

CHAPTER XXVII.

MINERAL INDUSTRY.

§ 1. The Mineral Wealth of Australia.

1. **Place of Mining in Australian Development.**—Population was first attracted to Australia in large numbers by the discovery of gold in payable quantities. This discovery was thus a significant factor in Australia's early development. In more recent times, the rapid growth of Australia's secondary industries has been associated with considerable expansion in mining for silver-lead-zinc, copper and iron ores, and coal. The value of mineral production, however, has lagged behind that recorded for Australia's large rural industries and in 1956 represented only about 11 per cent. of the net value of production of all primary industries.

2. **Extent of Mineral Wealth.**—The extent of the mineral wealth of Australia, as of any country, is not determined fully at any point of time. Regional and detailed investigations are being carried out by the Commonwealth Bureau of Mineral Resources, Geology and Geophysics, by the Geological Surveys of the State Governments and by the exploration departments of mining companies, but large areas of the country still await geological survey. Important prospects of copper, iron, lead and zinc, oil, uranium ore, bauxite (aluminium ore) and some other minerals have been recorded recently and are being investigated in detail.

3. **Presentation of Mineral Statistics.**—In the preparation of Australian mineral production statistics, the quantities and values of individual minerals produced are reported in terms of the products in the form in which they are dispatched from the locality of each mine. This involves the inclusion in the mining industry of ore-dressing and elementary smelting of metallic minerals (e.g., in the case of gold) and miscellaneous treatment of non-metallic minerals, where these operations are carried out in an associated plant at or near the mine. For example, in the case of a metal mine, the output is recorded as ore when no treatment is undertaken at the mine or as a concentrate where ore-dressing operations are carried out in associated works in the locality of the mine. In addition to the basic quantity data, the plan provides for the reporting of contents of metallic minerals and of contents or average grade of selected non-metallic minerals. Wherever practicable, contents (based on assay) of metallic minerals are shown for each metal which is a "pay-metal" or a "refiners' prize" when present in the particular mineral.

For the purpose of compiling and publishing data relating to employment, value of output, value of production, etc., a detailed statistical classification for the mining industry has been used in Australia since 1950. For the purpose of this classification, the "Mining Industry" includes all mining and quarrying and the recovery of minerals from ore dumps, tailings, etc. As mentioned above, ore dressing and miscellaneous treatment of non-metallic minerals (where these are carried out in an associated plant at or near the mine) are included in the mining industry. However, establishments primarily engaged in smelting and/or refining (including the smelting and refining sections of the large plants operated at Mt. Morgan and Mt. Isa in Queensland and at Mt. Lyell in Tasmania) are omitted and classified to the manufacturing industry. The classification divides the industry into four major groups, namely, Metal Mining, Fuel Mining, Non-metal (excluding Fuel) Mining and Construction Material Quarrying. In the tables, individual minerals are arranged in these four groups.

In the main, the data consist of official statistics of Mines Departments and of the Northern Territory Mines Branch. These statistics have been supplemented, as necessary, by data obtained from the Bureau of Mineral Resources, Geology and Geophysics, the Australian Mines and Metals Association (Inc.) and several other sources. The particulars shown have been compiled as far as practicable on the standardized basis. This has involved some re-arrangement of official statistics published by Mines Departments for some States.

It should be noted that the statistics included in this chapter omit particulars relating to uranium-bearing minerals.

4. **Quantity of Minerals Produced in 1957.**—(i) *Total Quantities.* In the following table, particulars of the quantities of principal minerals produced are shown for each State and the Northern Territory for 1957.

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, 1957.

Mineral.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust. (a)
METALLIC MINERALS.									
Antimony Ore and Concentrate	ton	(b) 850	2	(c) 988	..	..	..	..	852
Bauxite .. ..	..	3,248	3,471	988	..	..	..	..	7,707
Beryllium Ore .. ..	..	(b) 29	..	(d) 1	15	350	..	..	395
Chromite .. ..	..	..	..	1,737	..	1,312	..	..	3,049
Copper Ore, Concentrate and Precipitate .. ..	..	4,841	..	151,053	39	6,443	52,975	29,479	244,830
Gold Ore, Concentrate, etc. .. ..	..	112	847	..	..	..	..	..	959
Gold—Other Forms(e)	oz.	17,868	53,307	(f) 150	(f)	(f)	(f)	(f)	(f)
Ilmenite Concentrate	ton	976	..	150	..	70,029	..	..	71,155
Iron Ore	'000 tons	..	..	..	3,389	416	..	..	3,805
Lead Ore, Concentrate	ton	363,709	6	128,836	80	4,180	13,057	..	509,868
Manganese Ore .. ..	..	(b) 1,463	..	1,239	..	73,279	..	1,029	77,010
Pyrite Concentrate .. ..	..	b 14,196	..	25,160	68,169	57,918	63,682	..	229,125
Rutile Concentrate .. ..	..	86,155	..	42,748	..	..	..	..	128,903
Tantalite-Columbite Concentrate	lb.	..	..	..	..	50,038	..	..	50,038
Tin Concentrate	ton	(b) 297	(c)	1,189	..	270	1,094	17	2,867
Tungsten Concentrates—	..	..	..	..	..	..	..	..	..
Scheelite Concentrate .. ..	..	(b) 2	..	2	..	..	1,445	..	1,449
Wolfram Concentrate .. ..	..	(b) (c)	..	30	..	..	550	77	657
Zinc Ore and Concentrate .. ..	..	463,953	..	36,868	193	..	55,749	..	556,763
Zircon Concentrate .. ..	..	59,373	..	29,188	..	..	..	..	88,561
FUEL MINERALS.									
Coal, Black—	..	..	..	..	..	..	..	..	..
Semi-anthracite	'000 tons	..	..	69	..	..	2	..	71
Bituminous .. ..	..	15,376	112	2,475	..	..	266	..	18,229
Sub-bituminous .. ..	..	14	..	157	609	839	..	..	1,619
Total .. ..	..	15,390	112	2,701	609	839	268	..	19,919
Coal, Brown (Lignite) .. ..	..	..	10,741	..	..	..	..	..	10,741
NON-METALLIC (EXCLUDING FUEL) MINERALS.									
Asbestos	sh. ton	676	..	..	..	13,994	..	..	14,670
Barite	ton	5,415	..	..	4,223	140	..	..	9,778
Clays(g)—	..	..	..	..	..	..	..	..	..
Brick Clay and Shale	'000 tons	1,531	926	205	368	417	84	..	3,531
Other .. ..	..	470	150	9	83	30	6	..	748
Diatomite	ton	4,966	1,201	54	..	..	..	..	6,221
Dolomite .. ..	..	5,137	..	5,493	180,237	60	1,176	..	192,103
Felspar .. ..	..	6,254	..	5	1,565	995	..	..	8,819
Gypsum .. ..	..	101,491	68,647	..	274,945	33,352	..	..	478,435
Limestone	'000 tons	1,897	846	(h)	1,135	(h)	205	..	4,572
Magnesite	ton	83,271	..	..	202	..	..	..	83,473
Mica—Muscovite	lb.	..	..	..	..	..	..	77,313	77,313
Salt	ton	..	d 70,500	d 15,000	339,396	d 6,000	..	1,243	432,139
Silica (Glass, Chemical, etc.)(g) .. ..	..	137,130	(f)	3,129	13,802	5,693	6,552	(f)	166,306
Talc .. ..	..	1,020	..	..	9,686	3,654	..	..	14,360
CONSTRUCTION MATERIALS.(g)									
Sand	'000 tons	1,776	1,047	(f)	1,302	..	..	..	4,125
River Gravel and Gravel .. ..	..	..	..	..	..	..	..	..	..
Boulders .. ..	..	1,624	135	(f)	..	..	..	..	1,759
Dimension Stone .. ..	..	115	12	6	42	55	(c)	(f)	230
Crushed and Broken Stone .. ..	..	1,981	5,071	1,542	5,867	635	491	..	15,587
Other (Decomposed Rock, etc.) .. ..	..	11,896	645	(f)	..	5	..	..	12,546

(a) Excludes Australian Capital Territory where production is confined to brick clay mining and construction material quarrying. (b) Dispatches from the mine (or sales) as distinct from production (c) Less than half the unit of quantity shown. (d) Estimated. (e) Bullion, alluvial, retorted gold, etc. (f) Not available. (g) Incomplete. (h) Not available for publication.

(ii) *Contents of Metallic Minerals.* The following table shows the contents of metallic minerals produced in 1957. Further particulars, including data for earlier years, are shown in the several sections dealing with individual minerals later in this chapter.

CONTENTS OF METALLIC MINERALS PRODUCED, 1957.

Content of Metallic Minerals Produced.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Alumina ..	ton	1,354	1,910	494	..	..	..	..	3,758
Antimony ..	..	1,208	1	(a)	..	..	..	..	1,209
Beryllium Oxide (BeO) ..	unit(b)	350	..	10	200	4,007	..	..	4,567
Bismuth ..	lb.	..	..	..	..	..	..	1,344	1,344
Cadmium ..	ton	924	..	..	..	..	55	..	979
Chromic Oxide (Cr ₂ O ₃) ..	..	..	..	869	..	551	..	..	1,420
Cobalt ..	..	68	..	..	..	..	(a)	..	68
Copper ..	..	4,382	..	33,706	2	788	10,984	7,313	57,175
Gold ..	fine oz.	31,043	45,752	63,363	35	849,751	20,027	73,970	1,083,941
Iron ..	'000 tons	..	..	..	(c) 2,203	263	3,087	..	(d) 2,466
Lead ..	ton	266,928	4	50,780	20	3,087	12,445	..	333,264
Manganese (e) ..	..	6,082	..	557	..	33,956	..	..	40,595
Manganese Di-oxide (MnO ₂) (f) ..	..	385	..	..	..	186	..	668	1,239
Molybdenum Disulphide (MoS ₂) ..	lb.	..	..	5,236	..	..	..	..	5,236
Monazite ..	ton	47	..	85	..	..	..	..	132
Osmiridium ..	oz.	2	..	..	..	..	66	..	68
Platinum ..	..	17	..	..	..	..	..	..	17
Silver ..	'000 fine oz.	9,969	3	4,274	1	188	1,299	5	15,739
Sulphur(g) ..	ton	207,604	..	56,479	32,721	25,420	51,154	..	373,378
Tantalite-Columbite (Ta ₂ O ₅ + Nb ₂ O ₅) ..	lb.	..	..	..	..	23,499	..	..	23,499
Tin ..	ton	211	(a)	772	..	182	777	10	1,952
Titanium Oxide (TiO ₂) ..	..	83,848	..	41,578	..	38,325	..	..	163,751
Tungstic Oxide (WO ₃) ..	..	1	..	20	..	..	1,339	49	1,409
Zinc ..	..	241,509	..	19,536	97	..	30,440	..	291,582
Zircon ..	..	58,747	..	28,956	..	..	..	..	87,703

(a) Less than half the unit of quantity shown. (b) Unit of 22.4 lb. (c) Estimated. (d) Partly estimated. (e) Content of metallurgical grade ore. (f) Content of manganese ore other than metallurgical grade. (g) Sulphur content of lead and zinc concentrates and pyrite. In addition it was estimated that the sulphur content of spent oxide roasted in Australia was 5,751 tons.

5. Mine Production of Principal Metals and Production of Coal and Sulphur, 1953 to 1957.—Particulars of the mine production of principal metals (i.e., metallic contents of minerals produced) and production of coal and sulphur in the years 1953 to 1957 are shown in the following table. Graphs showing details of the mine production of principal metals and coal from 1930 to 1958 may be found on pages 1037-38.

MINE PRODUCTION OF PRINCIPAL METALS AND PRODUCTION OF COAL AND SULPHUR, AUSTRALIA.

Particulars.	Unit.	1953.	1954.	1955.	1956.	1957.
Metallic Content of Minerals Produced(a)—						
Copper ..	ton	36,762	41,241	46,192	53,737	57,175
Gold ..	fine oz.	1,075,181	1,117,742	1,049,039	1,029,821	1,083,941
Lead ..	ton	269,344	284,862	295,944	299,485	333,264
Iron(b) ..	..	2,131,865	2,274,330	2,304,165	2,542,826	2,465,523
Silver ..	fine oz.	12,539,152	13,827,038	14,555,412	14,586,197	15,739,439
Tin ..	ton	1,553	2,075	2,017	2,078	1,952
Titanium Oxide (TiO ₂) ..	..	37,067	43,241	57,494	95,502	163,751
Tungstic Oxide (WO ₃) ..	..	1,406	1,372	1,482	1,582	1,409
Zinc ..	..	239,324	252,659	256,564	278,082	291,582
Production of—						
Coal—Black ..	..	18,410,845	19,763,039	19,274,751	19,273,834	19,919,096
Brown ..	..	8,257,299	9,331,255	10,112,206	10,559,801	10,740,989
Sulphur(c) ..	..	225,197	254,403	269,071	344,890	379,129

(a) Mine production of metals. (b) Partly estimated. (c) Total sulphur content of lead and zinc concentrates and pyrite produced and of spent oxide roasted, except for years prior to 1956 when sulphur content of lead concentrates was not recorded.

6. Value of Output of Minerals Produced 1953 to 1957.—Particulars of the estimated values of minerals (mine and quarry products) produced during the years 1953 to 1957 are shown in the following table. The values represent the estimated selling value at the mine or quarry of minerals produced during the years concerned.

VALUE OF MINERALS PRODUCED, AUSTRALIA.

(£'000.)

Mineral.	1953.	1954.	1955.	1956.	1957.
METALLIC MINERALS.					
Copper Ore, Concentrate, etc.	7,527	9,912	15,018	18,182	13,927
Gold Ore, Concentrate, Other forms, etc.	15,627	15,810	15,536	15,509	16,767
Iron Ore	3,666	3,923	4,004	4,449	4,295
Lead and Lead-Silver Ore and Concentrate, etc.	23,308	27,560	32,308	34,552	28,810
Manganese Ore	178	366	192	337	589
Pyritic Ore and Concentrate	807	897	1,091	1,023	1,166
Rutile Concentrate	1,756	1,597	2,995	6,430	8,577
Tin Concentrate	1,329	1,606	1,554	1,599	1,612
Tungsten Concentrates	3,067	2,347	3,375	3,332	2,167
Zinc Ore and Concentrate	5,171	6,531	7,879	8,215	3,655
Zircon Concentrate	197	324	392	604	854
Other Metallic Minerals	181	253	179	415	602
<i>Total Metallic Minerals</i>	<i>62,814</i>	<i>71,126</i>	<i>84,523</i>	<i>94,647</i>	<i>83,021</i>
FUEL MINERALS.					
Coal, Black	52,424	54,884	53,737	52,439	52,279
Coal, Brown	3,628	3,945	4,382	4,644	5,228
<i>Total Fuel Minerals</i>	<i>56,052</i>	<i>58,829</i>	<i>58,119</i>	<i>57,083</i>	<i>57,507</i>
NON-METALLIC (EXCLUDING FUEL) MINERALS.(a)					
<i>Total Non-metallic (excluding Fuel) Minerals</i>	<i>6,267</i>	<i>7,102</i>	<i>7,405</i>	<i>8,146</i>	<i>9,054</i>
CONSTRUCTION MATERIALS.(b)					
<i>Total Construction Materials</i>	<i>9,409</i>	<i>12,346</i>	<i>14,824</i>	<i>16,444</i>	<i>17,842</i>
TOTAL.					
Total, All Minerals and Construction Materials	134,542	149,403	164,871	176,320	167,424

(a) Excludes Australian Capital Territory, details of which are included with construction materials.
 (b) Incomplete.

