	...	...	2·33	310·25	225·88	...
	3936, etc. ...	Yellowdine Gold Areas, N.L.	...	...	...	...	...	...	...	7,341·50	7,605·06	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	281·00	418·04	...
		Voided leases	...	...	...	...	...	...	176·13	1,349·56	1,557·76	...
		Sundry claims	...	...	...	...	...	·60	73·97	2,291·60	1,602·46	...
Evanston	3895	Blue Peter	...	...	...	...	...	...	...	1,288·00	285·84	...
	3868	Evanston	...	...	3,120·00	796·13	...	...	...	48,125·30	24,513·45	10·14
	3870	Evanston East	...	...	...	...	...	...	...	34·00	13·59	...
	3869	Evanston North	...	...	...	...	...	...	...	1,598·76	1,079·93	...
	3888	Goldie's	...	...	...	...	...	...	...	200·00	43·15	...
	3997	Gravel Pit	...	...	21·00	28·88	...	...	79·27	238·80	160·25	...
		Voided leases	...	...	...	...	...	...	...	649·00	230·70	...
		Sundry claims	...	...	...	...	...	4·98	...	503·35	133·66	...
Forrestonia ...	...	Voided leases	...	...	...	...	...	...	...	1,185·00	298·15	...
		Sundry claims	...	...	...	...	...	...	...	372·00	141·78	...
Golden Valley ...	3575	Great Bingin	...	...	349·00	171·83	...	...	...	16,771·00	10,248·61	...
	3573	(Marie's Find)	...	...	...	...	...	...	...	742·00	353·15	...
	3822	(Queen Marie)	...	...	...	...	...	...	...	180·50	164·83	...
	(4066)	Queenslander	...	...	49·00	20·94	...	...	...	291·00	111·45	...
	2994, etc. ...	Radio leases	...	...	765·00	701·98	...	...	2·70	16,034·30	37,145·14	7·43
	3248, etc. ...	Radio Deeps leases	...	...	200·00	80·32	...	...	...	5,460·58	6,252·15	...
	3993	Stumpy Doodle	...	·58	900·00	246·25	7·44	...	·58	1,932·00	690·46	7·44
		Voided leases	...	...	...	...	...	...	35·76	10,511·84	10,472·95	2·00
		Sundry claims	...	...	26·00	5·06	...	4·58	57·83	6,076·77	4,511·84	1·02
Greenmount ...	...	Voided leases	...	...	...	...	...	45·99	21·62	125,022·64	31,575·09	944·50
		Sundry claims	...	...	...	...	...	·46	4·27	2,856·58	779·67	...
Holleton	37PP	Britannia	...	...	36·00	32·90	...	...	...	278·00	423·91	...
	3923	Holleton East	...	...	300·00	37·44	·40	...	...	3,924·00	380·83	2·74
		Voided leases	...	...	...	...	...	...	9·33	39,808·75	12,554·58	31·79
		Sundry claims	...	...	50·00	14·48	·20	...	3·75	3,464·05	923·78	·20
Hope's Hill ...	3414	Pilot	...	...	...	...	...	...	...	19,446·12	2,948·68	...
	4033	Queen Elizabeth	...	...	...	...	...	...	...	113·00	46·22	...
		Voided leases	...	...	...	...	...	...	74·78	132,361·55	36,369·69	1·00
		Sundry claims	...	...	...	...	...	18·67	33·36	4,151·02	1,301·77	...
Kennyville ...	3766	Golden Arrow	...	...	160·00	29·80	...	...	...	2,329·00	314·27	...
	3875	Victoria	...	...	...	...	...	...	...	3,592·00	841·55	·63

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

YILGARN GOLDFIELD—*continued.*

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Kennyville—*contd.*		Voided leases	...	...	...	...	...	...	18·76	53,252·63	21,206·34	·59
		Sundry claims	...	...	...	...	...	...	5·06	8,237·50	2,137·54	...
Koolyanobbing ...	...	Voided leases	...	...	...	...	...	...	...	1,707·05	884·28	...
		Sundry claims	...	...	...	...	...	·26	...	580·00	225·46	...
Marvel Loch ...	4046	Banker	...	...	...	...	...	...	...	50·00	19·67	...
	3987, etc. ...	Burbidge Gold Mines, N.L.	...	...	4,350·00	411·39	...	...	...	72,785·00	7,404·15	...
	3987	(Grand National)	...	...	...	...	...	...	...	19,739·00	2,647·30	...
	4003	Christmas Gift	...	...	...	...	...	...	1·40	90·00	46·58	...
	3957	Comet	...	...	...	...	...	...	...	1,067·00	639·66	6·85
	13PP	Cricket	...	...	...	...	...	...	...	1,616·00	921·75	...
	3966	Donovan's Find	...	...	...	...	...	...	...	120·05	47·26	...
	3942, 3943 ...	Edward's Reward leases	...	...	2,725·00	1,338·65	...	...	...	16,507·50	8,551·01	...
	3942	(Edward's Reward)	...	...	...	...	...	...	...	2,080·00	2,016·32	...
	3943	(Sunshine)	...	...	...	...	...	...	...	3,866·00	2,384·79	...
	4034	Firelight	...	...	...	...	...	...	...	645·00	117·54	...
	3724	Frances Firness	...	...	...	...	...	...	...	8,012·00	3,731·76	...
	3941	Geelong	...	...	25·00	3·14	...	...	1·95	403·50	72·14	...
	3683	Golden Cube	...	...	...	...	...	...	20·27	1,193·00	606·09	...
	3718	Kurrajong	...	...	...	...	...	...	...	9,106·00	3,231·11	...
	4047	Lennenburg's Reward	...	...	...	...	...	...	...	341·00	32·40	...
	3431, etc. ...	Lenodo leases	...	...	...	1·07	...	...	...	5,006·00	1,039·93	·36
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,056·00	177·67	...
	3914	May	...	...	...	...	...	...	...	145·00	45·86	...
	(3837)	Maydo	...	...	10·00	2·88	...	...	...	315·00	190·72	...
	3459	May Queen	...	...	...	...	...	...	...	3,738·00	6,922·23	...
	3970	Mountain Queen	...	...	6·00	65·46	...	...	...	476·00	254·24	...
	3390, etc. ...	N.G.M., Ltd.	...	...	...	...	...	...	...	4,067·50	351·36	·50
		Prior to transfer to present holders	...	...	...	...	...	...	...	2,675·00	459·66	...
	4068	Try Again	...	...	140·00	33·12	...	...	...	140·00	33·13	...
	4035	Undaunted	...	...	252·00	44·46	...	...	...	742·00	92·19	...
	4006	Union Jack	...	...	...	...	...	...	...	907·00	177·74	1·04
		Voided leases	...	...	...	...	...	...	385·60	626,630·16	176,740·16	2,464·70
		Sundry claims	...	...	40·00	4·93	...	11·35	214·18	33,125·84	12,810·48	...
Mt. Jackson ...	3449	Die Hardy	...	...	...	...	...	...	...	365·50	343·86	...
	3859	Great Unknown	...	12·99	66·00	96·89	...	...	14·71	708·50	650·97	...
	3418	Clamp's Central	...	...	...	...	...	...	...	1,232·50	665·35	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	7,224·00	6,457·63	6·34
		Voided leases	...	...	...	...	...	...	164·60	44,202·28	30,726·43	2,307·43
		Sundry claims	...	...	...	...	...	6·44	52·87	9,811·85	4,453·41	70·74
Mt. Palmer ...	3544, etc. ...	Yellowdine Gold Development. Ltd. ...	...	...	14,695·00	5,536·13	...	...	...	300,478·50	153,377·88	...
		Prior to transfer to present holders	...	...	...	...	...	...	...	1,564·65	2,540·71	...

		Voided leases	...	...	...	...	...	...	...	67·25	22·90	...
		Sundry claims	...	...	...	...	...	1,643·48	18·19	385·25	356·07	...
Mt. Rankin ...	3555	No Trumps	...	...	...	...	...	...	...	5,205·37	819·29	...
		Voided leases	...	...	...	...	...	3·84	5·20	496·00	122·17	...
		Sundry claims	...	...	...	...	...	...	...	491·00	117·59	...
Parker's Range ...	3520	Centenary	...	...	...	...	...	...	...	1,671·00	440·00	...
	3460	Fortuna lease	...	...	244·00	107·13	...	...	...	2,958·00	834·51	...
	4064	Groper	...	...	10·00	3·65	...	...	30·38	41·00	157·18	...
	4052	McIntosh	...	...	37·00	53·42	...	...	...	234·00	153·39	...
	4000	Olga	...	...	...	...	...	...	...	96·00	114·14	...
	(2801)	Scot's Greys	...	...	58·00	17·82	...	...	...	2,129·00	735·04	...
	4062	Victory	...	...	308·00	157·67	...	...	...	509·00	402·60	...
	3969	White Horseshoe	...	...	255·00	92·94	...	...	...	1,682·60	1,049·73	25·95
		Voided leases	...	...	...	...	...	·42	117·30	48,098·75	24,395·50	·45
		Sundry claims	...	...	...	...	...	6·59	51·73	9,960·75	4,351·53	·08
Southern Cross ...	4004	Excelsior	...	...	90·00	19·26	...	...	...	866·00	261·16	...
	4018	Fraser's	...	...	...	...	...	...	...	1,211·50	152·41	...
	(3862)	Fraser's Central	...	...	48·00	18·67	...	...	10·43	1,549·00	403·52	...
	4010	Lord Cardigan	...	...	...	...	...	...	...	280·00	36·13	...
	3944	Nil Desperandum	...	...	...	...	...	...	...	1,297·00	189·83	...
	4032	Queen Ann	...	...	20·00	4·66	...	...	...	230·00	27·99	...
	3444, etc. ...	Three Boys Gold Mines, Limited ...	...	...	...	...	...	...	...	9,947·00	1,376·56	1·26
	3444	(Three Boys)	...	...	...	...	...	...	...	4,180·00	727·75	...
	3934	(Three Boys North)	...	...	...	...	...	...	...	106·00	14·66	...
	3981	(Three Kings)	...	...	...	...	...	...	...	104·00	10·01	...
	3444, etc. ...	(Yellowdine Options, N.L.)	...	...	...	...	...	...	...	8,074·25	2,000·29	...
		Voided leases	...	...	...	...	...	4·89	250·92	451,302·68	214,548·95	364·41
		Sundry claims	...	...	...	...	...	95·90	642·09	8,099·66	2,609·39	...
Westonia	3038, etc. ...	Edna May (W.A.) Amalgamated G.M.'s. N.L.	...	...	8,681·00	3,332·31	335·13	...	...	89,920·00	40,723·24	3,706·24
		Prior to transfer to present holders	...	...	...	...	...	...	...	4,092·00	2,867·26	...
	4023	Greenfinch	...	...	...	...	...	...	...	462·00	424·02	...
		Voided leases	...	...	...	...	...	...	4·06	445,495·49	314,459·63	21·78
		Sundry claims	...	...	...	...	...	9·51	64·96	3,853·41	2,487·34	...
	From Goldfield generally :—											
	Sundry parcels treated at :											
	Butcher Bird Cyanide Plant	...	...	...	*3·30	...	...	...	4·50	*3,254·86	...
	Centenary Cyanide Plant	...	...	...	*22·06	...	...	...	...	*450·34	...
	Copperhead Cyanide Plant	...	...	...	*268·59	...	...	...	...	*15,592·17	...
	Coronation G.M. Co.'s Cyanide Plant	...	...	...	*·73	...	...	...	...	*273·00	...
	Holleton Cyanide Plant	...	...	...	*101·05	·04	...	...	...	*619·13	47·50
	Howlett's Cyanide Plant	...	...	...	*285·28	...	...	...	110·00	*13,220·06	...
	Invermay Cyanide Plant	...	...	...	...	...	...	...	...	*597·71	3·57
	Kurrajong Cyanide Plant	...	...	...	...	...	...	...	...	*409·57	...
	Pilot Cyanide Plant	...	...	...	...	...	...	...	...	*3,745·95	...
	Queen Ann Treatment Works	...	...	...	*22·06	...	...	...	...	*169·05	...
	Radio Deeps Cyanide Plant	...	...	...	*216·22	...	...	...	...	*1,401·39	...
	Rainbow Cyanide Plant	...	...	...	*149·35	...	...	...	...	*529·97	...
	Three Boys Cyanide Plant	...	...	...	*13·12	...	...	...	7·00	*2,249·37	...
	L. C. Wesley's Hope Hill Cyanide Plant ...	...	...	...	*131·20	...	...	...	...	*1,085·63	...
	Various Works	...	...	...	...	...	...	...	156·78	57,495·74	36·54
	Reported by Banks and Dealers	·86	...	...	·26	...	313·31	62·14	...	8·00	...
	Totals	**·86**	**16·93**	**38,397·00**	**14,942·71**	**343·21**	**2,179·74**	**2,827·12**	**3,543,630·81**	**1,625,227·93**	**38,033·63**

TABLE I.—*Production of Gold and Silver from all sources, etc.*—continued.

Dundas Goldfield.