7. Value of Output and Value of Production for Mining and Quarrying.—(i) *Individual Industries*, 1957. The following two tables show particulars of the value of output and value of production of individual mining and quarrying industries and for all mining and quarrying for the year 1957. The data were obtained from industrial censuses of the mining and quarrying industry which were made on a substantially uniform basis in all States and Territories.

MINING AND QUARRYING: VALUE OF OUTPUT(a), 1957.
(£'000.)

Industry.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
<i>Metal Mining—</i>									
Gold Mining	268	680	301	(b)	14,537	..	973	..	16,759
Silver-Lead-Zinc Mining ..	26,820	(c)	(c)	(b)	(c)	1,951	(c)	..	39,463
Copper-Gold Mining	12	..	(c)	(b)	56	(c)	1,521	..	7,233
Tin Mining	173	(c)	625	..	151	808	(c)	..	1,762
Mineral Sands Mining	6,219	..	(c)	..	(c)	..	..	..	9,792
Other Metal Mining	97	(c)	(c)	4,389	1,408	(c)	..	52	8,004
<i>Total, Metal Mining</i>	<i>33,589</i>	<i>704</i>	<i>16,650</i>	<i>4,389</i>	<i>16,836</i>	<i>8,294</i>	<i>2,551</i>	<i>..</i>	<i>83,013</i>
<i>Fuel Mining—</i>									
Black Coal Mining	40,450	556	7,177	911	2,553	632	..	..	52,279
Brown Coal Mining .. .. .	..	5,228	..	..	..	..	..	..	5,228
<i>Total, Fuel Mining</i>	<i>40,450</i>	<i>5,784</i>	<i>7,177</i>	<i>911</i>	<i>2,553</i>	<i>632</i>	<i>..</i>	<i>..</i>	<i>57,507</i>
<i>Non-metal (excluding Fuel)</i>									
<i>Mining—</i>									
Clays(d)	847	549	103	329	(e)	(c)	..	(e)	2,090
Gypsum	194	54	..	341	26	..	..	..	615
Limestone	990	625	(c)	887	(e)	234	..	..	3,301
Salt(d) .. .. .	..	(f)	(c)	679	(e)	..	(c)	..	735
Other Non-metal (ex- cluding Fuel) Mining	601	3	22	457	(c)	(c)	(c)	..	2,328
<i>Total, Non-metal</i> <i>(excluding Fuel)</i>									
<i>Mining</i>	<i>2,632</i>	<i>1,231</i>	<i>582</i>	<i>2,693</i>	<i>1,565</i>	<i>291</i>	<i>75</i>	<i>(e)</i>	<i>9,069</i>
<i>Total, All Mining</i>	<i>76,671</i>	<i>7,719</i>	<i>24,409</i>	<i>7,993</i>	<i>20,954</i>	<i>9,217</i>	<i>2,626</i>	<i>(e)</i>	<i>149,589</i>
<i>Construction Material</i>									
<i>Quarrying(d)</i>	<i>6,499</i>	<i>4,953</i>	<i>1,168</i>	<i>3,879</i>	<i>758</i>	<i>339</i>	<i>69</i>	<i>170</i>	<i>17,835</i>
<i>Total, All Mining</i> <i>and Quarrying</i>	<i>83,170</i>	<i>12,672</i>	<i>25,577</i>	<i>11,872</i>	<i>21,712</i>	<i>9,556</i>	<i>2,695</i>	<i>170</i>	<i>167,424</i>

(a) Selling value at point of sale of mine or quarry products, less transport costs from mine or quarry to point of sale, i.e., value of output at mine or quarry. (b) Not available for publication; included with "Other Metal Mining". (c) Not available for publication. (d) Incomplete. (e) Not available for publication; included with "Construction Material Quarrying". (f) Not available.

MINING AND QUARRYING: VALUE OF PRODUCTION(a), 1957.
(£'000.)

Industry.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
<i>Metal Mining—</i>									
Gold Mining	108	473	236	(b)	9,837	..	783	..	11,437
Silver-Lead-Zinc Mining ..	19,805	(c)	(c)	(b)	(c)	1,630	(c)	..	29,044
Copper-Gold Mining	(d) - 12	..	(c)	(b)	..	..	1,304	..	4,694
Tin Mining	133	(c)	453	..	95	649	(c)	..	1,334
Mineral Sands Mining	5,064	..	(c)	..	(e)	..	..	..	7,815
Other Metal Mining	81	(c)	(c)	(c)	1,166	(c)	..	40	6,603
<i>Total, Metal Mining</i>	<i>25,179</i>	<i>497</i>	<i>(c)</i>	<i>(c)</i>	<i>11,635</i>	<i>6,013</i>	<i>2,131</i>	<i>..</i>	<i>60,927</i>
<i>Fuel Mining—</i>									
Black Coal Mining	32,445	401	5,896	762	2,021	521	..	..	42,046
Brown Coal Mining .. .. .	..	4,593	..	..	..	..	..	..	4,593
<i>Total, Fuel Mining</i>	<i>32,445</i>	<i>4,994</i>	<i>5,896</i>	<i>762</i>	<i>2,021</i>	<i>521</i>	<i>..</i>	<i>..</i>	<i>46,639</i>
<i>Non-metal (excluding Fuel)</i>									
<i>Mining—</i>									
Clays(e)	703	511	89	(c)	(c)	(c)	..	(f)	1,866
Gypsum	154	39	..	233	19	..	..	..	445
Limestone	621	323	(c)	719	(c)	174	..	..	2,173
Salt(e) .. .. .	..	(g)	(c)	538	(c)	..	(c)	..	586
Other Non-metal (ex- cluding Fuel) Mining	490	3	21	407	(c)	(c)	(c)	..	1,844
<i>Total, Non-metal</i> <i>(excluding Fuel)</i>									
<i>Mining</i>	<i>1,968</i>	<i>876</i>	<i>(c)</i>	<i>(c)</i>	<i>1,203</i>	<i>225</i>	<i>73</i>	<i>(f)</i>	<i>6,914</i>
<i>Total, All Mining</i>	<i>59,592</i>	<i>6,367</i>	<i>17,984</i>	<i>6,713</i>	<i>14,859</i>	<i>6,759</i>	<i>2,204</i>	<i>(f)</i>	<i>114,480</i>
<i>Construction Material</i>									
<i>Quarrying(e)</i>	<i>6,499</i>	<i>3,521</i>	<i>827</i>	<i>2,606</i>	<i>516</i>	<i>273</i>	<i>36</i>	<i>110</i>	<i>14,388</i>
<i>Total, All Mining</i> <i>and Quarrying</i>	<i>66,091</i>	<i>9,888</i>	<i>18,811</i>	<i>9,321</i>	<i>15,375</i>	<i>7,032</i>	<i>2,240</i>	<i>110</i>	<i>128,868</i>

(a) Value of output at mine, less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted. (b) Not available for publication; included with "Other Metal Mining". (c) Not available for publication. (d) Cost of materials used, etc., exceeds value of output. (e) Incomplete. (f) Not available for publication; included with "Construction Material Quarrying". (g) Not available.

(ii) *States, 1953 to 1957.* The following table shows the value of output and the value of production ascertained from the Australia-wide mineral industry censuses for the years 1953 to 1957.

MINING AND QUARRYING : VALUE OF OUTPUT AND VALUE OF PRODUCTION.
(£'000.)

Year.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
VALUE OF OUTPUT.(a)									
1953	72,346	9,329	17,284	6,203	20,011	8,037	1,221	111	134,542
1954	78,202	10,080	21,603	8,580	20,736	8,955	1,145	103	149,404
1955	84,244	10,917	26,892	10,512	19,746	10,744	1,691	125	164,871
1956	88,790	11,891	30,204	11,910	20,230	10,355	2,594	146	176,320
1957	83,170	12,672	25,577	11,872	21,712	9,556	2,695	170	167,424
VALUE OF PRODUCTION.(b)									
1953	58,042	7,277	12,906	5,051	13,998	6,392	1,117	92	104,875
1954	63,965	8,146	15,935	7,101	14,776	7,057	1,028	80	118,088
1955	69,262	8,867	21,732	8,452	14,143	8,612	1,377	63	132,508
1956	72,049	9,457	24,148	9,487	14,350	8,299	2,084	105	139,979
1957	66,091	9,888	18,811	9,321	15,375	7,032	2,240	110	128,868

(a) Selling value of mine and quarry products at the mine or quarry. (b) Value of output less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted.

8. **Industrial Census of the Mining and Quarrying Industry, 1957.**—Since 1952, industrial censuses of the mining and quarrying industry have been taken annually in all States and Territories on a substantially uniform basis, thus providing important Australian statistics on mining and quarrying operations which were not previously available. A summary of the statistics collected in 1957 is shown in the following table.

MINING AND QUARRYING: SUMMARY OF OPERATIONS, AUSTRALIA, 1957.

Particulars.	Unit.	Metal Mining.	Fuel Mining. (a)	Non-metal (excluding Fuel) Mining. (b)	Total, All Mining.	Construction Material Quarrying.(c)	Total All Mining and Quarrying.
Mines and Quarries ..	No.	662	248	816	1,726	780	2,506
Persons Employed(d)	"	22,882	23,924	3,048	49,854	4,640	54,494
Salaries and Wages Paid(e)(f)	£'000	29,284	26,745	2,517	58,546	3,219	61,765
Value of Output(g)	"	83,013	57,507	9,069	149,589	17,835	167,424
Total Fuel, Materials, etc., Used	"	22,086	10,868	2,155	35,109	3,447	38,556
Value of Production(h)	"	60,927	46,639	6,914	114,480	14,388	128,868
Value of Additions and Replacements to Fixed Assets(e)	"	10,734	11,935	1,788	24,457	874	25,331

(a) Oil Mining, where available, is included with Non-metal Mining. (b) Incomplete for some industries outside the normal administrative control of State Mines Departments (e.g., clays and salt). (c) Incomplete in some States. (d) Average number employed (including working proprietors) during whole year. (e) Excludes mines and quarries employing less than four persons. (f) Excludes drawings by working proprietors; the amounts are net after deducting value of explosives sold to employees. (g) Value at mine or quarry. (h) Value of output less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted.

In the next table, statistics of numbers of mines and quarries, persons employed, value of output and value of production are shown for each State, the Northern Territory and the Australian Capital Territory for the year 1957

MINING AND QUARRYING: SUMMARY OF OPERATIONS, 1957.

State or Territory.	Mines and Quarries.	Persons Employed. (a)	Salaries and Wages Paid. (b)(c)	Value of Output. (d)	Total Fuel, Materials, etc., Used.	Value of Production. (e)	Value of Additions and Replacements to Fixed Assets.
			£'000.	£'000.	£'000.	£'000.	£'000.
New South Wales ..	846	27,299	31,958	83,170	17,079	66,091	10,912
Victoria ..	226	4,519	4,710	12,672	2,784	9,888	3,239
Queensland ..	471	9,109	10,421	25,577	6,766	18,811	5,619
South Australia ..	559	2,183	1,924	11,872	2,551	9,321	1,665
Western Australia ..	207	7,815	8,429	21,712	6,337	15,375	2,454
Tasmania ..	96	2,898	3,432	9,556	2,524	7,032	781
Northern Territory ..	97	628	834	2,695	455	2,240	622
Aust. Cap. Territory ..	4	43	57	170	60	110	39
Australia ..	2,506	54,494	61,765	167,424	38,556	128,868	25,331

(a) Average number employed (including working proprietors) during whole year. (b) Excludes mines and quarries employing less than four persons. (c) Excludes drawings by working proprietors; the amounts are net after deducting value of explosives sold to employees. (d) Value at mine or quarry. (e) Value of output less cost of power, fuel and light and other materials and stores used; depreciation and maintenance costs have not been deducted.

§ 2. Gold.

1. **Discovery in Various States.**—A detailed account of the discovery of gold in the various States appears under this section in Official Year Books Nos. 1 to 4.

2. **Mine Production.**—The following table shows the recorded mine production of gold (i.e., gold content of minerals produced) in the several States and in Australia as a whole during each of the ten decennial periods from 1851 to 1950, and in single years from 1951 to 1957. Owing to defective information in the earlier years it is likely that the recorded production falls considerably short of the actual totals.

GOLD : MINE PRODUCTION.(a)
(⁰⁰⁰ fine oz.)

Period.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
1851-60 ..	2,714	21,973	3	..	..	186	..	24,876
1861-70 ..	3,220	15,327	489	..	..	3	..	19,039
1871-80 ..	2,019	9,564	2,527	136	..	165	19	14,430
1881-90 ..	1,014	6,689	3,259	58	42	357	168	11,587
1891-1900 ..	2,432	7,040	5,648	52	5,252	550	214	21,188
1901-10 ..	2,253	7,095	5,512	73	17,784	604	111	33,432
1911-20 ..	1,145	3,067	2,263	55	10,671	202	23	17,426
1921-30 ..	204	593	434	10	4,557	43	2	5,843
1931-40 ..	569	1,052	1,021	53	8,474	130	84	11,383
1941-50 ..	572	800	750	13	6,683	157	148	9,123
1951 ..	49	66	79	(b)	648	15	39	896
1952 ..	39	68	85	(b)	727	16	45	980
1953 ..	26	64	92	(b)	823	17	53	1,075
1954 ..	32	53	98	(b)	862	19	54	1,118
1955 ..	30	38	64	(b)	835	17	65	1,049
1956 ..	29	39	56	(b)	814	17	75	1,030
1957 ..	31	46	63	(b)	850	20	74	1,084
Total, 1851-1957	16,378	73,574	22,443	450	59,022	2,518	1,174	175,559

(a) Gold content of minerals produced.

(b) Less than 500 fine oz.

The amount of gold won in Australia in any one year attained its maximum in 1903, when Western Australia also reached its highest point. For the other States, the years in which the greatest yields were obtained were as follows:—New South Wales, 1852; Victoria, 1856; Queensland, 1900; South Australia, 1904; and Tasmania, 1899. In recent years, output has expanded to record levels in the Northern Territory which is now the second largest producer in Australia.

Owing to the exhaustion of the more easily worked deposits and increased costs due to deep mining, the production of gold in Australia declined from 3,837,979 fine oz. in 1903 to 427,160 fine oz. in 1929, the lowest output since its discovery.

Increased activity in prospecting due to prevailing economic conditions resulted in some improvement in 1930, but the marked development between that year and 1939 was caused by the heavy depreciation of Australian currency in terms of gold. Following the outbreak of the 1939–45 War, there was a sharp fall in gold production to 656,867 fine oz. in 1944 and 657,213 fine oz. in 1945, but with the release of man-power after the war, there has been a slight upward trend in mine production of gold, which in 1953 exceeded 1,000,000 fine oz. for the first time since 1942. The devaluation of Australian currency in September, 1949 gave an impetus to gold production, but this was offset in the following years by increasing costs which brought about the closing of several large producers in New South Wales, Victoria and Western Australia.

To assist the industry in meeting the increase in costs, the Commonwealth Government decided in November, 1951, to permit Australian newly-won gold to be sold at a premium on overseas markets. Towards the end of 1953, however, the price of gold on overseas premium markets fell sharply and subsequent sales have been made at prices very little above the official price. This had an adverse effect on the financial position of the gold-mining industry and as a result the Commonwealth Government passed the Gold-Mining Industry Assistance Act in 1954 to prevent any serious decline in gold-mining activity. The operation of this Act has since been extended from two years to five years. In October, 1957, a further amendment to the Act increased the maximum subsidy payable, and also increased the maximum expenditure allowed for mine development in determining costs of production. The production of gold in Australia increased from 1951 to 1954 and fell back in 1955 and 1956 but recovered to a higher level in 1957 than in the previous two years.