Mining Centre.	Number of Lease.	Registered Name of Company or Lease.	Total for 1943.					Total Production.				
			Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Silver.
			Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.
Buldania	...	Voided leases	...	...	...	...	...	...	3·02	846·05	708·99	...
		Sundry claims	...	...	...	...	...	...	36·53	1,281·02	837·20	·12
Dundas	...	Voided leases	...	...	...	...	...	1·88	28·02	6,103·48	2,545·38	155·02
		Sundry claims	...	...	51·50	71·11	5·13	·76	413·85	1,761·75	1,019·19	17·81
Norseman ...	1596	Abbotshall	...	...	378·25	243·31	9·86	...	...	2,362·45	973·14	745·00
	1382, etc. ...	Blue Bird Gold Mines, N.L.	...	...	154·00	225·85	145·52	...	1,663·32	10,927·00	24,299·51	1,617·21
		Prior to transfer to present holders	...	...	...	...	...	...	...	864·25	1,277·32	...
	1468	Bronzewing	...	...	103·00	132·39	10·19	...	33·89	626·25	778·88	29·86
	1617	Caesar	...	...	...	...	...	...	...	54·00	42·72	...
	1319, etc. ...	Central Norseman Gold Corporation, N.L.	...	...	76,864·00	27,088·90	20,167·40	...	...	614,590·20	227,193·95	231,223·03
	1386	(Valkyrie South Extended) ...	...	...	...	...	...	...	...	15·25	5·68	...
	1319, etc. ...	Prior to transfer to present holders	...	...	...	...	...	...	...	19,487·58	14,657·87	2,305·45
	1452	Cumberland Central	...	...	...	...	...	...	...	265·25	72·77	·19
	1462	Cumberland Central West ...	...	...	...	...	...	...	...	118·00	36·75	...
	1619	Dunkerque	...	...	...	...	...	...	...	203·00	218·20	3·04
	1637	Ellen Terry	...	...	130·00	189·00	21·44	...	...	279·25	447·50	37·27
	1421	Empress Gold Mines, N.L.	...	...	...	...	...	...	...	567·50	516·08	54·61
	1653	Houghton	...	...	35·00	27·56	3·33	...	...	35·00	27·56	3·33
	1364	Lady Mary	...	...	...	...	...	...	...	99·00	15·45	...
	1490, etc. ...	Norseman Associated G.M's., Ltd. ...	...	...	...	...	...	...	...	17,917·00	3,216·75	4,981·00
		Prior to transfer to present holders	...	...	...	...	...	...	...	83·25	23·47	...
	1371, etc. ...	Norseman Development, N.L.	...	...	...	...	...	...	...	38,102·00	7,532·50	12,586·00
		Prior to transfer to present holders	...	...	...	...	...	...	...	40·50	9·68	...
	1315, etc. ...	Norseman Gold Mines, Ltd.	...	...	58,215·00	11,734·00	23,991·00	...	...	836,582·00	221,991·95	317,851·54
		Prior to transfer to present holders	...	...	...	...	...	...	...	2,656·75	669·38	...
	1588	O.K.	...	...	...	...	...	...	...	288·00	133·72	2·37
	1422	Onkaparinga	...	...	145·00	388·91	42·49	...	...	309·25	694·57	66·80
	1468, 1422 ...	Bronzewing and Onkaparinga (prior to cancellation of Amalgamation)	...	...	...	...	...	...	...	843·00	1,396·98	3·62
	1530	Second Try	...	...	...	...	...	...	4·37	191·75	71·20	8·80
	1624	Valhalla	...	...	22·25	28·64	1·09	...	...	204·50	168·35	7·06
		Voided leases	...	...	...	...	...	9·31	10,551·37	891,402·47	585,967·60	36,638·93
		Sundry claims	...	...	410·00	278·15	25·48	1,041·31	3,377·55	43,540·91	20,888·29	131·30
Peninsula	1616	Day Dawn	...	...	...	...	...	...	...	364·75	414·21	3·60
	1597	Peninsula North	...	...	...	...	...	...	...	191·75	231·07	7·54
		Voided leases	...	...	...	...	...	...	24·29	8,817·14	5,373·87	...
		Sundry claims	...	...	...	...	...	...	...	203·00	108·18	·97
	From Goldfield generally:											
	Sundry parcels treated at:											
	State Battery, Norseman		...	...	...	*311·30	138·24	...	...	405·39	*24,094·06	1,023·65
	Princess Royal Cyanide Plant		...	...	...	*16·15	...	...	...	...	*1,833·92	1,498·05
	Various Works		...	...	...	...	...	...	54·52	483·14	*12,857·24	844·36

		Reported by Banks and Gold Dealers	1·90	...	...	...	...	1,180·87	41·03	47·50	18·62	·43
		Totals	**1·90**	...	**136,508·00**	**40,735·27**	**44,561·17**	**2,234·13**	**16,231·76**	**2,503,160·33**	**1,163,369·75**	**611,847·96**

Phillips River Goldfield.

Hatter s Hill ...	...	Voided leases	...	...	...	...	...	...	4·38	1,499·55	1,182·75	...
		Sundry claims	...	...	11·00	27·98	...	74·91	21·69	5,219·60	2,716·30	26·09
Kundip	249, etc. ...	Beryl Gold Mines Ltd.	...	...	...	...	...	...	...	2,365·00	*2,330·52	197·78
	261	Gem Restored	...	...	...	...	...	...	...	68·00	10·29	...
		Voided leases	...	...	...	...	...	113·28	556·17	82,109·58	†58,196·98	3,811·03
		Sundry claims	...	...	...	...	...	90·27	72·84	6,404·18	†1,939·25	54·65
Mt. Desmond ...	...	Voided leases	...	...	...	...	...	...	1·40	9·00	3,905;46	6,891·59
		Sundry claims	...	...	...	...	...	...	...	...	32·81	51·01
Ravensthorpe ...	...	Voided leases	...	...	...	...	...	...	141·80	24,723·55	26,070·94	4,384·07
		Sundry claims	...	...	16·00	4·48	...	163·96	7·68	7,251·57	3,194·41	41·12
West River ...	...	Voided leases	...	...	...	...	...	...	...	...	*10·34	31·06
		Sundry claims	...	...	...	...	...	...	...	...	3·29	3·44
		From Goldfield generally :—										
		Sundry parcels treated at :										
		Cordingup Cyanide Plant	...	...	...	*16·07	...	...	...	...	*909·37	4·36
		Floater Cyanide Plant	...	...	...	*6·35	...	...	...	12·00	*242·50	...
		Daw & Toleman's Cyanide Plant	...	...	...	...	...	...	...	...	*337·35	...
		Kundip Cyanide Plant	...	...	...	...	...	...	...	15·00	*15·25	...
		Various Works	...	...	...	...	...	...	...	...	*1,925·45	493·66
		Reported by Banks and Gold Dealers	2·43	...	...	...	...	164·69	11·47	...	...	...
		Totals	**2·43**	...	**27·00**	**54·88**	...	**607·11**	**817·43**	**129,677·03**	**103,023·26**	**15,989·86**

Outside Proclaimed Goldfield.

Burracoppin ...	...	Voided leases	...	...	...	...	...	...	...	710·85	706·38	...
		Sundry claims	...	...	...	...	...	...	...	372·75	213·97	...
Donnybrook ...	...	Voided leases	...	...	...	...	...	23·24	...	1,613·30	816·23	...
		Sundry claims	...	...	...	...	...	44·01	42·29	119·50	15·71	15·18
Jimperding ...	45PP	Hillsdale	...	...	...	...	...	...	...	1,261·75	298·05	...
Roebourne ...	68H, 70H ...	Corderoy's Mines, Ltd.	...	...	...	...	...	...	...	1,954·50	451·44	10·79
		Voided leases	...	...	...	...	...	177·74	93·21	19,975·11	22,105·90	1,258·16
		Sundry claims	...	...	...	...	...	46·39	88·97	1,074·35	845·13	99·11
		Reported by Banks and Gold Dealers ...	...	...	...	...	...	6,063·75	170·45	103·50	228·32	...
		From State generally :—										
		Sundry parcels treated at :										
		Fremantle Smelter, Ltd.	...	...	...	...	...	...	...	...	*1,879·08	1,109·06
		Various Works	...	...	...	...	...	...	...	27·00	*7,233·06	30,417·57
		Sundry Specimens	...	...	...	...	...	4·24	56·85	...	...	...
		Voided leases and sundry claims	...	...	...	...	...	245·45	14·13	201·60	43·58	...
		Reported by Banks and Gold Dealers	67·55	15·98	...	...	...	979·40	821·18	...	240·14	59·99
		Totals	**67·55**	**15·98**	...	...	...	**7,584·22**	**1,287·08**	**27,414·21**	**35,076·99**	**32,969·86**

† Includes Gold and Silver from Smelted Copper Ore.

TABLE II.

PRODUCTION OF GOLD AND SILVER FROM ALL SOURCES, SHOWING IN FINE OUNCES THE OUTPUT, AS REPORTED TO THE MINES DEPARTMENT DURING THE YEAR 1943.

Goldfield.	District.	DISTRICT.						GOLDFIELD.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold	Silver.
		Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240 lbs.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	... ...	...	...	...	...	...	...	64·05	...	455·00	262·21	326·26	...
Pilbara	Marble Bar ...	11·60	107·96	15,228·44	14,910·11	15,029·67	...	71·77	107·96	16,930·69	15,579·19	15,758·92	...
	Nullagine ...	60·17	...	1,702·25	669·08	729·25	...						
Ashburton	... ...	...	...	...	...	...	...	17·10	...	35·00	27·51	44·61	...
Gascoyne	... ...	...	...	...	...	...	...	...	...	...	...	...	...
Peak Hill	... ...	...	...	...	...	...	...	9·33	25·99	404·00	444·31	479·63	...
East Murchison ...	Lawlers ...	...	...	29,938·18	8,688·70	8,688·70	...	12·60	170·52	610,055·57	81,006·98	81,190·10	32·07
	Wiluna ...	12·60	...	580,410·14	71,308·87	71,321·47	...						
	Black Range ...	...	170·52	707·25	1,009·41	1,179·93	32·07						
Murchison	Cue	444·57	132·66	27,807·00	5,975·78	6,553·01	757·61	549·95	171·82	70,818·75	24,614·64	25,336·41	916·08
	Meekatharra ...	39·85	...	2,778·25	4,305·57	4,345·42	...						
	Day Dawn ...	53·05	20·46	786·25	1,748·57	1,822·08	...						
	Mt. Magnet ...	12·48	18·70	39,447·25	12,584·72	12,615·90	158·47						
Yalgoo	... ...	...	...	...	...	...	...	2·64	6·04	2,721·75	1,279·25	1,287·93	·40
Mt. Margaret ...	Mt. Morgans ...	32·34	29·14	1,713·25	2,627·46	2,688·94	...	51·82	193·63	78,776·75	28,527·11	28,772·56	2,045·24
	Mt. Malcolm ...	8·20	32·13	76,758·00	24,979·57	25,019·90	2,045·24						
	Mt. Margaret...	11·28	132·36	305·50	920·08	1,063·72	...						
North Coolgardie ...	Menzies ...	8·72	41·00	9,939·75	7,296·97	7,346·69	172·91	8·86	41·20	13,937·75	8,362·09	8,412·15	189·28
	Ularring ...	...	·20	534·00	471·30	471·50	...						
	Niagara ...	...	...	127·00	37·82	37·82	...						
	Yerilla ...	·14	...	3,337·00	556·00	556·14	16·37						
Broad Arrow ...	... ...	...	...	...	...	...	...	10·43	53·87	17,883·00	6,391·12	6,455·42	...
N.E. Coolgardie ...	Kanowna ...	53·38	48·86	280·25	361·83	464·07	...	53·38	231·26	297·75	419·93	704·57	...
	Kurnalpi ...	...	182·40	17·50	58·10	240·50	...						
East Coolgardie ...	East Coolgardie	48·84	173·04	1,000,081·82	291,597·80	291,819·68	77,268·59	53·95	181·31	1,000,451·07	291,661·01	291,896·27	77,268·59
	Bulong ...	5·11	8·27	369·25	63·21	76·59	...						
Coolgardie	Coolgardie ...	49·12	50·01	62,372·20	14,182·12	14,281·25	591·63	62·29	50·01	63,311·45	15,131·83	15,244·13	591·63
	Kunanalling ...	13·17	...	939·25	949·71	962·88	...						
Yilgarn	... ...	...	...	...	...	...	...	·86	16·93	38,397·00	14,942·71	14,960·50	343·21
Dundas	... ...	...	...	...	...	...	...	1·90	...	136,508·00	40,735·27	40,737·17	44,561·17
Phillips River ...	... ...	...	...	...	...	...	...	2·43	...	27·00	54·88	57·31	...
Outside Proclaimed Goldfields ...		...	...	...	...	...	...	67·55	15·98	...	...	83·53	...
		...	...	...	...	...	...	**1,040·91**	**1,266·52**	**2,051,010·53**	**529,440·04**	**531,747·47**	**125,947·67**

TABLE III.

RETURN SHOWING TOTAL PRODUCTION REPORTED TO THE MINES DEPARTMENT, AND RESPECTIVE DISTRICTS AND GOLDFIELDS FROM WHENCE DERIVED, TO 31ST DECEMBER, 1943.

Goldfield.	District.	DISTRICT.						GOLDFIELD.					
		Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	*Silver.	Alluvial.	Dollied and Specimens.	Ore treated.	Gold therefrom.	Total Gold.	*Silver.
		Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Tons (2,240lbs.).	Fine ozs.	Fine ozs.	Fine ozs.
Kimberley	... ...	...	...	...	...	...	...	7,626·00	142·43	22,453·15	17,036·31	24,804·74	93·00
Pilbara	Marble Bar ...	14,696·74	4,400·46	246,281·72	261,267·62	280,364·82	755·05	24,223·68	5,003·40	318,083·41	350,462·34	379,689·42	783·72
	Nullagine ...	9,526·94	602·94	71,801·69	89,194·72	99,324·60	28·67						
Ashburton	... ...	...	...	...	...	...	...	9,220·98	406·39	5,684·25	2,398·70	12,026·07	8,183·68
Gascoyne	... ...	...	...	...	...	...	...	677·52	41·57	387·00	517·29	1,236·38	...
Peak Hill	... ...	...	...	...	...	...	...	3,361·69	4,998·33	609,054·18	290,791·73	299,151·75	2,311·33
East Murchison ...	Lawlers ...	6,855·69	2,277·45	1,900,742·26	793,762·32	802,895·49	26,279·64	8,691·67	21,410·77	11,498,024·32	3,449,448·99	3,479,551·43	51,663·06
	Wiluna ...	218·61	1,235·82	7,879,433·84	1,714,229·31	1,715,683·74	2,889·42						
	Black Range ...	1,617·37	17,897·47	1,717,848·22	941,457·36	960,972·20	22,494·00						
Murchison	Cue	4,418·16	7,569·81	3,369,704·64	911,865·54	923,853·51	118,586·57	24,045·67	56,339·30	8,916,568·51	4,132,397·00	4,212,781·97	294,995·75
	Meekatharra ...	14,186·72	17,425·79	2,221,897·99	1,263,382·77	1,294,995·28	5,042·27						
	Day Dawn ...	2,989·08	11,066·29	2,012,866·28	1,328,502·82	1,342,558·19	169,210·44						
	Mt. Magnet ...	2,451·71	20,277·41	1,312,099·60	628,645·87	651,374·99	2,156·47						
Yalgoo	... ...	...	...	...	...	...	...	1,736·26	2,923·09	427,300·10	254,619·15	259,278·50	1,410·22
Mt. Margaret ...	Mt. Morgans ...	3,267·21	9,243·91	1,195,129·61	692,465·99	704,977·11	5,781·64	10,921·96	32,522·99	9,291,463·13	4,354,226·34	4,397,671·29	212,153·37
	Mt. Malcolm ...	3,725·41	13,994·05	5,632,839·38	2,527,383·50	2,545,102·96	144,778·55						
	Mt. Margaret...	3,929·34	9,285·03	2,463,494·14	1,134,376·85	1,147,591·22	61,593·18						
North Coolgardie ...	Menzies ...	1,612·62	6,168·53	1,439,537·19	1,165,564·89	1,173,346·04	29,736·86	4,735·25	18,178·24	2,981,317·59	2,162,621·59	2,185,535·08	42,290·73
	Ularring ...	107·04	6,455·46	367,615·35	342,230·02	348,792·52	6,098·46						
	Niagara ...	1,704·65	1,811·27	924,239·02	512,766·39	516,282·31	5,603·42						
	Yerilla ...	1,310·94	3,742·98	249,926·03	142,060·29	147,114·21	851·99						
Broad Arrow ...	... ...	...	...	...	...	...	...	21,847·53	25,703·64	1,266,283·85	688,675·34	736,226·51	5,262·41
N.E. Coolgardie ...	Kanowna ...	106,372·41	12,603·01	995,588·46	621,184·63	740,160·05	2,583·91	119,191·91	20,846·40	1,008,727·53	639,595·31	779,633·62	2,595·13
	Kurnalpi ...	12,819·50	8,243·39	13,139·07	18,410·68	39,473·57	11·22						
East Coolgardie ...	East Coolgardie	33,152·61	39,358·62	48,501,148·40	26,272,068·66	26,344,579·89	3,279,806·23	60,516·62	55,309·29	48,679,278·95	26,402,407·06	26,518,232·97	3,279,819·15
	Bulong ...	27,364·01	15,950·67	178,130·55	130,338·40	173,653·08	12·92						
Coolgardie	Coolgardie ...	16,606·24	15,574·01	2,256,505·21	1,220,363·05	1,252,543·30	5,729·73	18,087·07	21,152·29	2,607,061·86	1,467,124·04	1,506,363·40	6,480·87
	Kunanalling ...	1,480·83	5,578·28	350,556·65	246,760·99	253,820·10	751·14						
Yilgarn	... ...	...	...	...	...	...	...	2,179·74	2,827·12	3,543,630·81	1,625,227·93	1,630,234·79	38,033·63
Dundas	... ...	...	...	...	...	...	...	2,234·13	16,231·76	2,503,160·33	1,163,369·75	1,181,835·64	611,847·96
Phillips River ...	... ...	...	...	...	...	...	...	607·11	817·43	129,677·03	103,023·26	104,447·80	15,989·86
Outside Proclaimed Goldfields ...		...	...	...	...	...	...	7,584·22	1,287·08	27,414·21	35,076·99	43,948·29	32,969·86
		...	...	...	...	...	...	327,489·01	286,141·52	93,835,570·21	47,139,019·12	47,752,649·65	4,606,883·73