3. Sources of Production.—(i) *New South Wales.* Gold production in 1957 was 31,043 fine oz. The only gold producer of any significance was Wellington Alluvials Ltd., who operated a dredge on the Macquarie River. However, as the grade of reserves was too low for profitable working, dredging operations there ceased in May, 1958. Other small quantities were won in conjunction with silver, lead and zinc at Broken Hill and at Captain's Flat, and by small prospecting parties throughout the State.

(ii) *Victoria.* In 1957, the gold yield in Victoria was 45,752 fine oz., nearly 7,000 fine oz. more than in 1956. The Wattle Gully mine at Chewton in central Victoria continued to be the major producer and accounted for almost half the State's total production.

(iii) *Queensland.* The output of 63,363 fine oz. during 1957 was higher than the previous year. More than two-thirds of the output came from Mt. Morgan. The only other major producer is Golden Plateau N.L. at Cracow.

(iv) *South Australia.* Only 35 fine oz. of gold were won in 1957 by prospectors in central and northern parts of the State.

(v) *Western Australia.* Production of gold during 1957 was 849,751 fine oz. This was 36,000 fine oz. more than production in 1956. More than half the year's total production of gold in Western Australia came from the Coolgardie goldfields, most of the remaining production coming from the Murchison, Dundas, Yilgarn and Mt. Margaret goldfields. The Lake View and Star Mine at Fimiston maintained its position as the largest gold producer in Australia, winning 169,745 fine oz. during 1957, and two other mines each produced over 100,000 fine oz. in the same period.

(vi) *Tasmania.* Production of gold in Tasmania during 1957 was 20,027 fine oz. Almost all of this production was won as a by-product of lead-zinc mining at Rosebery and of copper mining at Mt. Lyell in western Tasmania but a small amount was also won in tin dredging operations in the north-eastern area of the State.

(vii) *Northern Territory.* Gold production in Northern Territory which has been steadily increasing in recent years, reached a record level of 75,421 fine oz. in 1956 but declined to 73,970 fine oz. in 1957. Production is centered around Tennant Creek, the main producer being the "Nobles Nob" mine. Another large producer is the Peko mine where gold is recovered from copper concentrates.

4. *Refinery Production.*—Details of the refinery production of gold in Australia and the value of refined newly-won gold of Australian origin are shown in the following table for each of the years 1953 to 1957. The value of the refined newly-won gold is based on the price fixed by the Commonwealth Bank, but allowance is made for premiums on sales of gold overseas and for industrial purposes in Australia.

PRODUCTION OF REFINED GOLD IN AUSTRALIA.

Particulars.	1953.	1954.	1955.	1956.	1957.
QUANTITY (FINE OUNCES).					
Australian Origin—					
Newly-won Gold	1,052,779	1,063,457	1,054,714	1,044,164	1,078,419
From Scrap	21,494	20,728	20,130	20,106	21,480
Oversea Origin—					
Newly-won Gold	202,405	189,913	167,547	161,065	171,970
From Scrap	324	828	454	708	1,248
Total	1,277,002	1,274,926	1,242,845	1,226,043	1,273,117
VALUE (£.).					
Newly-won Gold of Australian Origin	16,780,106	16,589,114	16,503,403	16,345,912	16,872,458

5. *Changes in Stocks of Gold held in Australia.*—The following table shows particulars of production, imports and exports of gold and changes in stocks of gold held in Australia for each of the years 1953–54 to 1957–58.

CHANGES IN STOCKS OF GOLD HELD IN AUSTRALIA.
(Fine oz.)

Particulars.	1953-54.	1954-55.	1955-56.	1956-57.	1957-58.
Mine Production of Gold(a)	1,111,420	1,080,249	1,032,436	1,062,128	1,083,534
Imports of Gold(b)(c) ..	189,628	175,166	175,649	143,852	169,119
<i>Total</i>	<i>1,301,048</i>	<i>1,255,415</i>	<i>1,208,085</i>	<i>1,205,980</i>	<i>1,252,653</i>
Exports of Gold(b) ..	863,464	864,391	531,664	908,283	405,307
Gold Content of Ores and Concentrates Exported ..	12,526	11,133	13,427	21,817	23,787
Net Industrial Absorption of Gold	51,543	45,253	34,678	39,815	40,786
<i>Total</i>	<i>927,533</i>	<i>920,777</i>	<i>579,769</i>	<i>969,915</i>	<i>469,880</i>
Changes in Stocks of Gold held in Australia(d)	+373,515	+334,638	+628,316	+236,065	+782,773

(a) Gold content of minerals produced in Australia. (b) Includes gold contained in matte.
(c) Excludes gold imported in some minor minerals. (d) Includes gold content of mineral products awaiting refining; excludes gold specie.

6. **Production in Principal Countries.**—The quantities of gold produced in the principal producing countries and the estimated world total production in each of the years 1952 to 1957, according to data published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys, are shown in the table hereunder.

GOLD : PRODUCTION IN PRINCIPAL COUNTRIES.
(*000 fine oz.)

Country.	1953.	1954.	1955.	1956.	1957.
Union of South Africa ..	11,941	13,237	14,601	15,897	17,031
Canada	4,056	4,366	4,542	4,384	4,436
United States of America ..	1,958	1,837	1,880	1,832	1,794
Australia	1,075	1,118	1,049	1,030	1,084
Ghana	731	787	687	638	790
Rhodesia and Nyasaland ..	504	538	527	540	540
Philippines	481	416	419	406	380
Belgian Congo	371	365	370	374	374
Mexico	483	387	383	350	346
Colombia	437	377	381	438	325
<i>Estimated World Total(a)</i> ..	<i>24,200</i>	<i>25,700</i>	<i>26,900</i>	<i>28,000</i>	<i>29,000</i>

(a) Excludes U.S.S.R.

7. **Price of Gold.**—Under existing legislation, all gold produced in Australia is sold to the Commonwealth Bank. The official price of gold is fixed by the Commonwealth Bank, and on 1st May, 1954, it was raised from £15 9s. 10d. to £15 12s. 6d. per fine oz. The current price reflects the "parity" value of Australian currency established by the International Monetary Agreement Act 1947. Previously, the price of gold was based on the price for which gold could be sold abroad in official markets, less costs of movement.

From December, 1951, gold has been sold on overseas premium markets, and the highest price realized was £17 4s. 2d. per fine oz. in February, 1952. Since October, 1953, however, the premium on gold sold overseas only exceeded one shilling per fine oz. for a short period in 1956.

Average prices of gold per fine oz. in Australia, on overseas premium markets, and in London, for the years 1953 to 1957, are shown in the following table. The London gold market was re-opened on 22nd March, 1954, and the prices quoted on this market are used from that date. Previously the Bank of England official price was used.

PRICE OF GOLD.

Year.	At Mints in Australia.			Australian Gold Sold on Oversea Premium Markets.			London.		
	£A.	s.	d.	£A.	s.	d.	£stg.	s.	d.
1953.. .. .	15	9	10	16	2	9	12	8	0
1954.. .. .	15	11	7	15	11	7	12	9	4
1955.. .. .	15	12	6	15	13	1	12	10	11
1956.. .. .	15	12	6	15	13	6	12	10	2
1957.. .. .	15	12	6	15	13	2	12	10	3

8. **Employment in Gold Mining.**—Particulars of the numbers of persons employed in gold mining are shown in § 13, page 1049.

9. **Assistance to Gold-mining Industry.**—In 1939, a tax was imposed on gold produced in Australia or any Australian Territory but this tax was suspended in 1947. In November, 1951, the Commonwealth Government decided to allow Australian gold producers to benefit from the high prices being paid for gold on some overseas markets. To implement this decision, the Gold Producers' Association was incorporated in Victoria, but with its headquarters in Kalgoorlie, Western Australia, in December, 1951, and the first sales were made in that month. Under existing legislation, all gold produced in Australia must be sold to the Commonwealth Bank but the newly-formed Association was permitted to purchase from the Bank each month for resale on premium markets a maximum quantity of gold equal to the amount of new gold delivered to the Bank by members in the previous month, less the quantity required for industrial purposes in Australia. The net proceeds from premium sales are distributed to members in proportion to their production of gold. The actual volume of sales has been dependent largely on prices offering and, up to the end of 1953, premium sales of gold brought an additional return to the industry amounting to over £1,800,000. Towards the end of 1953, however, the price of gold on overseas premium markets fell sharply and subsequent sales have been made at prices very little above the official price.

The following table shows the quantity and value of gold sold on overseas premium markets during the years 1953 to 1957. For the average price realized for their sales, see para. 7 above.

GOLD SOLD ON OVERSEA PREMIUM MARKETS.

Item.	Unit.	1953.	1954.	1955.	1956.	1957.
Quantity ..	fine oz. . .	1,108,506	602,767	981,980	505,262	687,115
Value ..	£A. f.o.b.	16,435,910	9,390,028	15,370,834	7,919,646	10,760,214

After the collapse of high premium prices late in 1953, conditions in the gold-mining industry again became acute and many producers were faced with the prospect of closing down. To meet this situation, the Gold-Mining Industry Assistance Act was assented to on 18th November, 1954. The purpose of this Act was to assist the gold-mining industry by the payment of subsidy subject to certain conditions on the production and sales of gold during the two financial years 1954-55 and 1955-56. In 1956, the operation of the Act was extended for a further three years to 1958-59. A further amendment enacted on 22nd October, 1957, raised the maximum subsidy payable and increased expenditure allowances for mine development. Under this amendment, which operated from 1st July, 1957, the subsidy payable to small producers whose annual output does not exceed 500 fine oz. was raised from £1 10s. 0d. per fine oz. to £2 per fine oz., irrespective of cost of

production. For large producers, the formula for determining the amount of subsidy payable remained unchanged, namely: Three-quarters of the excess of average cost of production per fine oz. over £13 10s. 0d.

Subsequently, the maximum rate of subsidy payable was increased from £2 per fine oz. to £2 15s. 0d. per fine oz. Where a producer receives an amount in excess of the official price of £15 12s. 6d. per fine oz. as a result of sales on oversea premium markets or otherwise, the subsidy payable shall be reduced by the amount of the excess. The subsidy will also be limited to the extent that the annual net profit of a producer will not, with the addition of the subsidy, exceed 10 per cent. of the capital investment in the company. A further condition of the Act is that the recovery rate of the mine shall be maintained at the level of the year previous to the Act.

Payments under the Act commenced in March, 1955, and the amounts paid to gold producers in the various States and Territories of Australia in each of the years 1955 to 1958 are shown in the following table.

NET SUBSIDY PAYMENTS TO GOLD PRODUCERS.

(£.)

Year.	New South Wales.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor. Terr.	Papua and New Guinea.	Total.
1955	225	29,657	966	..	199,051	..	441	6,606	236,946
1956	17	31,478	2,848	..	496,819	..	1,020	63,979	596,161
1957	34	56,044	620	..	512,708	..	8,345	10,761	588,512
1958	26,951	38,380	3,958	..	623,394	..	16,360	44,485	753,528

§ 3. Silver, Lead and Zinc.

1. Mine Production.—The following table shows for 1957 the mine production (metallic content of ores and concentrates produced) of silver, lead and zinc in Australia, and the respective minerals in which these metals were contained.

SILVER, LEAD AND ZINC : CONTENT OF ORES AND CONCENTRATES PRODUCED, AUSTRALIA, 1957.

Mineral in which contained.	Silver (fine oz.).	Lead (tons).	Zinc (tons).
Copper Ore and Concentrate	1,009,686	2,719	..
Gold Concentrate, etc.	193,675	..	..
Lead-Silver Ore	384,779	2,656	..
Lead Concentrate	13,475,649	320,319	..
Zinc Concentrate	675,650	7,570	291,582
Total	15,739,439	333,264	291,582

The following table shows the mine production of silver, lead and zinc in Australia, for the years 1953 to 1957.

SILVER, LEAD AND ZINC : CONTENT OF ORES AND CONCENTRATES PRODUCED, AUSTRALIA.

Metal.	Unit.	1953.	1954.	1955.	1956.	1957.
Silver	'000 fine oz.	12,539	13,827	14,555	14,586	15,739
Lead	ton	269,344	284,862	295,944	299,485	333,264
Zinc .. ..	..	239,324	252,659	256,564	278,082	291,582

The following table shows the quantities of silver, lead and zinc contained in minerals won in the several States of Australia in the year 1957:—

SILVER, LEAD AND ZINC : CONTENT OF ORES AND CONCENTRATES PRODUCED, 1957.

State.	Silver (fine oz.)	Lead (tons).	Zinc (tons).
New South Wales	9,969,102	266,928	241,509
Victoria	3,157	4	..
Queensland	4,274,271	50,780	19,536
South Australia	975	20	97
Western Australia	187,530	3,087	..
Tasmania	1,299,062	12,445	30,440
Northern Territory	5,342	..	..
Australia	15,739,439	333,264	291,582

Particulars of the values ascribed to the minerals containing silver, lead and zinc for the years 1953 to 1957 are shown in the table relating to mineral production on page 1014.

2. Sources of Production.—(i) *New South Wales.* By far the most silver-lead-zinc ore in Australia is won from the massive silver-lead-zinc sulphide deposit at Broken Hill. The companies concerned in operating this gigantic lode are North Broken Hill Ltd., which mines the northern limb of the ore-bearing structure, and Broken Hill South Ltd. and Zinc Corporation Ltd. (with which is associated New Broken Hill Consolidated), which are conducting operations on the southern limb.

The present-day sulphide ores are concentrated by gravity and flotation methods at Broken Hill. The lead concentrates are railed to Port Pirie and smelted to produce lead bullion which is later refined by a continuous lead refining process for the elimination of arsenic and antimony and the recovery of silver and gold. Cadmium metal also is produced from smelter fumes. Lead concentrates produced at Broken Hill are now in excess of Port Pirie smelter capacity and part of the Broken Hill production is exported. About half of the zinc concentrate produced at Broken Hill is exported overseas from Port Pirie while most of the remainder is treated at Risdon in Tasmania.

At Captain's Flat, Lake George Mines Ltd. is operating a lode of similar constitution. Concentration of the ore is carried out at the mine itself, after which process individual concentrates of zinc and lead (containing silver) are dispatched to Port Kembla, New South Wales, for further treatment. Concentrates of copper, pyrite and gold are also produced at this mine.

Silver-lead-zinc ore has been mined in small quantities in various other parts of the State, the more important localities being Howell, Yerranderie and Kangiara.

(ii) *Victoria.* Small quantities of lead sulphide ore occur on most of Victoria's gold-fields and in minor amounts in the Ormeo, Bethanga and Cassilis districts. The lead content of silver-lead ore produced in 1957 was 4 tons.

Of the total production of 3,157 fine oz. of silver in 1957, 3,082 fine oz. were won as a by-product of the gold mining industry.

(iii) *Queensland.* Silver produced in Queensland is obtained mainly as a by-product of ores of other metals such as lead-zinc and copper ores at Mt. Isa and copper-gold ore at Mt. Morgan.

Nearly all the output of lead in Queensland is produced at Mt. Isa in the far north-west of the State, where mining is carried out on extensive silver-lead-zinc ore and copper ore bodies. Lead concentrate produced at Mt. Isa is smelted to lead bullion at the mine. All Mt. Isa lead bullion is exported overseas, where certain impurities, such as antimony, arsenic and copper, as well as silver, are removed to yield a pure lead suitable for commercial use.