* By-product from treatment of auriferous ore, with exception of yield from Ashburton G.F. and outside Proclaimed Goldfield.

TABLE IV.

TOTAL OUTPUT OF GOLD (BULLION AND CONCENTRATES ENTERED FOR EXPORT AND GOLD RECEIVED AT THE ROYAL MINT, PERTH), FROM 1ST JANUARY, 1886 TO 31ST DECEMBER, 1943; SHOWING IN FINE OUNCES THE QUANTITY CREDITED TO THE RESPECTIVE GOLDFIELDS.

Year.	Export.	Mint.	Total.	Export.	Mint.	Total.
		KIMBERLEY.			PILBARA.	
	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
Prior to 1940	22,422·06	10,921·60	33,343·66	147,356·01	240,812·15	388,168·16
1940	....	767·82	767·82	....	19,164·69	19,164·69
1941	....	806·73	806·73	128·64	20,330·75	20,459·39
1942	....	605·88	605·88	127·94	15,747·25	15,875·19
1943	....	249·60	249·60	....	16,222·38	16,222·38
Total	22,422·06	13,351·63	35,773·69	147,612·59	312,277·22	459,889·81
		(*a*) WEST PILBARA.			ASHBURTON.	
Prior to 1940	4,351·11	26,760·61	31,111·72	4,104·96	4,394·59	8,499·55
1940	....	....	....	....	717·86	717·86
1941	....	....	....	....	551·08	551·08
1942	....	....	....	....	95·42	95·42
1943	....	....	....	....	33·57	33·57
Total	4,351·11	26,760·61	31,111·72	4,104·96	5,792·52	9,897·48
		(*b*) GASCOYNE.			(*c*) PEAK HILL.	
Prior to 1940	304·55	1,037·75	1,342·30	41,102·62	199,143·49	240,246·11
1940	....	23·50	23·50	·14	1,483·74	1,483·88
1941	....	2·64	2·64	....	1,332·11	1,332·11
1942	....	....	....	....	253·82	253·82
1943	....	....	....	....	388·52	388·52
Total	304·55	1,063·89	1,368·44	41,102·76	202,601·68	243,704·44
		EAST MURCHISON.			MURCHISON.	
Prior to 1940	241,127·85	2,465,040·99	2,706,168·84	1,570,132·72	2,568,368·18	4,138,500·90
1940	4,249·40	135,235·82	139,485·22	834·90	133,094·08	133,928·98
1941	2,864·92	108,328·38	111,193·30	1,324·84	103,960·74	105,285·58
1942	3,850·32	82,262·14	86,112·46	853·58	85,325·67	86,179·25
1943	3,025·25	63,725·90	66,751·15	568·11	25,431·99	26,000·10
Total	255,117·74	2,854,593·23	3,109,710·97	1,573,714·15	2,916,180·66	4,489,894·81
		(*d*) YALGOO.			(*e*) MT. MARGARET.	
Prior to 1940	13,505·95	174,281·19	187,787·14	665,299·26	3,395,119·17	4,060,418·43
1940	....	5,749·11	5,749·11	11,920·81	71,974·46	83,895·27
1941	37·98	4,864·43	4,902·41	12,357·47	52,765·11	65,122·58
1942	6·80	2,981·14	2,987·94	1,867·53	41,497·11	43,364·64
1943	22·42	1,272·93	1,295·35	411·87	24,666·82	25,078·69
Total	13,573·15	189,148·80	202,721·95	691,856·94	3,586,022·67	4,277,879·61
		(*f*) NORTH COOLGARDIE.			(*g*) BROAD ARROW.	
Prior to 1940	262,775·66	1,898,186·03	2,160,961·69	122,229·85	352,918·32	475,148·17
1940	211·62	23,331·75	23,543·37	71·47	22,171·68	22,243·15
1941	74·33	24,708·48	24,782·81	22·91	16,164·60	16,187·51
1942	12·82	19,339·58	19,352·40	69·14	8,950·04	9,019·18
1943	97·63	8,220·58	8,318·21	46·24	7,318·34	7,364·58
Total	263,172·06	1,973,786·42	2,236,958·48	122,439·61	407,522·98	529,962·59
		(*f*) NORTH-EAST COOLGARDIE.			(*f*) EAST COOLGARDIE.	
Prior to 1940	235,796·33	453,315·98	689,112·31	6,912,650·14	19,168,093·22	26,080,743·36
1940	10·29	746·57	756·86	53,037·94	538,917·99	591,955·93
1941	5·38	1,102·87	1,108·25	47,377·28	524,307·42	571,684·70
1942	19·42	494·60	514·02	7,246·74	443,509·94	450,756·68
1943	6·03	395·36	401·39	828·72	316,369·51	317,198·23
Total	235,837·45	456,055·38	691,892·83	7,021,140·82	20,991,198·08	28,012,338·90
		(*h*) COOLGARDIE.			YILGARN.	
Prior to 1940	662,299·85	1,010,681·53	1,672,981·38	216,630·37	1,310,177·77	1,526,808·14
1940	185·83	40,136·71	40,322·54	299·17	63,192·45	63,491·62
1941	87·60	45,060·80	45,148·40	495·43	54,327·48	54,822·91
1942	58·32	32,199·57	32,257·89	929·82	30,765·37	31,695·19
1943	172·36	16,897·52	17,069·88	600·83	14,505·05	15,105·88
Total	662,803·96	1,144,976·13	1,807,780·09	218,955·62	1,472,968·12	1,691,923·74
		(*i*) DUNDAS.			(*j*) PHILLIPS RIVER.	
Prior to 1940	168,072·51	869,016·94	1,037,089·45	40,413·90	57,648·72	98,062·62
1940	304·54	60,263·49	60,568·03	155·12	1,261·98	1,417·10
1941	437·48	80,771·37	81,208·85	2·14	2,453·97	2,456·11
1942	74·13	66,630·78	66,704·91	23·50	964·46	987·96
1943	40·35	44,115·34	44,155·69	1·88	80·80	82·68
Total	168,929·01	1,120,797·92	1,289,726·93	40,596·54	62,409·93	103,006·47
		¶ DONNYBROOK.			OUTSIDE PROCLAIMED GOLDFIELDS.	
Prior to 1940	282·21	557·53	839·74	18,969·12	31,273·87	50,242·99
1940	....	....	....	399·24	1,567·38	1,966·62
1941	....	....	....	709·54	1,553·00	2,262·54
1942	....	....	....	536·42	881·20	1,417·62
1943	....	....	....	586·65	172·87	759·52
Total	282·21	557·53	839·74	21,200·97	35,448·32	56,649·29

(*a*) Prior to 1st May, 1898, included with Pilbara, and abolished 12th July, 1929. (*b*) Prior to March, 1899, included with Ashburton. (*c*) From 1st August, 1897. (*d*) Prior to 1st April, 1897, included with Murchison. (*e*) From 1st August, 1897. (*f*) Prior to 1st May, 1896, included with Coolgardie. (*g*) From 1st September, 1897. (*h*) Declared 5th April, 1894, to which date included with Yilgarn. (*i*) Prior to 1893, included with Yilgarn. (*j*) Prior to 1902, included in Outside Proclaimed Goldfields. ¶ Abolished 4th March, 1908.

TABLE V.

TOTAL OUTPUT OF GOLD BULLION, CONCENTRATES, ETC., ENTERED FOR EXPORT AND RECEIVED AT THE PERTH BRANCH OF THE ROYAL MINT.

Year.	Export.	Mint.	Total.	Estimated Value.
	fine ozs.	fine ozs.	fine ozs.	£A.
1886	270·17	...	270·17	1,147
1887	4,359·37	...	4,359·37	18,518
1888	3,124·82	...	3,124·82	13,273
1889	13,859·52	...	13,859·52	58,871
1890	20,402·42	...	20,402·42	86,664
1891	27,116·14	...	27,116·14	115,182
1892	53,271·65	...	53,271·65	226,284
1893	99,202·50	...	99,202·50	421,385
1894	185,298·73	...	185,298·73	787,099
1895	207,110·20	...	207,110·20	879,749
1896	251,618·69	...	251,618·69	1,068,808
1897	603,846·44	...	603,846·44	2,564,977
1898	939,489·49	...	939,489·49	3,990,697
1899	1,283,360·25	187,244·41	1,470,604·66	6,246,732
1900	894,387·27	519,923·59	1,414,310·86	6,007,610
1901	923,686·96	779,729·56	1,703,416·52	7,235,654
1902	707,039·75	1,163,997·60	1,871,037·35	7,947,661
1903	833,685·78	1,231,115·62	2,064,801·40	8,770,719
1904	810,616·04	1,172,614·03	1,983,230·07	8,424,226
1905	655,089·88	1,300,226·00	1,955,315·88	8,305,654
1906	562,250·59	1,232,296·01	1,794,546·60	7,622,749
1907	431,803·14	1,265,750·45	1,697,553·59	7,210,750
1908	356,353·96	1,291,557·17	1,647,911·13	6,999,881
1909	386,370·58	1,208,898·83	1,595,269·41	6,776,274
1910	233,970·34	1,236,661·68	1,470,632·02	6,246,848
1911	160,422·28	1,210,445·24	1,370,867·52	5,823,075
1912	83,577·12	1,199,080·87	1,282,657·99	5,448,385
1913	86,255·13	1,227,788·15	1,314,043·28	5,581,701
1914	51,454·65	1,181,522·17	1,232,976·82	5,237,352
1915	17,340·47	1,192,771·23	1,210,111·70	5,140,228
1916	26,742·17	1,034,655·87	1,061,398·04	4,508,532
1917	9,022·49	961,294·67	970,317·16	4,121,646
1918	15,644·12	860,867·03	876,511·15	3,723,183
1919	6,445·89	727,619·90	734,065·79	3,618,509
1920	5,261·13	612,581·00	617,842·13	3,598,931
1921	7,170·74	546,559·92	553,730·66	2,942,526
1922	5,320·16	532,926·12	538,246·28	2,525,812
1923	5,933·82	498,577·59	504,511·41	2,232,186
1924	2,585·20	482,449·78	485,034·98	2,255,927
1925	3,910·59	437,341·56	441,252·15	1,874,320
1926	3,188·22	434,154·98	437,343·20	1,857,715
1927	3,359·10	404,993·41	408,352·51	1,734,572
1928	3,339·30	390,069·19	393,408·49	1,671,093
1929	3,037·12	374,138·96	377,176·08	1,602,142
1930	1,753·09	415,765·00	417,518·09	1,864,442
1931	1,726·66	508,845·36	510,572·02	2,998,137
1932	3,887·07	601,674·33	605,561·40	4,403,642
1933	2,446·97	634,760·40	637,207·37	4,886,254
1934	3,520·40	647,817·95	651,338·35	5,558,873
1935	9,868·71	639,180·38	649,049·09	5,702,149
1936	55,024·58	791,183·21	846,207·79	7,373,539
1937	71,646·91	928,999·84	1,000,646·75	8,743,755
1938	113,620·06	1,054,171·13	1,167,791·19	10,363,023
1939	98,739·88	1,115,497·76	1,214,237·64	11,842,964
1940	71,680·47	1,119,801·08	1,191,481·55	12,696,503
1941	65,925·94	1,043,391·96	1,109,317·90	11,851,445
1942	15,676·48	832,503·97	848,180·45	8,865,495
1943	6,408·34	540,067·08	546,475·42	5,710,668
Total	11,509,519·94	37,773,512·04	49,283,031·98	266,386,137

	1942. £	1943. £
Estimated total par value of above production	207,019,690	209,340,969
Premiums received on sales of gold during 1920–1924 and 1930–1942 (approximate)	53,655,778	57,045,168
Estimated Total	£A260,675,468	£A266,386,137
Gross estimated value of gold won (including £161,448, bonus paid under the Commonwealth Bounty Act, 1930)	£A260,836,916	£A266,547,585

TABLE VI.—MINERALS OTHER THAN GOLD.

GENERAL RETURN OF ORE AND MINERALS, OTHER THAN GOLD, SHOWING THE QUANTITY PRODUCED AND THE VALUE THEREOF AS REPORTED TO THE MINES DEPARTMENT FROM THE RESPECTIVE GOLDFIELDS AND MINERAL FIELDS, DURING 1943, AND PREVIOUS YEARS.

Period.	ANTIMONY.								GLAUCONITE.	
	East Murchison Goldfield.		Pilbara Goldfield.		State generally.		Total.		State generally.	
	Quantity.*	Value.*	Quantity.	Value.	Quantity	Value.	Quantity	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	1,265	16,289	3	39	21	491	1,289	16,819	1,792	8,960
1940	264	10,180	....	....	....	....	264	10,180	200	‡4,823
1941	308	12,484	1	55	....	....	309	12,539	156	3,888
1942	†2,370	64,539	†13	169	....	....	†2,383	64,708	260	6,500
1943	†1,127	41,676	....	....	....	....	†1,127	41,676	98	2,450
Total	**5,334**	**145,168**	**17**	**263**	**21**	**491**	**5,372**	**145,922**	**2,506**	**26,621**

* By-product from Moonlight Wiluna and Wiluna G.M's.

† Concentrates.

Note.—Metallic content only shown to 1941.