Zinc concentrates produced by Mt. Isa are also exported overseas. Copper ore is mined and smelted on a large scale at Mt. Isa and details of those operations are given in § 4.

(iv) *South Australia.* Output of lead from local ores has been very small in recent years. During 1957, 20 tons of lead and 975 fine oz. of silver were produced in lead-silver ore and 97 tons of zinc were produced in zinc concentrates.

(v) *Western Australia.* During 1957, 582 tons of lead were produced in lead-silver ore and 2,505 tons produced in lead concentrates.

Silver in Western Australia is obtained as a by-product of the gold-mining industry, which produced 178,619 fine oz. of silver out of the State's total production of 187,053 fine oz. in 1957. There was no production of zinc in Western Australia during 1957.

(vi) *Tasmania.* There are two large centres of silver-lead-zinc mining in Tasmania, the more important being that operated by the Electrolytic Zinc Company of Australasia Ltd. at Read-Rosebery. This company also operates the electrolytic zinc reduction works at Risdon near Hobart. Although the product of this field is primarily zinc, lead and copper-lead concentrates are also produced.

The lead concentrates and copper-lead concentrates produced at Rosebery are exported overseas, while the zinc concentrates, containing some lead, are treated at Risdon. The Risdon plant also treats considerable quantities of zinc concentrates from the Broken Hill mines.

Of secondary importance to Rosebery is the Mount Farrell field, situated 6 miles north-east of Rosebery. These ore-bodies are mainly silver-lead lodes which yield a lead concentrate with high silver content. The zinc content is insufficient to warrant recovery.

Most of the State's silver is contained in concentrates produced at Rosebery, the remainder being contained in copper concentrate produced at Mt. Lyell and in lead concentrate produced at several small mines in the west coast district.

(vii) *Northern Territory.* There was no production of minerals containing lead or zinc in the Northern Territory in 1957. Silver is obtained mainly as a by-product of the copper-gold mining industry which produced 4,268 fine oz. of the Territory's total production of 5,342 fine oz.

3. **Production and Sales of Refined Silver, Lead and Zinc.**—In the following table, details are given of the production and sales of refined primary silver, lead and zinc as recorded from data received from the Bureau of Mineral Resources and the Australian Mines and Metals Association. The figures shown for refined silver production include small quantities recovered from imported materials.

REFINED SILVER, LEAD AND ZINC : PRODUCTION AND SALES, AUSTRALIA.

Particulars.	1953.	1954.	1955.	1956.	1957.
SILVER ('000 fine oz.).					
Production (a)	6,595	8,474	7,818	8,232	8,011
Sold to Australian consumers (b)	1,447	1,977	1,928	1,893	4,410
Sold for export (b)	4,755	6,989	5,793	6,214	3,397
LEAD (tons).					
Refined Lead—					
Production (a)	172,468	200,409	187,134	194,506	192,161
Sold to Australian consumers (b)	31,663	42,088	45,851	38,616	37,291
Sold for export (b)	141,007	153,847	148,189	151,628	152,432
Lead Bullion—					
Produced for export (lead content) (a)	34,050	38,146	37,392	41,658	46,891
ZINC (tons).					
Production (a)	90,178	104,523	101,090	104,993	110,348
Sold to Australian consumers (b)	58,524	61,478	71,355	69,760	78,874
Sold for export (b)	32,881	36,130	34,049	32,718	37,316

(a) Source: Bureau of Mineral Resources.

(b) Source: Australian Mines and Metals Association.

4. **Production in Principal Countries and World Total:**—The following table shows, for the years 1955 to 1957, particulars of silver, lead and zinc production (mine basis) in principal producing countries, together with the estimated world total, according to data published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys.

SILVER, LEAD AND ZINC : MINE PRODUCTION IN PRINCIPAL COUNTRIES.

Country.	1955.	1956.	1957.
SILVER (fine oz.).			
Mexico	47,957,655	43,078,040	47,149,514
United States of America	37,197,742	38,948,121	38,164,915
Canada	27,984,204	28,431,847	30,138,447
Peru	22,947,625	22,972,766	25,310,479
U.S.S.R.	(a) 25,000,000	(a) 25,000,000	(a) 25,000,000
Australia	14,555,412	14,586,197	15,739,439
Japan	5,948,627	6,166,963	6,526,183
Bolivia	5,851,242	7,543,304	5,375,058
Belgian Congo	4,083,000	3,794,000	3,045,000
<i>Estimated World Total</i>	<i>224,000,000</i>	<i>225,000,000</i>	<i>230,000,000</i>
LEAD (long tons).			
Australia	295,944	299,485	333,264
U.S.S.R.	(a) 290,000	(a) 305,000	(a) 320,000
United States of America	301,808	315,023	301,979
Mexico	207,486	196,457	211,482
Canada	181,037	168,620	167,777
Peru	116,875	127,035	129,200
<i>Estimated World Total</i>	<i>2,140,000</i>	<i>2,225,000</i>	<i>2,320,000</i>
ZINC (long tons).			
United States of America	459,528	484,232	474,763
Canada	386,926	377,350	368,133
U.S.S.R.	(a) 255,000	(a) 270,000	(a) 300,000
Australia	256,564	278,082	291,582
Mexico	265,144	244,956	239,189
Poland	153,700	150,900	156,300
Peru	163,459	172,354	154,974
<i>Estimated World Total</i>	<i>2,820,000</i>	<i>2,950,000</i>	<i>3,010,000</i>

(a) Estimated.

5. Prices of Silver, Lead and Zinc.—The following table shows average prices in Australia and on the London Metal Exchange during the years 1953 to 1957. Lead and zinc prices were controlled in Australia and the United Kingdom after the outbreak of war in 1939, but were decontrolled in Australia on 21st April, 1953. Free trading in lead in the United Kingdom, after thirteen years of Government control, was resumed on 1st October, 1952, while the fixing by regulation of the price of zinc was abandoned from 1st January, 1953. Silver prices have not been controlled in Australia or the United Kingdom.

PRICES OF SILVER, LEAD AND ZINC.

Metal.	1953.	1954.	1955.	1956.	1957.
<i>Australian Prices, in Australian currency—</i>					
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Silver, per fine oz. (a)	7 8	7 8	8 1	8 3	8 3
	£	£	£	£	£
Lead, per ton	(b) 104	114	127	140	117
Zinc, per ton	(b) 92	101	114	122	104
<i>London Metal Exchange Prices, in sterling—</i>					
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
Silver, per fine oz.	6 2	6 2	6 4	6 7	6 7
	£	£	£	£	£
Lead, per ton	91	96	106	116	97
Zinc, per ton	75	78	91	98	82

(a) Silver prices shown represent export parity calculated from London Metal Exchange prices.

(b) Prices fixed by regulation to 21st April, 1953; average market prices have been used thereafter.

6. Employment in Silver, Lead and Zinc Mining.—Particulars of the number of persons employed in mining for these metals are shown in § 13, page 1049.

§ 4. Copper.

1. **Mine Production.**—Copper is widely distributed throughout Australia. However, the principal producing States in 1957 were Queensland, Tasmania, Northern Territory and New South Wales, in that order of magnitude. The table hereunder shows the quantity of mine production of copper (copper content of ores and concentrates produced) in Australia for the years 1953 to 1957, including cupreous ore mined for fertilizer production. It should be noted that the minerals shown below contain, in addition to copper, certain other metals.

COPPER : CONTENT OF ORES AND CONCENTRATES PRODUCED, AUSTRALIA
(Tons.)

Mineral in which Contained.	1953.	1954.	1955.	1956.	1957.
Copper Ore, Concentrate and Precipitate	33,184	37,425	42,370	49,556	52,672
Gold Ore, Concentrate, etc.	1	(a)	..	(a)	(a)
Lead Ore and Concentrate	3,037	3,241	3,224	3,462	3,770
Zinc Concentrate	540	575	598	719	726
Tin Concentrate . . . . .	..	..	..	..	7
Total	36,762	41,241	46,192	53,737	57,175

(a) Less than half a ton.

Particulars of the copper content of ores and concentrates produced in each producing State and the Northern Territory for the years 1953 to 1957, are shown in the table below.

COPPER : CONTENT OF ORES AND CONCENTRATES PRODUCED, STATES.
(Tons.)

State.	1953.	1954.	1955.	1956.	1957.
New South Wales	3,626	3,182	3,492	4,289	4,382
Queensland	23,955	27,207	30,738	34,898	33,706
South Australia	1	(a)	..	1	2
Western Australia	190	380	699	740	788
Tasmania	8,902	9,880	8,394	8,807	10,984
Northern Territory	88	592	2,869	5,002	7,313
Australia	36,762	41,241	46,192	53,737	57,175

(a) Less than half a ton.

2. **Sources of Production.**—(i) *New South Wales.* The copper content of all ores and concentrates produced in New South Wales amounted to 4,382 tons in 1957. The only producer of copper concentrate in the State was the Lake George mine at Captain's Flat, but the major production of copper was as a by-product of lead and zinc mining at Broken Hill.

(ii) *Queensland.* In 1957, mine production of copper in minerals amounted to 33,706 tons. The main centre of production is the Cloncurry field in the north-western part of the State. Since the opening of the new copper smelter at Mt. Isa in February, 1953, copper production in Queensland has increased rapidly and the Mt. Isa mine now produces about half of the total Australian output. Lead bullion and zinc concentrate are also produced at Mt. Isa. The only other major copper producer is Mt. Morgan, just south of Rockhampton, where copper is produced in conjunction with gold.

(iii) *South Australia.* Deposits of copper were found in the past over a large portion of South Australia, but the principal fields have been exhausted and output in recent years has been negligible.

(iv) *Western Australia.* During 1957, 324 tons of copper were produced in copper concentrates, compared with 46 tons of copper in the previous year. This increase was caused by the commencement of production, during 1957, at the Ravensthorpe mine in the south-east of the State. In addition, 464 tons of copper were produced in copper ore used for superphosphate fertilizer production.

(v) *Tasmania.* The quantity of copper produced in Tasmania during 1957 was 10,984 tons, the Mount Lyell Mining and Railway Co. Ltd. providing the greater part thereof. The remainder consisted mainly of copper in copper-lead concentrates exported from Read-Rosebery.

(vi) *Northern Territory.* The greatest part of the output of 7,306 tons of copper in the Northern Territory during 1957, came from the Peko mine at Tennant Creek. Although originally worked as a gold mine, high-grade copper ore was discovered there, and since the new milling plant came into operation in June, 1954, the mine has become the major producer of copper in the Northern Territory. Copper concentrate is also produced at Rum Jungle by Territory Enterprises Pty. Ltd. In addition, 53 tons of copper ore containing 7 tons of copper were produced for fertilizer manufacture.

3. Smelter and Refinery Production of Copper.—The production of blister copper in Australia has more than doubled since the copper smelter at Mt. Isa commenced operations in 1953. Blister copper is also produced at Mt. Lyell in Tasmania, Mt. Morgan in Queensland and at Port Kembla in New South Wales. Copper concentrate smelted at Port Kembla is mainly from Lake George Mines Pty. Ltd. at Captain's Flat, N.S.W. and Peko Mines N.L. at Tennant Creek, N.T. The production of primary blister copper in Australia during 1957 was 50,879 tons compared with 49,030 tons in 1956 and 20,008 tons before the opening of the Mt. Isa smelter in 1952.

Mt. Isa Mines Ltd. has no facilities of its own for refining copper at the present time, but it has under construction an electrolytic refinery at Townsville, Queensland, with an initial annual capacity of 30,000 tons. Some of the copper is at present shipped for refining at Port Kembla, the balance being exported overseas. Blister copper produced at Mt. Morgan is shipped to Port Kembla for refining and the recovery of gold, which in 1957 averaged just over 7 fine oz. per ton of blister copper.

At Mt. Lyell, refined copper is produced by electrolytic process, and, apart from some sold in Tasmania, the cathode copper produced is shipped to Port Kembla for casting into refinery shapes.

The refining plant operated by the Electrolytic Refining and Smelting Co. at Port Kembla, is a custom smelter and refinery which treats copper ore, concentrates, and metal in all stages. It has an annual capacity of 32,000 tons of electrolytic copper. Fire-refining, which is a cheaper process, is done on a smaller scale when materials are amenable to that treatment. There is also a refinery for the recovery of precious metals from tank house slimes. In the following table, details are given of the production and sales of refined copper, as recorded from data received from the Australian Mines and Metals Association and the Bureau of Mineral Resources.

REFINED COPPER(a) : PRODUCTION AND SALES, AUSTRALIA.

(Tons.)

Particulars.	1953.	1954.	1955.	1956.	1957.
Production (b)	16,682	29,287	28,148	29,307	32,880
Sold to Australian consumers (c)	15,415	29,361	27,366	29,038	34,114
Sold for export (c)	2,607			650	

(a) Refined from domestic primary copper.
(c) Source: Australian Mines and Metals Association.

(b) Source: Bureau of Mineral Resources.

4. Production in Principal Countries and World Total.—The following table shows the mine production of copper during 1955, 1956 and 1957 from the principal producing countries, as published by the Minerals Resources Division of the United Kingdom Overseas Geological Surveys and their estimate of total world production in those years.

COPPER: MINE PRODUCTION IN PRINCIPAL COUNTRIES.
(Long Tons.)

Country.	1955.	1956.	1957.
United States of America	891,580	982,692	969,769
Chile	438,859	494,851	(a) 490,000
U.S.S.R.	(a) 400,000	(a) 425,000	(a) 465,000
Rhodesia	354,016	399,461	431,732
Canada	291,066	316,839	308,953
Belgian Congo	231,394	246,016	238,418
Japan	71,845	77,230	79,650
Mexico	53,812	53,998	59,600
Australia	46,192	53,737	57,175
Peru	42,718	45,506	47,583
Union of South Africa	43,669	45,762	45,499
<i>Estimated World Total</i>	<i>3,110,000</i>	<i>3,450,000</i>	<i>3,530,000</i>

(a) Estimated.

5. Prices.—From the outbreak of war in 1939 to August, 1953, in the United Kingdom and October, 1954, in Australia, the price of copper was fixed by regulation. Private trading has now been resumed in both countries. Details of the average price for the years shown are given in terms of Australian currency and sterling in the following table:—

AVERAGE PRICE PER TON OF ELECTROLYTIC COPPER IN AUSTRALIA AND THE UNITED KINGDOM.

(£.)

Country.	1953.	1954.	1955.	1956.	1957.
Australia — in Australian currency(a)	330	(b) 310	437	435	341
United Kingdom—in sterling (c) 253		249	352	304	220

(a) Ex works Port Kembla. (b) Average market prices from 26th October, 1954. (c) Average market prices from 5th August, 1953.

6. Employment in Copper Mining.—Particulars of the numbers of persons engaged in the mining of copper and copper-gold ores are shown in § 13, page 1049.

7. Assistance to the Copper-mining Industry.—Following a Tariff Board enquiry which recommended that the industry should be assisted by stabilizing the price of copper at £330 per ton, the Government decided to provide this assistance partly by duty and partly by bounty. The bounty is payable on copper sold on the Australian market, with a maximum of £45 per ton, or such total bounty as will give a return of 10% on assessed capital employed in the production of copper if this is less than £45 per ton. The bounty reduced the net effective price of copper to Australian consumers from £330 to £285. A duty is imposed on imported copper when the Australian equivalent of the London Metal Exchange price falls below £275 (£Stg.220), increasing by £1 for each £1 that the Australian equivalent falls below £275. Including freight and other charges, the landed cost is thus expected to be maintained at about £285 so long as the Australian equivalent of the London Metal Exchange price is not in excess of £275.

§ 5. Tin.

1. Mine Production.—The following table shows the tin content of concentrates produced in each State and the Northern Territory for the years 1953 to 1957.

TIN: CONTENT OF TIN CONCENTRATES PRODUCED: STATES.
(Tons.)

State.	1953.	1954.	1955.	1956.	1957.
New South Wales	342	272	270	269	211
Victoria	31	26	2	..	(a)
Queensland	292	730	770	630	772
Western Australia	76	80	119	240	182
Tasmania	788	947	853	938	777
Northern Territory	24	20	3	1	10
<i>Australia</i>	<i>1,553</i>	<i>2,075</i>	<i>2,017</i>	<i>2,078</i>	<i>1,952</i>

(a) Less than half the unit of quantity shown.

2. Sources of Production.—(i) *New South Wales.* Production of tin in tin concentrates in 1957 was 211 tons compared with 269 tons in 1956. A large proportion of the output in this State is obtained by dredging and sluicing, principally in the New England district.

(ii) *Victoria.* With the closing down of the Eldorado gold dredge in July, 1954, the production of tin in Victoria virtually ceased. Production during 1957 amounted to one third of a ton of concentrates.

(iii) *Queensland.* The tin content of concentrates produced in 1957 and 1956 was 772 tons and 630 tons respectively. Production of concentrates in 1957 amounted to 1,189 tons compared with 883 tons in 1956. The chief districts producing concentrate during 1957 were Herberton 1,058 tons, Kangaroo Hills 72 tons and Cooktown 30 tons. The largest producer is Tableland Tin N.L. It is interesting to compare these production figures with those recorded in this State in the early years of this century when the output ranged between 2,000 and 5,000 tons per annum.

(iv) *Western Australia.* The quantity of tin in tin concentrates reported in this State in 1957 amounted to 182 tons, compared with 240 tons in 1956. Production was mainly in the Pilbara and Greenbushes fields.

(v) *Tasmania.* For 1957, the output of tin in tin concentrates amounted to 777 tons. The tin content for 1956 was 938 tons.

(vi) *Northern Territory.* The production of tin in tin concentrates for 1957 amounted to 10 tons compared with one ton produced during 1956.

3. Production of Refined Tin.—There are two firms engaged in the smelting of tin in Australia, both located in Sydney, New South Wales. Production recorded by the Bureau of Mineral Resources amounted to 1,806 tons in 1957, compared with 1,850 tons in 1956.

4. Production in Principal Countries and World Total.—The production of tin reached its maximum in 1941 when 241,400 tons were recorded. The chief producing countries of the world are—Federation of Malaya, Bolivia, Indonesia, Belgian Congo, Thailand and China and in recent years these countries have produced approximately 90 per cent. of the total production. Australia's share of the world's tin production is about 1 per cent.

The production of tin ore (metal content) as published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys, for the principal producing countries in 1956 and 1957 was as follows.

TIN : PRODUCTION IN PRINCIPAL COUNTRIES.

(Long Tons.)

Country.	Production.		Country.	Production.	
	1956.	1957.		1956.	1957.
Malaya	62,296	59,293	Australia	2,078	1,952
Bolivia	26,421	27,796	Union of South Africa	1,442	1,463
Indonesia	29,579	27,721	Portugal	1,276	1,127
Belgian Congo	14,764	14,859	United Kingdom ..	1,066	1,080
Thailand	12,481	13,528			
China	8,400	9,600	<i>Estimated World</i>		
Nigeria	9,067	9,534	<i>Total(a)</i> ..	174,600	174,000

(a) Excludes U.S.S.R.

5. Prices.—At the outbreak of war in September, 1939, the price of tin in Australia and in London was fixed by regulation. London control of tin prices ceased on 14th November, 1949, while the Australian price was decontrolled on the 21st April, 1953. Details of the movement in average prices for the years 1952 to 1956 are given in terms of Australian currency and sterling in the following table.

AVERAGE PRICE PER TON OF TIN IN AUSTRALIA AND THE UNITED KINGDOM.
(£.)

Country.	1953.	1954.	1955.	1956.	1957.
Australia—in Australian currency (a)	919	911	947	1,014	992
United Kingdom—in sterling (b)	731	720	741	788	755

(a) Prices fixed by regulation *ex* smelters for sales of 10 cwt. or more or in ingots of 70 lb. or more to 21st April, 1953; average market prices thereafter. (b) Average spot market prices for standard tin.

6. **Employment in Tin Mining.**—The number of persons employed in tin mining is shown in § 13 (page 1049).

§ 6. Iron.

1. **General.**—Although iron ore is widely distributed throughout Australia, the only known ore bodies of large extent and high grade which are easily accessible are those situated at Iron Knob and Iron Baron, South Australia, and at Yampi Sound, Western Australia. Estimates of the high grade reserves at these centres place the quantities available at approximately 200 million tons and 100 million tons respectively. Bearing in mind the expansion of the iron industry in Australia, and the limitations of these reserves, the Commonwealth Government prohibited the export of iron ore from 1st July, 1938.

2. **Mine Production.**—(i) *Australia.* Production of iron ore for smelting purposes and estimated iron content are shown below for the years 1953 to 1957:—

IRON ORE : PRODUCTION, AUSTRALIA.
(Tons.)

Particulars.	1953.	1954.	1955.	1956.	1957.
Production of Iron Ore ..	3,298,718	3,518,804	3,572,609	3,923,985	3,805,473
Estimated Iron Content ..	2,131,865	2,274,330	2,304,165	2,542,826	2,465,523

(ii) *New South Wales.* Since 1945, no iron ore has been mined in this State for conversion into pig-iron. For many years, South Australia has been the chief source of supply for New South Wales blast furnaces.

Small quantities of iron oxide produced in New South Wales are used by the various gas-works for purifying gas, and also in the manufacture of paper, and for pigments. These supplies are drawn chiefly from the deposits in the Port Macquarie Division. During 1957, 2,749 tons of oxide were won. In addition, four tons of magnetite were produced in 1957 for coal-washing.

(iii) *Victoria.* Deposits of iron ore exist in the Nowa Nowa area of East Gippsland, but much larger quantities of ore than are at present known will have to be proved if the area is to become an economic source of iron. In 1957, 2,300 tons of limonite (iron oxide) were produced at Buchan for gas purification purposes.

(iv) *Queensland.* Deposits of iron ore in the Constance Range area of north-west Queensland may prove to be the largest deposits in Australia. First indications were that the ore was too low in grade to warrant exploitation. Later investigations have been more promising and an extensive programme of drilling and detailed field mapping is now being carried out to evaluate the deposits. The output of 4,273 tons of iron oxide for 1957 came from the Townsville district and was used for cement manufacture.

(v) *South Australia.* The main production of iron ore in Australia is from the deposits worked by the Broken Hill Proprietary Co. Ltd. at Iron Knob and Iron Baron in the Middleback Ranges near Whyalla. Production in 1956 reached a record level of 3,389,237 tons (estimated iron content, 2,203,004 tons). Production from Iron Baron

commenced early in 1958 and it is planned to reach a rate of one million tons of ore annually. The presence of thirty million tons of high grade iron ore has been proved near the leases held by B.H.P. Co. Ltd. and it is proposed to offer the company new leases in this area covering 250 square miles.

(vi) *Western Australia.* The production of iron ore in Western Australia during 1957 was 416,236 tons with an estimated iron content of 262,519 tons. The major part of this production came from Yampi Sound, and was shipped to New South Wales for smelting. The Yampi Sound iron ore is of high grade but much of it is powdery and friable and a sintering plant was opened at Port Kembla, N.S.W., in 1957 to beneficiate the ore. The remaining production all came from Koolyanobbing.

(vii) *Tasmania.* There has been no production of ironstone in Tasmania since 1943 when seven tons were produced. In 1957, 5,775 tons of iron oxide were produced for cement manufacture and for use in gas purification.

(viii) *Northern Territory.* Extensive deposits of low grade iron-bearing material have been discovered in the Roper River area. With modern ore beneficiation methods, these deposits may have some economic significance.

3. *Imports.*—During 1957, 203,011 tons of iron ore were imported into Australia from all sources, compared with 14,052 tons in 1956. Imports of iron ore from New Caledonia were 202,982 tons in 1957, compared with 14,026 tons in 1956, the first year of imports from this source. This ore has a lower iron content than ore from the Middleback Range and Yampi Sound. It contains impurities such as chromium and nickel and at present it is blended with Australian ores for smelting.

4. *Sources of Production.*—(i) *Australia.* The production of pig-iron and steel ingots in Australia, of which New South Wales is the main producing State, is shown in the following table for each of the years ended 31st May, 1949 to 1958.

PIG-IRON AND STEEL : PRODUCTION, AUSTRALIA.

(Tons.)

Year Ended 31st May.	Pig-iron. (a)	Steel Ingots.	Year Ended 31st May.	Pig-iron. (a)	Steel Ingots.
1949	1,044,957	1,178,010	1954	1,826,711	2,116,813
1950	1,097,635	1,217,971	1955	1,868,841	2,208,708
1951	1,313,332	1,443,831	1956	1,910,521	2,320,289
1952	1,430,027	1,521,386	1957	2,097,349	2,853,501
1953	1,691,693	1,801,028	1958	2,283,817	3,105,586

(a) Includes pig-iron for castings; excludes ferro-alloys.

In 1958, eight blast furnaces were operating in Australia; three at Newcastle and three at Port Kembla, in New South Wales, one at Whyalla, South Australia, and one at Wundowie, Western Australia. During 1958, ingot steel was produced from 27 open-hearth furnaces (17 at Newcastle and 10 at Port Kembla) and from 10 electric furnaces (5 at Newcastle, 3 at Melbourne, 1 at Whyalla and 1 at Port Kembla).

(ii) *New South Wales.* The principal producers in Australia, both in New South Wales, are the Broken Hill Proprietary Co. Ltd. at Newcastle and Port Kembla and its subsidiary, the Australian Iron and Steel Ltd. at Port Kembla. The postwar expansion of the steel industry has concentrated major development work at Port Kembla. The hot-dip tinplate mill at Port Kembla began production in August, 1957 and plant capacity is at present 70,000 tons a year, or about 60 per cent. of present Australian requirements. It is proposed to increase capacity to 150,000 tons annually and to use electrolytic methods for plating. In June, 1957, work commenced on the building of a £9,000,000 coke manufacturing plant. The project includes a battery of ninety-six coke ovens and associated by-products chemical plant. A slabbing mill costing £8,750,000 with a capacity of two million tons of ingots a

year was completed in April 1958. At Newcastle, the new skelp mill commenced operations in February, 1958. This mill will produce high quality steel strip for processing into tubes and it will have a capacity of 400,000 tons annually. During 1956, the construction of an additional blast furnace at Port Kembla was commenced. When completed in 1959, its productive capacity of 600,000 tons of pig iron annually will at least equal the output of the world's largest blast furnace. In 1956, the B.H.P. Central Research Organization commenced activities at Newcastle. It has been designed to investigate problems in coal and ore beneficiation, fuel technology, iron and steel making, fabrication and heat treatment of steel, and the chemistry and physics of materials used in modern industry.

(iii) *South Australia.* At Whyalla in South Australia, in addition to the blast furnace production, The Broken Hill Proprietary Co. Ltd. produces a small quantity of steel ingots from an electric furnace. In March, 1958, it was announced that the B.H.P. Co. Ltd. would build a steel plant at Whyalla at an estimated cost of £30,000,000. The project will include added blast furnace capacity, steelmaking plant, rolling mills and associated works.

(iv) *Western Australia.* In Western Australia, the State-owned Wundowie Wood Distillation, Charcoal Iron and Steel Industry produces pig iron using charcoal for smelting instead of the non-coking local coal. This high grade iron is used for the manufacture of spheroidal graphite cast iron. The output of pig iron during the year 1956-57 amounted to 14,020 tons and during 1957-58 to 15,914 tons. At Kwinana in Western Australia, a steel rolling mill commenced operations in 1956. Billets are shipped from New South Wales steel works to Kwinana, and after cutting to fifteen foot lengths, they are heated in an oil-fired furnace and then broken down into merchant steel sections in the semi-continuous rolling mill. The capacity of this mill is over 50,000 tons of steel products annually.

5. *Production in Principal Countries.*—Particulars of the production in the principal countries and the estimated world total production during the years 1956 and 1957 according to figures published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys, are shown in the next table.

IRON AND STEEL: PRODUCTION IN PRINCIPAL COUNTRIES.

('000 Tons.) (a)

Country.	Pig-iron and Ferro-alloys.		Steel Ingots and Castings.	
	1956.	1957.	1956.	1957.
United States of America ..	69,264	72,141	102,872	100,638
U.S.S.R.	35,200	36,400	47,800	50,200
Germany, Federal Republic ..	17,299	18,068	22,823	24,120
United Kingdom	13,170	14,283	20,659	21,699
France	11,298	11,727	13,187	13,873
Japan	6,186	7,021	10,931	12,372
Italy	1,964	2,170	5,814	6,680
Belgium	5,679	5,499	6,211	6,177
China(b)	4,700	5,400	4,280	5,300
Poland	3,451	3,624	4,935	5,220
Czechoslovakia	3,230	3,507	4,805	5,084
Canada	3,402	3,525	4,737	4,498
Luxemburg	3,261	3,315	3,401	3,438
Saar	2,983	3,116	3,321	3,384
Australia	2,074	2,218	2,584	3,055
Germany, Eastern	1,549	1,636	2,696	2,850
Sweden	1,389	1,520	2,361	2,444
India	1,958	1,911	1,738	1,710
<i>Estimated World Total</i> ..	<i>197,800</i>	<i>207,700</i>	<i>278,100</i>	<i>287,200</i>

(a) Long tons.

(b) Estimated.

§ 7. Other Metallic Minerals.

1. Tungsten.—Tungsten ores occur in all States. Particulars of scheelite concentrates from King Island, in Bass Strait, the major producer, are included in Tasmanian production. Other important deposits of tungsten ores occur in Queensland, New South Wales, the Tasmanian mainland and the Northern Territory, but production from Victoria, South Australia and Western Australia has been comparatively unimportant. In recent years, the largest producer has been Tasmania, but with the cessation in August, 1958, of production at King Island due to the continued downward trend in world prices, future production in this State will be severely curtailed. Production of tungsten concentrates and contents during 1957 in each producing State and Territory is shown below:—

TUNGSTEN CONCENTRATES : PRODUCTION, 1957.
(Tons.)

Particulars.	N.S.W.	Q'land.	Tas.	N. Terr.	Australia.
Scheelite Concentrate ..	(a) 2	2	1,445	..	1,449
WO ₃ Content ..	1	1	948	..	950
Wolfram Concentrate ..	(a)(b)	30	550	77	657
WO ₃ Content ..	(b)	19	391	49	459

(a) Dispatches from the mine (or sales) as distinct from production.

(b) Less than half the unit of quantity shown.

The following table shows production for Australia for the years 1953 to 1957:—

TUNGSTEN CONCENTRATES : PRODUCTION, AUSTRALIA.
(Tons.)