‡ Reviewed F.O.B. cost figure accepted.

Period.	FELSPAR						GYPSUM.					
	Coolgardie Goldfield.		State generally.		Total.		Yilgarn Goldfield.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	17,412	34,722	250	500	17,662	35,222	9,960	9,960	80,567	97,487	90,527	107,447
1940	3,457	6,915	48	96	3,505	7,011	1,359	850	11,661	13,232	13,020	14,082
1941	3,990	11,970	117	220	4,107	12,190	132	159	9,381	10,086	9,513	10,245
1942	3,241	9,712	11	22	3,252	9,734	....	....	2,878	3,136	2,878	3,136
1943	2,289	6,867	25	57	2,314	6,924	....	....	935	880	935	880
Total	**30,639**	**70,686**	**201**	**395**	**30,840**	**71,081**	**11,451**	**10,969**	**105,422**	**124,821**	**116,873**	**135,790**

Period.	COPPER ORE.									
	West Kimberley Goldfield.		Pilbara Goldfield.				West Pilbara Goldfield.		Ashburton Goldfield.	
			Marble Bar District.		Nullagine District.					
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	109	1,709	33	386	14	480	82,745	748,482	352	6,431
1940	....	....	....	....	....	....	....	....	....	....
1941	....	....	....	....	....	....	....	....	....	....
1942	....	....	....	....	....	....	....	....	....	....
1943	....	....	....	....	....	....	....	....	....	....
Total	**109**	**1,709**	**33**	**386**	**14**	**480**	**82,745**	**748,482**	**352**	**6,431**

Period.	COPPER ORE—*continued.*									
	Peak Hill Goldfield.		East Murchison Goldfield. (Lawlers District).		Murchison Goldfield.		Yalgoo Goldfield.		Northampton Mineral Field.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	1,015	32,212	238	4,364	1,024	11,236	39	413	24,019	119,451
1940	15	152	....	....	....	....	....	....	7	46
1941	....	....	....	....	....	....	....	....	....	....
1942	13	268	10	152	....	....	....	....	....	....
1943	....	....	1	33	....	....	....	....	....	....
Total	**1,043**	**32,632**	**249**	**4,549**	**1,024**	**11,236**	**39**	**413**	**24,026**	**119,497**

TABLE VI.—*Minerals other than Gold*—continued.

Period.	COPPER ORE—*continued.*									
	Yandanooka Mineral Field.		Mt. Margaret Goldfield.		North Coolgardie Goldfield (Menzies District).		East Coolgardie Goldfield (East Coolgardie District).		Phillips River Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	172	1,889	47,861	230,846	6	51	51	330	95,729	588,200
1940	....	....	....	....	....	....	....	....	14	159
1941	....	....	....	....	....	....	....	†49	6	105
1942	....	....	....	....	....	....	....	....	9	241
1943	....	....	....	....	....	....	....	....	....	....
Total	**172**	**1,889**	**47,861**	**230,846**	**6**	**51**	**51**	**379**	**95,758**	**588,705**

† Metallic Content Value.

Period.	COPPER ORE—*continued.*						BISMUTH CONCENTRATES.		GADOLINITE.	
	Yilgarn Goldfield.		State generally.		Total.		State generally.		Pilbara Goldfield (Marble Bar District).	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	lbs.	£	tons.	£
Prior to 1940	....	....	22	410	253,429	1,746,890	480·00	138	1	112
1940	....	....	....	....	36	357	2,918·40	891	....	....
1941	....	....	....	....	6	154	....	....	....	....
1942	16	77	....	....	48	738	....	....	....	....
1943	....	....	....	....	1	33	560·00	137	....	....
Total	**16**	**77**	**22**	**410**	**253,520**	**1,748,172**	**3,958·40**	**1,166**	**1**	**112**

Period.	CLAYS.						ARSENIC.*		COAL.	
	Collie Mineral Field.		State generally.		Total.		East Murchison Goldfield (Wiluna District).		Collie Coalfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	1,051	738	830	522	1,881	1,260	19,599	352,776	14,434,827	9,505,545
1940	....	....	3,070	1,990	3,070	1,990	3,332	59,977	539,427	364,500
1941	....	....	1,400	894	1,400	894	3,378	70,938	556,574	389,278
1942	798	449	....	....	798	449	2,727	57,267	581,176	461,495
1943	....	....	2,112	1,387	2,112	1,387	2,283	47,943	531,546	489,721
Total	**1,849**	**1,187**	**7,412**	**4,793**	**9,261**	**5,980**	**31,319**	**588,901**	**16,643,550**	**11,210,539**

* By-product from Wiluna G.M's., Ltd.

Period.	MAGNESITE.						MANGANESE.		GLASS SAND.	
	East Coolgardie Goldfield (Bulong District).		Coolgardie Goldfield.		Total.		Peak Hill Goldfield.		State generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	825	1,053	10	12	835	1,065	77	436	16	18
1940	....	....	257	230	257	230	....	....	14	15
1941	100	87	....	....	100	87	....	....	22	25
1942	....	....	25	100	25	100	....	....	111	141
1943	....	....	....	....	....	....	....	....	340	304
Total	**925**	**1,140**	**292**	**342**	**1,207**	**1,482**	**77**	**436**	**503**	**503**

Period.	GRAPHITE.		PHOSPHATIC GUANO.		BERYL.					
	State generally.		State generally.		Pilbara Goldfield.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	....	....	....	....	....	....	7	60	7	60
1940	1	12	39	273	....	....	2	16	2	16
1941	....	....	21	41	....	....	1	7	1	7
1942	6	30	....	....	....	....	....	....	....	....
1943	11	55	....	....	507	14,741	41	1,268	548	16,009
Total	**18**	**97**	**60**	**314**	**507**	**14,741**	**51**	**1,351**	**558**	**16,092**

TABLE VI.—*Minerals other than Gold*—continued.

Period.	Ironstone.								Iron Ore.		Pyrites.	
	West Pilbara Goldfield.		East Coolgardie Goldfield (East Coolgardie District).		State generally.		Total.		State generally.		Dundas Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	100	300	450	247	57,280	36,148	57,830	36,695	....	....	....	....
1940	....	....	....	....	....	....	....	....	....	....	....	....
1941	....	....	....	....	....	....	....	....	....	....	....	....
1942	....	....	....	....	....	....	....	....	150	225	368	607
1943	....	....	....	....	....	....	....	....	84	128	10,189	19,078
Total ...	100	300	450	247	57,280	36,148	57,830	36,695	234	353	10,557	19,685

Period.	Lead Ore.						Silver Lead Ore.					
	Northampton Mineral Field.		State generally.		Total.		Pilbara Goldfield (Marble Bar District).		Ashburton Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	416,715	1,280,207	107	1,529	416,822	1,281,736	195	3,658	2,974	35,796	3,169	39,454
1940	....	....	....	....	....	....	....	....	....	....	....	....
1941	....	....	....	....	....	....	....	....	....	....	....	....
1942	....	....	....	....	....	....	....	....	....	....	....	....
1943	1,250	1,100	....	....	1,250	1,100	....	....	....	....	....	....
Total	417,965	1,281,307	107	1,529	418,072	1,282,836	195	3,658	2,974	35,796	3,169	39,454

Period.	Vermiculite.								Emery.	
	East Coolgardie Goldfield (Bulong District).		Yilgarn Goldfield.		State generally.		Total.		State generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	30	250	....	....	....	....	30	250	....	....
1940	65	427	....	....	44	330	109	757	....	....
1941	....	....	....	....	160	962	160	962	....	....
1942	....	....	....	....	178	1,070	178	1,070	13	130
1943	....	....	20	60	343	2,057	363	2,117	....	....
Total	95	677	20	60	725	4,419	840	5,156	13	130