Particulars.	1953.	1954.	1955.	1956.	1957.
Scheelite Concentrate ..	1,185	1,331	1,449	1,495	1,449
WO ₃ Content ..	729	861	960	990	950
Wolfram Concentrate ..	1,008	722	788	877	657
WO ₃ Content ..	672	511	522	592	459

2. Mineral Sands.—(i) *General.* In recent years, the growing world demand for titanium metal has brought about a rapid expansion of mineral sands mining in Australia. The recovery of mineral sands from Australian beaches commenced in 1933 when 550 tons of ilmenite were produced in Tasmania. This ilmenite proved unsuitable for pigment manufacture and operations ceased the same year. In 1934, operations to recover mineral beach sands commenced at Byron Bay in New South Wales. At first, the concentrates produced were mainly mixed zircon-rutile-ilmenite, but in 1941 electro-magnetic separators were installed to separate the ilmenite, and in 1943 electro-static separators were introduced to produce rutile concentrate. The Commonwealth Government banned the export of mixed concentrates in 1944, and all producers now turn out separate concentrates of rutile, zircon, ilmenite and monazite. Australia is the largest producer of rutile and zircon in the world.

(ii) *Titanium.* The main raw material for titanium metal is rutile, which is an oxide of titanium and the principal mineral recovered from eastern coast beach sands. Ilmenite, an oxide of iron and titanium, is used largely in pigment manufacture, but owing to the presence of chromium as an impurity, eastern coast deposits are unsuitable for this purpose. However, large scale operations to produce chromium-free ilmenite started in 1956 in the Bunbury-Capel district of Western Australia. Details of production of rutile and ilmenite and the titanium content thereof during the years 1953 to 1957 are shown in the following table:—

PRODUCTION OF TITANIUM (IN TERMS OF TiO₂) IN AUSTRALIA.
(Tons.)

Year.	Rutile Concentrate.		Ilmenite Concentrate.		Total TiO ₂ Content.
	Quantity.	TiO ₂ Content.	Quantity.	TiO ₂ Content.	
1953	38,039	37,067	..	..	37,067
1954	44,659	43,011	469	230	43,241
1955	59,613	57,232	535	262	57,494
1956	96,816	93,242	4,274	2,260	95,502
1957	128,903	124,863	71,155	38,888	163,751

(iii) *Zircon*. Zircon was the main product when beach sand mining commenced in Australia, but consumption of zirconium has not increased as rapidly as world demand for titanium. Although production of zircon concentrate has increased in recent years in association with rutile, many producers are not now extracting saleable zircon concentrate. The production of zircon concentrate during the years 1953 to 1957 is shown in the following table:—

ZIRCON PRODUCTION, AUSTRALIA.

(Tons.)

State.	1953.	1954.	1955.	1956.	1957.
New South Wales	15,528	27,489	32,827	50,660	59,373
Queensland	11,679	13,964	15,846	21,798	29,188
<i>Total</i>	27,207	41,453	48,673	72,458	88,561
Zircon Content	26,858	40,920	48,209	71,769	87,703

3. *Cadmium and Cobalt*.—The sources of cadmium in Australia are lead and zinc concentrates. The cadmium content of these concentrates produced was 922 tons during 1956 and 979 tons in 1957. Most of the concentrates are treated at Risdon, Tasmania, and at Port Pirie, South Australia, for the extraction of cadmium. The remainder is exported.

Cobalt is present in zinc concentrate produced at Broken Hill, New South Wales, and at Rosebery, Tasmania. The cobalt is recovered in the form of cobalt oxide at the zinc refining plant at Risdon, Tasmania, and is sold as such to industry. The cobalt metal content of zinc concentrate produced was estimated at 59 tons in 1956 and at 68 tons in 1957.

Production of refined cadmium and cobalt oxide for the years 1953 to 1957 is shown in the following table:—

CADMIUM (REFINED) AND COBALT OXIDE : PRODUCTION.(a)

(Tons.)

Year.	Cadmium (Refined).			Cobalt Oxide. Extracted from Ores Mined in New South Wales.(b)
	Extracted from Ores Mined in—			
	New South Wales.	Tasmania.	Total.	
1953	257	40	297	17
1954	239	49	288	18
1955	261	40	301	18
1956	232	44	276	19
1957	345	48	393	20

(a) Source: Bureau of Mineral Resources.

(b) Excludes less than a ton of cobalt oxide produced from Tasmanian ores in each of the years shown.

The figures shown in the table above refer to production in Australia only and do not include the metallic contents of cadmium and cobalt oxide contained in the ores and concentrates exported overseas.

4. *Manganese*.—There has been considerable expansion of manganese ore production in recent years, due mainly to the relaxation of some provisions of the embargo on export of manganese ores. Western Australia continues as the main producing State where activities were centred around Horseshoe in the Peak Hill District and Ant Hill and Mt. Sunday in the Pilbara District. Northern Territory production is at Mucketty near Renners Springs.

The following table shows the production of metallurgical grade and battery and other grades of manganese ore for the years 1953 to 1957:—

MANGANESE ORE PRODUCTION : AUSTRALIA.

(Tons.)

Year.	Metallurgical Grade.				Battery and Other Grades.			
	N.S.W.	Q'land.	W. Aust.	Australia.	N.S.W.	W. Aust.	N. Terr.	Australia.
1953 ..	1,015	43	30,457	31,515	1,428	..	..	1,428
1954 ..	749	138	26,448	27,335	867	..	..	867
1955 ..	1,071	78	44,194	45,343	551	..	1,462	2,013
1956 ..	986	311	56,032	57,329	527	202	1,326	2,055
1957 ..	917	1,239	73,058	75,214	546	221	1,029	1,796

5. *Other.*—The production, in 1957 (1956 shown in parentheses) of other metallic minerals worthy of note, is as follows:—

Antimony. The antimony content of antimony-bearing minerals produced was 1,209 tons (903 tons). Of this amount, 724 tons (616 tons) were in lead concentrate and 485 tons (287 tons) in 852 tons (547 tons) of antimony ore and concentrate.

Bauxite. 7,707 tons (10,329 tons) of bauxite ore were produced, mainly in New South Wales and Victoria. During recent years, extensive deposits of bauxite have been discovered on the west coast of Cape York Peninsula, Queensland, and on the Gove Peninsula and Wessel Islands of the Northern Territory. Extensive surveys in these and nearby areas are being carried out and reserves already proved have placed Australia among the large potential bauxite producers of the world. The Commonwealth Aluminium Corporation Pty. Ltd. has authority to prospect an area of about 2,500 square miles, and it plans to produce annually 1,500,000 tons of bauxite yielding 500,000 tons of alumina which will be exported.

Beryllium. Production of beryllium ore was 395 tons (318 tons) which came mainly from Western Australia where the Pilbara gold field was the main producing area. The beryllium oxide content of the ore was 4,567 units of 22.4 lb. (3,768 units).

Chromite. Production of chromite was 3,049 tons (6,096 tons) with chromic oxide content of 1,420 tons (2,624 tons). This production came from Rockhampton in Queensland and Coobina in Western Australia.

Tantalite-Columbite. The production of tantalite-columbite concentrate was 50,038 lb. (159,655 lb.) and the whole of this output came from Western Australia. The tantalum pentoxide and columbium pentoxide content of the concentrates was 23,499 lb. (85,690 lb.).

Other. Other metallic minerals produced in Australia in small quantities during 1957 were molybdenite concentrate, monazite concentrate, native osmiridium, and platinum concentrate.

§ 8. Coal.

1. *Mine Production.*—An account of the discovery of coal in each State appears in earlier issues of the Official Year Book (see No. 3, pp. 515–16). The quantity and value of the production in each State in Australia for each of the years 1953 to 1957 are shown in the following table. Of the total production of black coal in 1957, 70,720 tons were classified as semi-anthracite, 18,229,181 tons as bituminous and 1,619,195 tons as sub-bituminous.

COAL PRODUCTION.

Year.	Black Coal.							Brown Coal.
	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	Australia.	Victoria.
QUANTITY ('000 tons).								
1953 ..	14,174	152	2,517	448	886	234	18,411	8,257
1954 ..	15,083	141	2,761	495	1,019	264	19,763	9,331
1955 ..	14,737	133	2,747	455	904	299	19,275	10,112
1956 ..	14,810	119	2,734	482	830	299	19,274	10,560
1957 ..	15,390	112	2,701	609	839	268	19,919	10,741
VALUE(a) (£'000).								
1953 ..	41,630	946	5,861	461	3,073	453	52,424	3,628
1954 ..	42,762	886	6,474	650	3,589	523	54,884	3,945
1955 ..	41,715	815	6,729	778	3,089	611	53,737	4,382
1956 ..	40,637	668	6,988	794	2,724	628	52,439	4,644
1957 ..	40,450	556	7,177	911	2,552	632	52,278	5,228

(a) At the mine.

The mining of black coal on a large scale by opencut methods first began in Australia at Blair Athol in Queensland, where in 1937, the first year of production, 18,494 tons were produced. Opencut mining of black coal was introduced in New South Wales in 1940, in Western Australia in 1943, in South Australia in 1944, and in Tasmania in 1950. The output from opencuts rose slowly up to 1943 when 119,406 tons were produced, increasing rapidly from 1944 and reaching an output of over four million tons in 1952. Since then however, the output from opencut mining has declined and in 1957 it was 2,031,403 tons only. This decline has been mainly due to the closing down of large opencuts in New South Wales, as overproduction of coal began to occur late in 1952. It is the policy of the Joint Coal Board that opencut mining should provide the quantity of coal by which underground mine production fails to meet total requirements.

The production of black coal from underground and opencut mines in each State for the years 1953 to 1957 is shown in the following table.

BLACK COAL PRODUCTION : UNDERGROUND AND OPENCUT.

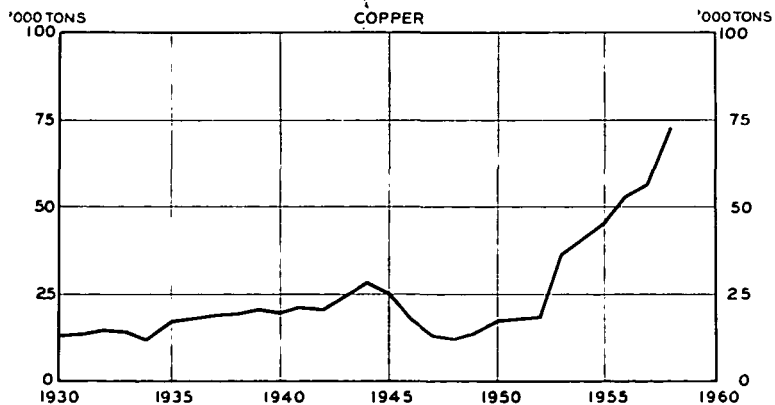
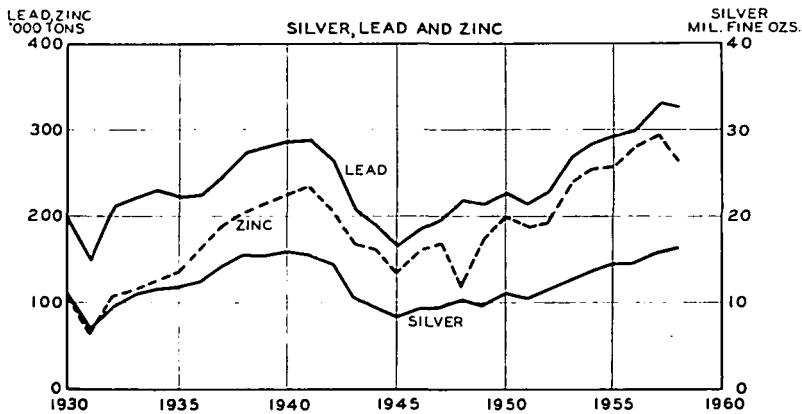
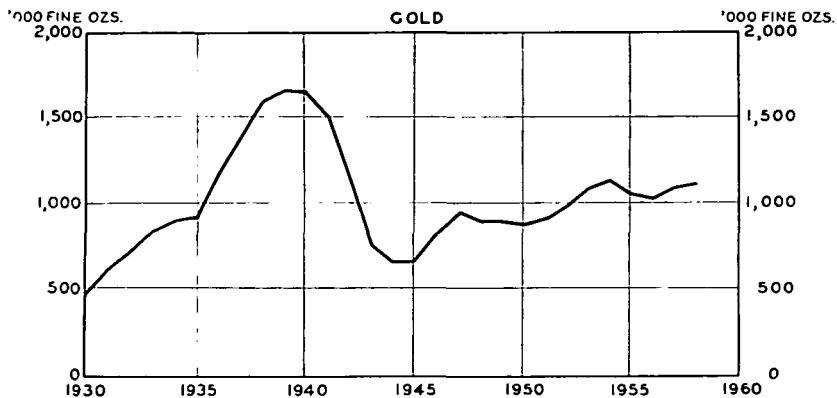
('000 Tons.)

Year.	Method of Mining.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	Aust.
1953 ..	Underground ..	12,452	152	1,941	..	493	234	15,272
	Opencut ..	1,722	..	576	448	393	(a)	3,139
	Total ..	14,174	152	2,517	448	886	234	18,411
1954 ..	Underground ..	13,703	141	2,067	..	608	254	16,773
	Opencut ..	1,380	..	694	495	411	10	2,990
	Total ..	15,083	141	2,761	495	1,019	264	19,763
1955 ..	Underground ..	13,835	133	2,108	..	600	284	16,960
	Opencut ..	902	..	639	455	304	15	2,315
	Total ..	14,737	133	2,747	455	904	299	19,275
1956 ..	Underground ..	14,000	119	2,103	..	621	281	17,124
	Opencut ..	810	..	631	482	209	18	2,150
	Total ..	14,810	119	2,734	482	830	299	19,274
1957 ..	Underground ..	14,662	112	2,171	..	690	253	17,888
	Opencut ..	728	..	530	609	149	15	2,031
	Total ..	15,390	112	2,701	609	839	268	19,919

(a) Less than 500 tons.

MINE PRODUCTION OF PRINCIPAL METALS
(METALLIC CONTENT OF MINERALS)

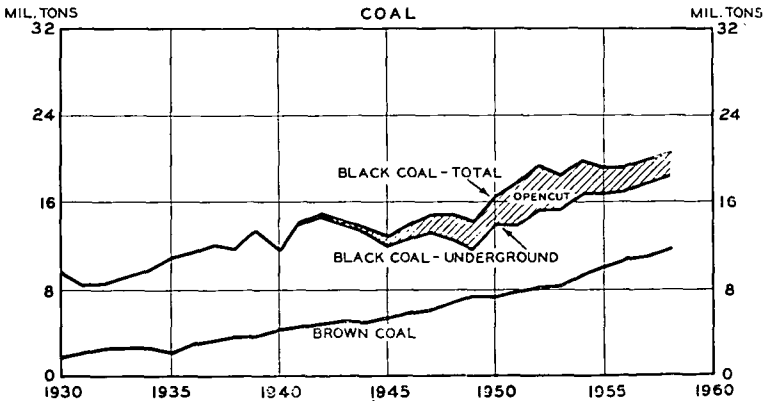
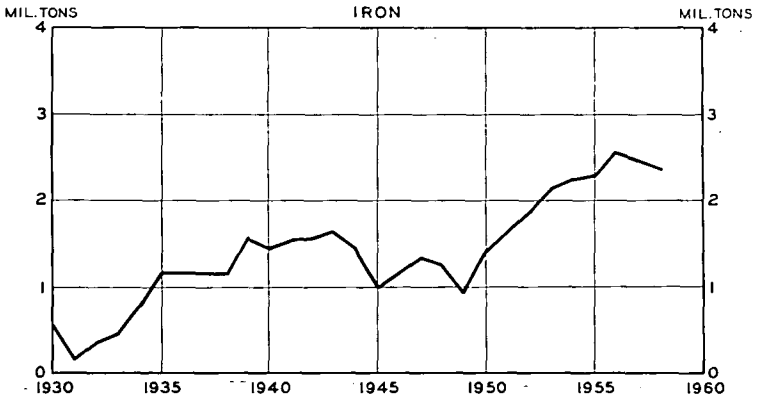
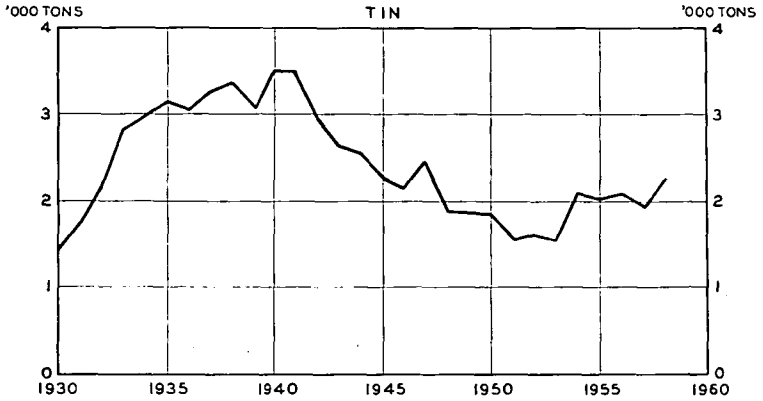
AUSTRALIA, 1930 TO 1958



MINE PRODUCTION OF PRINCIPAL METALS AND PRODUCTION OF COAL

(METALLIC CONTENT OF MINERALS)

AUSTRALIA, 1930 TO 1958



2. Sources of Production.—(i) *New South Wales.* The coal deposits of New South Wales are the most important and extensively worked in Australia. The principal fields are known as the Northern, Southern and Western, and are situated in the vicinity of Newcastle, Bulli and Lithgow respectively.