Period.	Diamonds.		Emeralds.		Bentonite.		Soapstone.					
	Pilbara Goldfield (Nullagine District).		Murchison Goldfield (Cue District).		State generally.		Greenbushes Mineral Field.		State generally.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	carats.	£	carats (cut and rough).	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	....	24	18,373	1,609	....	....	....	....	....	....	....	....
1940	....	....	....	....	....	....	....	....	....	....	....	....
1941	....	....	....	....	....	....	....	....	....	....	....	....
1942	....	....	....	....	16	33	255	950	10	25	265	975
1943	....	....	....	....	159	337	....	....	....	....	....	....
Total	....	24	18,373	1,609	175	370	255	950	10	25	265	975

Period.	Red Oxide.								Talc.	
	Pilbara Goldfield (Nullagine District).		East Coolgardie Goldfield.		State generally.		Total.		East Coolgardie Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	142	1,398	....	....	26	78	168	1,476	....	....
1940	238	2,384	....	....	....	....	238	2,384	....	....
1941	287	2,870	....	....	....	....	287	2,870	....	....
1942	....	....	....	....	143	1,360	143	1,360	38	57
1943	....	....	15	46	382	3,820	397	3,866	73	170
Total	667	6,652	15	46	551	5,258	1,233	11,956	111	227

TABLE VI.—*Minerals other than Gold*—continued.

Period.	TIN.											
	Kimberley Goldfield.				Pilbara Goldfield (Marble Bar District).				East Murchison Goldfield.			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Prior to 1940	....	....	....	....	372·62	5,520·87	5,893·49	545,176	....	....	....	....
1940	....	....	....	....	....	2·95	2·95	547	....	....	....	....
1941	....	....	....	....	....	5·86	5·86	1,105	....	....	....	....
1942	....	....	....	....	....	10·70	10·70	2,265	....	....	....	....
1943	....	·60	·60	143	....	4·60	4·60	1,022	·14	....	·14	53
Total	....	**·60**	**·60**	**143**	**372·62**	**5,544·98**	**5,917·60**	**550 115**	**·14**	....	**·14**	**53**

Period.	TIN—*continued.*							
	Greenbushes Mineral Field.				Total.			
	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Prior to 1940	435·18	10,832·35	11,267·53	986,975	807·80	16,353·22	†17,166·49	†1,532,572
1940	32·90	·65	33·55	4,627	32·90	3·60	36·50	5,174
1941	4·13	·95	5·08	769	4·13	6·81	10·94	1,874
1942	9·26	3·45	12·71	2,369	9·26	14·15	23·41	4,634
1943	3·20	·18	3·38	615	3·34	5·38	8·72	1,833
Total	**484·67**	**10,837·58**	**11,322·25**	**995,355**	**857·43**	**16,383·16**	**†17,246·06**	**†1,546,087**

† Includes 4·72 tons valued at £360 ; ·15 tons valued at £15 ; and ·60 tons valued at £46, the product of Cue, Coolgardie, and Yilgarn Goldfields respectively.

Period.	DIATOMACEOUS EARTH.		ASBESTOS.								ALUNITE.	
	State generally.		Ashburton Goldfield.		Pilbara Goldfield.		State generally.		Total.		State generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£	tons.	£
Prior to 1940	....	....	10	959	1,290	58,904	*1,237	*29,291	*2,537	*89,154	2	15
1940	....	....	....	....	355	14,200	9	334	364	14,534	30	180
1941	....	....	....	....	5	175	56	2,793	61	2,968	....	....
1942	....	....	....	....	....	....	119	5,788	119	5,788	....	....
1943	40	640	....	....	12	456	231	12,519	243	12,975	....	....
Total	**40**	**640**	**10**	**959**	**1,662**	**73,735**	**1,652**	**50,725**	**3,324**	**125,419**	**32**	**195**

* Includes 5 tons valued at £20 from East Coolgardie Goldfield.

Period.	TANTALITE.											
	Pilbara Goldfield (Marble Bar District).				Greenbushes Mineral Field.				Total.			
	Quantity.			Value.	Quantity.			Value.	Quantity.			Value.
	Lode.	Stream.	Total.		Lode.	Stream.	Total.		Lode.	Stream.	Total.	
	tons.	tons.	tons.	£	tons.	tons.	tons.	£	tons.	tons.	tons.	£
Prior to 1940	80·49	160·67	241·16	108,484	....	3·94	3·94	2,009	80·49	164·61	245·10	110,493
1940	3·82	....	3·82	5,471	....	....	....	....	*6·32	....	6·32	*7,811
1941	....	....	....	....	....	....	....	....	....	....	....	....
1942	·68	....	·68	314	....	·17	·17	157	·68	·17	·85	471
1943	·87	....	·87	779	3·49	1·95	5·44	5,559	4·36	1·95	6·31	6,338
Total	**85·86**	**160·67**	**246·53**	**115,048**	**3·49**	**6·06**	**9·55**	**7,725**	**91·85**	**166·73**	**258·58**	**125,113**

* Includes 2·50 tons valued at £2,340 from Coolgardie Goldfield.

TABLE VI.—*Minerals other than Gold*—continued.

Period.	LIMESTONE.								MICA.	
	Murchison Goldfield. (Cue District).		Yilgarn Goldfield.		State generally.		Total.		State generally.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	tons.	£	tons.	£	tons.	£	tons.	£	lbs.	£
Prior to 1940	298	772	2,548	1,607	90,859	15,911	93,705	18,290	444	196
1940	....	....	....	....	....	....	....	....	*2,408	311
1941	....	....	....	....	....	....	....	....	†6,160	25
1942	....	....	....	....	....	....	....	....	389	115
1943	....	....	....	....	....	....	....	....	13,908	715
Total	298	772	2,548	1,607	90,859	15,911	93,705	18,290	23,309	1,362

* Includes 1,708 lbs. crude mica.
† Crude mica.

Period.	TUNGSTEN ORES.											
	WOLFRAM.								SCHEELITE.			
	Broad Arrow Goldfield.		Yalgoo Goldfield.		State generally.		Total.		Yalgoo Goldfield.		Broad Arrow Goldfield.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Units.	£	Units.	£	Units.	£	Units.	£	Units.	£	Units.	£
Prior to 1940	....	....	....	....	521	1,295	521	1,295	....	....	*70	175
1940	....	....	....	....	70	211	70	211	....	....	....	....
1941	....	....	....	....	....	....	....	....	....	....	....	....
1942	16	88	5	27	....	....	21	115	....	....	....	....
1943	....	....	3	18	....	....	3	18	194	1,050	....	....
Total	16	88	8	45	591	1,506	615	1,639	194	1,050	70	175

* Approximate.

Period.	TUNGSTEN ORES—*continued.*									
	SCHEELITE—*continued.*									
	Coolgardie Goldfield (Coolgardie District).		North Coolgardie Goldfield (Menzies District).		Yilgarn Goldfield.		Dundas Goldfield.		Total.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Units.	£	Units.	£	Units.	£	Units.	£	Units.	£
Prior to 1940	*62	155	*388	970	....	....	*4	10	*524	1,310
1940	*627	1,960	....	....	....	....	....	....	627	1,960
1941	34	101	....	....	....	....	....	....	34	101
1942	58	321	10	36	....	....	....	....	68	357
1943	302	1,540	7	24	8	41	2	9	513	2,664
Total	1,083	4,077	405	1,030	8	41	6	19	1,766	6,392

* Approximate.

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