The coal from the various districts differs in quality or, geologically speaking, rank—that from the Northern district being especially suitable for gas-making, household purposes and steam, while the product of the Southern and Western districts is essentially a steaming coal. The Permian Coal Measures in the Northern division are being worked extensively in the Hunter River Valley area, particularly in the vicinity of Maitland, Cessnock and, more recently, Muswellbrook. This district is the most important, from the aspect of coal mining, in Australia.

The following table shows particulars of New South Wales coal production classified according to rank and type of mining during the five years 1953 to 1957:—

COAL : PRODUCTION, NEW SOUTH WALES.
(Tons.)

Particulars.	1953.	1954.	1955.	1956.	1957.
Semi-anthracite .. ..	.. ..	.. ..	1,658	.. ..	.. ..
Bituminous	14,164,603	15,065,979	14,718,426	14,792,853	15,376,240
Sub-bituminous	9,228	17,281	16,313	17,312	13,996
<i>Total</i>	<i>14,173,831</i>	<i>15,083,260</i>	<i>14,736,397</i>	<i>14,810,165</i>	<i>15,390,236</i>
Underground mines	12,451,741	13,703,289	13,834,824	13,999,615	14,662,155
Open-cut mines	1,722,090	1,379,971	901,573	810,550	728,081

(ii) *Victoria.* (a) *Black Coal.* Production of black coal in Victoria is restricted to the Gippsland district. The State Coal Mine at Wonthaggi is the main producer, the remaining production coming from small privately-owned mines. In 1957, production of bituminous coal was 111,569 tons compared with 118,827 tons in 1956.

(b) *Brown Coal.* The mining of brown coal in Australia is carried on only in Victoria, where extensive deposits exist; estimates place the available reserves at 40,000 million tons. Large-scale developmental projects are in progress and these, when completed, will greatly reduce the dependence on fuel from other States. In the past ten years, the output of brown coal in Victoria has doubled, and in 1955 it exceeded ten million tons for the first time. Of the 10,740,989 tons of brown coal produced in 1957, 9,831,217 tons, or 92 per cent., were won at the State opencuts at Yallourn.

The briquetting plant of the State Electricity Commission at Yallourn started operations in November, 1924, and the output, which in 1926 was 95,477 tons, had increased to 180,905 tons in 1930 and to 619,730 tons in 1957. Approximately two and a half tons of brown coal are required to make one ton of briquettes. In December, 1956, the Lurgi high pressure brown coal gasification plant at Morwell was opened. This plant is operated by the Gas and Fuel Corporation of Victoria and produces town gas which is sent to Melbourne through 103 miles of pipeline.

The table following shows the production and distribution of brown coal and the production of briquettes in Victoria for the years 1952-53 to 1956-57.

BROWN COAL : PRODUCTION AND UTILIZATION, VICTORIA.
(*000 Tons.)

Year.	Production.	Consumption as Fuel.			Consumption as Raw Material in Briquette Manufacture.	Briquettes Manufactured.
		Electricity Generation.	Briquette Factory.	Other Factories. (a)		
1952-53	8,075	4,933	729	837	1,457	545
1953-54	8,731	5,307	780	920	1,560	587
1954-55	9,668	5,899	842	1,088	1,684	631
1955-56	10,383	6,517	843	1,191	1,686	634
1956-57	10,772	6,943	806	1,309	1,613	618

(a) Recorded consumption.

(iii) *Queensland.* The production of coal classified according to rank and type of mining during the years 1953 to 1957 was as follows:—

COAL : PRODUCTION IN QUEENSLAND.
(Tons.)

Particulars.	1953.	1954.	1955.	1956.	1957.
Semi-anthracite ..	80,979	72,459	80,442	79,316	68,873
Bituminous ..	2,215,078	2,377,883	2,459,727	2,472,692	2,475,079
Sub-bituminous ..	220,755	310,468	206,996	182,651	157,625
<i>Total</i> ..	<i>2,516,812</i>	<i>2,760,810</i>	<i>2,747,165</i>	<i>2,734,659</i>	<i>2,701,577</i>
Underground mines ..	1,941,631	2,066,788	2,108,065	2,103,641	2,170,979
Open-cut mines ..	575,181	694,022	639,100	631,018	530,598

The principal coal-producing districts in Queensland are Ipswich, Clermont, Mount Morgan and Bowen; output from these areas in 1957 amounted to 2,338,484 tons or 87 per cent. of the total.

The opencut method of mining for black coal has advanced considerably in Queensland in recent years. In 1946, 106,444 tons (or 7 per cent. of total production) were won from opencuts while in 1954, 694,022 tons (25 per cent.) were mined in this manner. In 1957, the output from opencuts declined to 530,598 tons, or 20 per cent. of the total.

(iv) *South Australia.* Coal mined in South Australia is won by opencut methods at Leigh Creek, some 380 miles by rail north of Adelaide. This important deposit yields a low grade sub-bituminous coal of Triassic age, and has known reserves of about 380 million tons. However, this State relies to a great degree on bituminous coal from New South Wales to supplement the demand created by industrial expansion. In 1944, the first year of major production of the Leigh Creek mine, 34,620 tons were won. Production has risen considerably in more recent years, and amounted to 608,913 tons in 1957.

(v) *Western Australia.* The only coal deposits which have been developed on a commercial scale are at Collie in the south-west of the State. Collie coal is sub-bituminous in rank. Production in 1957 was 838,661 tons, compared with 830,007 tons in 1956. Although a large proportion of the coal produced in Western Australia comes from opencut mines, the amount available from these mines is limited, as present surveys estimate that only 8,000,000 tons can be extracted by opencut methods. In 1957, 148,779 tons, or 18 per cent. of the total production, were won by opencut mining.

(vi) *Tasmania.* Two periods of coal formation are represented in Tasmania. The older (Permo-Carboniferous) seams contain fairly high ranking semi-anthracitic coal, with a high sulphur content, but production from these mines, 1,847 tons in 1957, represents less than one per cent. of Tasmanian black coal output. The more recent Mesozoic coal of bituminous rank is mined in the north-east of the island, the Cornwall and Mt. Nicholas mines being the most prolific producers. In 1957, output amounted to 268,140 tons of which 15,032 tons came from opencut mining.

(vii) *Australia's Coal Reserves.* The latest available estimate of the actual and probable coal reserves of Australia is that prepared by the Coal and Lignites Panel of the Power Survey Sectional Committee of the Standards Association of Australia, and is shown in the following table.

COAL RESERVES OF AUSTRALIA.
(Million Tons.)

State.	Anthracitic and Bituminous Coal.	Sub-bituminous Coal.	Lignites and Brown Coal.
New South Wales	11,000	500	..
Victoria	12	..	40,000
Queensland	4,000	3	50
South Australia .. ..	..	380	225
Western Australia .. ..	..	1,000	2
Tasmania	240	..	2

3. **Production in Principal Countries.**—The following table shows the production of the principal countries in 1956 and 1957 as published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys.

COAL: PRODUCTION IN PRINCIPAL COUNTRIES.

('000 Tons.)(a)

Country.	Black Coal.		Brown Coal and Lignite.	
	1956.	1957.	1956.	1957.
United States of America ..	470,443	460,210	2,570	2,328
U.S.S.R.	298,900	322,000	123,500	134,000
United Kingdom	222,006	223,628	..	..
Germany, Federal Republic ..	134,051	132,882	93,729	95,282
China(b)	103,200	125,000	..	..
Poland	93,646	92,610	6,085	5,862
France	54,257	55,899	2,220	2,258
Japan	45,819	50,914	1,496	(c)
India	39,420	43,449	..	..
Union of South Africa	33,071	34,219	..	..
Belgium	29,088	28,627	..	..
Czechoslovakia	23,041	23,799	45,568	50,210
Australia	19,274	19,919	10,560	10,741
Saar	16,818	16,195	..	..
Spain	12,647	13,700	1,898	2,468
Netherlands	11,469	11,196	265	283
Canada	11,227	9,768	2,091	2,008
Germany, Eastern	2,700	2,710	202,615	209,237
Hungary	2,334	2,241	17,932	18,720
Yugoslavia	1,213	1,208	15,618	16,515
<i>Estimated World Total</i> ..	<i>1,654,000</i>	<i>1,700,000</i>	<i>556,000</i>	<i>580,000</i>

(a) Long tons. (b) Estimated. (c) Information not available.

4. **Exports.**—(i) *General.* The quantities and values of the overseas exports of Australian coal and of bunker coal for overseas vessels for the five years 1953-54 to 1957-58 are shown in the following table. These shipments were made mainly from New South Wales.

COAL : OVERSEA EXPORTS AND BUNKER, AUSTRALIA.

Year.	Oversea Exports.(a)		Bunker Coal for Oversea Vessels.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
1953-54	385,812	1,528,788	31,718	129,977
1954-55	291,226	1,147,441	25,363	111,625
1955-56	193,813	780,284	38,749	165,224
1956-57	545,101	2,196,044	9,065	44,116
1957-58	836,336	3,390,628	11,608	50,656

(a) Excludes bunker coal.

(ii) *New South Wales.* New South Wales is the principal Australian coal-producing State and, in addition to meeting requirements within the State, supplies considerable quantities of coal to other States and for export overseas as well as bunker coal for vessels calling at New South Wales ports. Of the total New South Wales coal production in 1957-58 (15,746,573 tons), 12,856,841 tons (81.6 per cent.) were available for consumption in the State, 1,914,588 tons (12.2 per cent.) were exported interstate and 786,000 tons (5.0 per cent.) were exported overseas as cargo coal, and 189,144 tons (1.2 per cent.) were supplied as bunker coal for interstate and overseas vessels.

5. **Consumption in Australia.**—Details of the production of black coal and its disposal in Australia are given in the following table for the years 1952-53 to 1956-57.

BLACK COAL: PRODUCTION AND CONSUMPTION.
(’000 Tons.)

Particulars.	1952-53.	1953-54.	1954-55.	1955-56.	1956-57.
Production(a)	18,545	19,424	19,352	19,033	19,711
Imports	146	2	5	4	6
Total	18,691	19,426	19,357	19,037	19,717
<i>Consumption as Fuel—</i>					
Electricity Generation	5,071	5,590	5,916	5,922	6,363
Factories	3,097	3,367	3,329	3,101	2,977
Railway Locomotives(b)	3,110	3,208	3,112	2,963	2,690
<i>Bunker Coal—</i>					
Oversea Vessels	43	32	25	39	9
Interstate Vessels	229	228	218	198	181
Total	11,550	12,425	12,600	12,223	12,220
<i>Consumption as raw material—</i>					
Gas works	2,081	2,047	2,063	2,031	1,946
Coke works	3,071	3,252	3,314	3,258	3,665
Total	5,152	5,299	5,377	5,289	5,611
Exports (Oversea)	256	386	291	194	545
Balance—Unrecorded consumption, other purposes(c)	1,733	1,316	1,089	1,331	1,341
Grand Total	18,691	19,426	19,357	19,037	19,717

(a) Includes miners' and colliery coal.
change in stocks.

(b) Government railways only.

(c) Includes net

After the 1939-45 War, it was found necessary to augment local supplies of black coal in Australia by increasing imports. The quantity imported reached a post-war peak of 597,866 tons in 1950-51, but since then has declined, as in recent years production has expanded considerably. Since 1952-53, exports have exceeded imports by a wide margin; in 1957-58, exports of black coal were 836,336 tons and imports were 9,335 tons.

6. Value at the Mine in New South Wales.—Particulars of the average values at the mine (or at screens or mine washeries where these are at a distance from the mine) of saleable coal for each district and for New South Wales as a whole are shown in the following table for the years 1953 to 1957. Saleable coal excludes miners' coal, coal consumed at the mines and refuse, etc., removed by the use of hand picking belts or at mine washeries. In calculating these values, coal won by producer consumers is also excluded and in respect of stocks of coal held at grass by the Commonwealth Government only actual sales have been taken into account. No deduction has been made in respect of excise duty operative from 1st November, 1949.

**AVERAGE SELLING VALUE AT THE MINE PER TON OF SALEABLE COAL :
NEW SOUTH WALES.**

(s. d.)

Year.	Northern District.	Southern District.	Western District.	Average for State.
1953.. .. .	62 1	61 0	56 9	61 1
1954.. .. .	60 3	59 0	57 3	59 7
1955.. .. .	59 11	58 10	55 9	59 2
1956.. .. .	59 3	58 1	55 1	58 6
1957.. .. .	58 3	55 7	50 7	56 9

7. Values in New South Wales, United Kingdom and the United States of America.—The following table shows, for the years 1953 to 1957, average values of coal produced in New South Wales, Great Britain and the United States of America. The figures give an indication of changes in average value or price within each country but they do not necessarily show the relative levels as between the countries concerned.

PRODUCTION VALUES OF COAL PER TON : NEW SOUTH WALES, UNITED KINGDOM AND UNITED STATES OF AMERICA.

Country.	1953.	1954.	1955.	1956.	1957.
	s. d.	s. d.	s. d.	s. d.	s. d.
New South Wales—Bituminous(a)	61 1	59 7	59 2	58 6	56 9
United Kingdom—Deep mined(b)	61 1½	63 6	68 0½	77 0	82 1
United States of America—Bituminous and lignite(c) ..	\$ 4.92	\$ 4.52	\$ 4.50	\$ 4.82	\$ 5.08

(a) Average selling value at the mine per ton of 2,240 lb.; the figures relate to saleable coal and include excise duty. (b) Average value in sterling at the mine per ton of 2,240 lb. (c) Average value in United States currency at the mine per ton of 2,000 lb.

8. **Employment in Coal-mines.**—The number of persons employed, both above and below ground, in coal-mines in each State for each of the years 1953 to 1957 is shown in the following table.

COAL-MINES : PERSONS EMPLOYED.

Year.	New South Wales.	Victoria.		Queensland.	South Australia.	Western Australia.	Tasmania.	Australia.
		Black.	Brown.					
1953	19,961	900	1,598	3,673	250	1,478	344	28,204
1954	19,979	786	1,598	3,638	270	1,583	358	28,212
1955	19,260	687	1,502	3,634	280	1,432	367	27,162
1956	17,918	610	1,566	3,568	260	1,190	349	25,461
1957	16,622	561	1,579	3,493	223	1,145	301	23,924

The year of maximum employment was 1926 when 31,774 persons were engaged in the coal-mines of Australia. Shortly after that year, the industrial depression and a prolonged stoppage of work on one of the principal fields of New South Wales during 1929 and 1930 seriously affected the figures of employment. After 1933, there was a gradual increase up to a level of about 23,000 which was maintained during the war years. There was a further increase after the war to 28,303 in 1952, but since then the number in employment has fallen again. In 1957, it was 23,924. In New South Wales in 1957, 10,895,051 tons of coal, or 74 per cent. of the total output of underground coal, were cut by machinery, compared with 3,594,000 tons or 32 per cent. in 1939. Similar details for other States are not available.

9. **Production of Black Coal per Man-shift.**—(i) *Underground Mines.* The following table shows particulars of estimated black coal output per man-shift worked, (a) at the coal face, and (b) by all employees, in respect of underground mines for each State concerned and for Australia for the years 1953 to 1957. These estimates have been calculated by the Joint Coal Board from data collected fortnightly in respect of coal production and the number of man-shifts actually worked. In South Australia, black coal is won only by open-cut mining.

PRODUCTION OF BLACK COAL PER MAN-SHIFT : UNDERGROUND MINES.
(Tons.)

Year.	N.S.W.	Vic.	Q'land.	W. Aust.	Tas.	Australia.
-------	--------	------	---------	----------	------	------------

PRODUCTION PER MAN-SHIFT WORKED AT COAL FACE.

1953	9.72	2.09	6.37	4.86	6.15	8.49
1954	10.16	2.03	6.54	4.82	5.95	8.81
1955	10.76	2.13	6.61	4.74	6.54	9.24
1956	11.43	2.05	6.79	5.14	7.04	9.77
1957	13.19	2.01	7.13	5.88	7.60	11.02

PRODUCTION PER MAN-SHIFT WORKED BY ALL EMPLOYEES.

1953	3.08	0.81	2.53	1.67	3.00	2.84
1954	3.25	0.82	2.61	1.91	3.07	3.00
1955	3.39	0.86	2.66	2.06	3.08	3.14
1956	3.55	0.83	2.65	2.35	3.41	3.28
1957	3.99	0.85	2.82	2.77	3.76	3.65

(ii) *Opencut Mines.* In the next table, the Joint Coal Board's estimates of production of black coal per man-shift worked by all employees in opencut mines are shown for the years 1953 to 1957. There are no opencuts producing black coal in Victoria.

PRODUCTION OF BLACK COAL PER MAN-SHIFT : OPENCUT MINES.

(Tons.)

Year.	N.S.W.	Q'land.	S. Aust.	W. Aust.	Tas.	Australia.
1953	8.51	10.97	(a) 3.57	5.37	9.25	6.92
1954	8.97	12.27	(a) 4.52	4.71	7.91	7.31
1955	9.18	11.42	6.02	5.77	7.78	8.11
1956	10.36	13.06	6.72	6.37	8.56	9.19
1957	11.11	12.17	9.89	6.04	7.68	10.25

(a) Figures prior to July, 1954, include man-shifts on other than mine work.

10. Joint Coal Board.—After the 1939–45 War, the Governments of the Commonwealth and New South Wales agreed to create jointly a coal authority with powers similar to, and in some respects wider, than those possessed under Commonwealth war-time legislation. Following this agreement, the Joint Coal Board was created and has functioned as from 1st March, 1947. Briefly, it is the responsibility of the Board to ensure that the coal of the State is conserved, developed, worked, distributed and used to the best advantage in the public interest, and to promote the welfare of the workers in the industry. Further details of the powers and functions of the Board are contained in earlier issues of the Official Year Book.

§ 9. Coke and Other By-products from Coal.

1. Coke.—The production of metallurgical coke in Australia was limited to about 250,000 tons per annum prior to the 1914–18 War. This was below local requirements and necessitated an annual import of about 27,000 tons. By 1920, production had risen to more than 500,000 tons, by 1938–39 to 1,164,873 tons, and in 1956–57 it reached the record level of 2,234,458 tons. Imports exceeded exports prior to 1952–53 but in 1952–53 and later years there has been a net export surplus. In 1956–57, exports amounted to 129,397 tons but decreased slightly to 112,760 tons in 1957–58. Imports were 8,206 tons in 1956–57 and 9,778 tons in 1957–58, but most of this tonnage is petroleum coke for use in the production of aluminium.

In addition to metallurgical coke referred to above (which is produced by specialized coke works), considerable quantities of coke are produced in gas works as a by-product of the manufacture of gas. Production in gas works in 1955–56 was 892,668 tons. To date, there has been no production of petroleum coke at Australian oil refineries.

In order to avoid duplication with coal values, the figures for coke have not been included in the general tables of mineral production in the early part of this chapter.

In the following table, particulars of the production of coke in coke works and gas works in Australia are shown for the years 1952–53 to 1956–57. The figures exclude output of coke breeze, which in 1956–57 amounted to 356,875 tons.

COKE PRODUCTION : AUSTRALIA.

(Tons.)

Industry.	1952–53.	1953–54.	1954–55.	1955–56.	1956–57.
Coke Works	1,858,428	2,010,404	2,046,790	2,058,426	2,234,458
Gas Works	1,071,106	943,344	1,099,859	1,031,135	892,668
Total	2,929,534	2,953,748	3,146,649	3,089,561	3,127,126

2. Other By-products from Coal.—In addition to coke, other products are obtained from the treatment of coal by coke and gas works. Some of the main items produced, principally in coke and gas works, during 1956–57 (1955–56 in parentheses) were crude tar, 52,799,000 gallons (54,352,000 gallons); refined tar 27,209,000 gallons (25,914,000 gallons); and ammonium sulphate 110,898 tons (75,321 tons).

§ 10. Mineral Oils.

The existence of crude petroleum has been proved in Queensland, Victoria, Western Australia and recently in Papua. None of these discoveries has been proved to be in commercial quantities, but the discovery in Papua and shows at the well at Meda in Western Australia are encouraging.

The Commonwealth Government has set aside the sum of £500,000 annually for four years to encourage drilling for stratigraphic information. This is being used to subsidize drilling by oil companies in areas not previously investigated at depth.

The Petroleum Search Subsidy Act 1957-58 continued to attract many applications for subsidy and to the end of November, 1958, five applications for the financial year 1958-59 had been approved.

Drilling programmes are being carried out in all States of the Commonwealth except Tasmania, and in Papua and New Guinea. No drilling was undertaken in the Northern Territory in 1958. In the following table, details are given of the footage drilled in the search for oil both in the Commonwealth of Australia and in the Territories of Papua and New Guinea.

FOOTAGE DRILLED IN THE SEARCH FOR OIL, STATES OF AUSTRALIA AND TERRITORIES OF PAPUA AND NEW GUINEA.(a)

State or Territory.	1953.	1954.	1955.	1956.	1957.	1958.(b)
	feet.	feet.	feet.	feet.	feet.	feet.
New South Wales .. ..	..	..	9,338	4,608	8,729	16,357
Victoria .. ..	..	..	10,738	22,660	12,244	2,439
Queensland	3,965	22,581	58,668	92	15,343	5,081
South Australia .. ..	..	..	661	16,966	13,995	6,239
Western Australia	5,045	40,627	77,824	61,271	26,961	30,383
Australia	9,010	63,208	157,229	105,597	77,272	60,499
Territories of Papua and New Guinea.. ..	1,826	7,912	10,205	17,500	25,636	29,350

(a) Source: Bureau of Mineral Resources, based on figures obtained from State and Territory Departments of Mines.

(b) Subject to revision.

§ 11. Sulphur.

Sulphur, although produced in Australia as a content of certain metallic minerals, is itself non-metallic in character. Sulphides such as zinc concentrate and pyrite, which contain sulphur, are produced in appreciable quantities. There is no production of elemental sulphur (brimstone) in Australia. A large proportion of the zinc concentrate produced is exported and therefore lost to Australia for utilization of the sulphur content. The sulphur recovered in Australia is in the form of acid, most of which is used in the manufacture of fertilizers, mainly superphosphate. As this recovery does not at present satisfy local requirements, it is necessary to import elemental sulphur to meet the balance.

Pyrite ore and concentrate are obtained partly from direct mining at Nairne, South Australia, and at Norseman, Western Australia, and partly as a by-product of base metal mining at Mt. Morgan in Queensland, Captain's Flat in New South Wales, Mt. Lyell in Tasmania, and Kalgoorlie in Western Australia. There was no recorded production of pyritic ore in Australia during 1957; but the production of pyrite concentrate was as follows:—New South Wales, 14,196 tons; Queensland, 25,160 tons; South Australia, 68,169 tons; Western Australia, 57,918 tons; Tasmania, 63,682 tons; Australia, 229,125 tons.

The following table shows for the years 1953 to 1957 the production of monohydrate sulphuric acid (100 per cent.), and the sulphur content of this monohydrate acid produced.

SULPHUR USED IN SULPHURIC ACID PRODUCTION: AUSTRALIA.
- (Tons.)

Item.	1953.	1954.	1955.	1956.	1957.
<i>Monohydrate Sulphuric Acid Produced</i>	671,471	778,008	895,765	841,225	971,976
<i>Quantity of Sulphur in Monohydrate Acid produced from—</i>					
Sulphur (Elemental)(a)	123,469	154,337	187,015	146,816	156,413
Zinc concentrate	31,270	33,564	30,412	29,061	35,025
Lead concentrate .. .. .	..	..	..	16,090	18,272
Pyrite	60,811	62,533	71,179	76,780	100,111
Spent Oxide	3,973	3,973	4,295	4,643	4,744
Other Materials .. .. .	..	..	..	1,694	3,271
<i>Total</i>	219,523	254,407	292,901	275,084	317,836

(a) All imported.

§ 12. Non-metallic Minerals.

1. **Asbestos.**—The production of asbestos in Australia at present is only sufficient to meet about one-sixth of domestic requirements. Production in recent years has been of two types, chrysotile (white) and crocidolite (blue), the former being the most important type economically. The deposits of chrysotile, however, are relatively small and widely scattered, and during 1957, it was produced mainly at Nunyerry and Lionel in Western Australia and at Baryulgil in New South Wales. Production of crocidolite, which is confined to the Hammersley Ranges in Western Australia, about 200 miles south-east of Roebourne, has expanded greatly in recent years. Large scale operations were commenced there in 1943 at Wittenoom Gorge by Australian Blue Asbestos Ltd. and reserves in seams over which the company holds leases are estimated at two million tons.

The production of chrysotile and crocidolite in Australia during the five years 1953 to 1957 is shown in the following table:—

PRODUCTION OF ASBESTOS : STATES.

(Short Tons of 2,000 lb.)

Year.	Chrysotile.			Crocidolite.	
	New South Wales.	Western Australia.	Australia.	Western Australia.	Australia.
1953	637	679	1,316	4,250	4,250
1954	690	339	1,029	4,249	4,249
1955	661	307	968	5,025	5,025
1956	697	852	1,549	8,160	8,160
1957	676	1,556	2,232	12,438	12,438

2. **Clays.**—Statistics of clay production in Australia are not entirely satisfactory, mainly because of differences between States in the classification of the various types of clays. In the following table, the recorded production of the main types of clays produced in each State of Australia is shown for the year 1957.

PRODUCTION OF CLAYS : STATES, 1957.
(Tons.)

Type.	New South Wales.	Victoria.	Queensland	South Australia.	Western Australia.	Tasmania.	Total.
Bentonite ..	73		114		742		929
Brick Clay and Shale	1,531,572	(a)925,768	(a)204,841	(a)368,154	(a)417,098	(a) 83,707	63,531,140
Cement Clay and Shale ..	117,100	..	..	12,782	11,551	..	141,433
Damourite ..	..	..	..	650	..	..	650
Fireclay ..	102,508	28,848	8,526	21,865	17,647	..	179,394
Fuller's Earth ..	215	..	..	..	..	..	215
Kaolin ..	22,618	3,661	43	10,923	203	6,038	43,486
Stoneware Clay ..	75,132	..	152	36,715	..	..	111,999
Tile Clay ..	145,386	(c)	(c)	(c)	(c)	(c)	145,386
Other Clays ..	7,064	117,614	(c)	(c)	(c)	(c)	124,678

(a) Estimated. (b) Partly estimated. (c) Not available.

3. Gypsum.—There are very extensive deposits of gypsum in Australia, but only the more accessible and easily worked deposits have been exploited. These deposits lie in four main regions, (a) in New South Wales stretching from around Griffith to near Broken Hill, (b) in the north-west corner of Victoria, the south-west corner of New South Wales and adjoining parts of South Australia, (c) in South Australia on both sides of Gulf St. Vincent and extending to Lake MacDonnell in the west, and (d) between Perth and Kalgoorlie in Western Australia. The South Australian deposits are the most important and more than half of the total Australian production of gypsum in 1957 came from that State, where the main centres of production are Stenhouse Bay on Yorke Peninsula and Lake MacDonnell.

The building industry is the main user of the gypsum produced in Australia. The greater part is used in the manufacture of plaster and most of the remainder in cement manufacture. A small amount is also used as fertilizer. A considerable quantity is exported, mainly to New Zealand for use in the plaster industry, and to New Caledonia for use in nickel smelting operations.

The production of gypsum in Australia is set out in the following table for the five years 1953 to 1957.

PRODUCTION OF GYPSUM : STATES.
(Tons.)

Year.	New South Wales.	Victoria.	South Australia.	Western Australia.	Australia.
1953	71,819	36,286	181,640	40,247	329,992
1954	128,790	75,012	194,772	41,142	439,716
1955	136,356	89,190	204,522	39,946	470,014
1956	94,203	83,024	263,136	27,121	467,484
1957	101,491	68,647	274,945	33,352	478,435

4. Limestone.—Limestone is quarried in all States, being used mainly for the manufacture of cement. Other uses are in agriculture, the steel industry, as a metallurgical flux, and in the chemical industry.

The recorded statistics of limestone production in each State of Australia for the years 1955 to 1957 are shown in the following table. Details of limestone produced for use as building or road material are not included.

PRODUCTION OF LIMESTONE(a): STATES.
('000 Tons.)

Year.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Total.
1955 ..	1,690	714	(b)	987	(b)	206	3,998
1956 ..	1,700	814	(b)	1,076	(b)	179	4,264
1957 ..	1,897	846	(b)	1,135	(b)	205	4,572

(a) Includes shell and coral. (b) Not available for publication.

5. Magnesite.—The major sources of magnesite at present are deposits at Fifield and Thuddunga in central New South Wales. Most of the output of magnesite in Australia is used for refractory purposes, particularly in the steel industry, and small amounts are used in chemical, paper, glass, rubber, and ceramic industries. Particulars of the production of magnesite in each State for the years 1953 to 1957, are set out in the table below.

PRODUCTION OF MAGNESITE : STATES.
(Tons.)

Year.	New South Wales.	Victoria.	South Australia.	Western Australia.	Australia.
1953	45,769	572	36	20	46,397
1954	42,825	..	235	92	43,152
1955	57,262	..	412	..	57,674
1956	63,050	..	831	804	64,685
1957	83,271	..	202	..	83,473

6. *Mica*.—Almost all Australian production of muscovite mica comes from the Northern Territory, though small quantities of inferior grades have been obtained from most of the States. The centre of mica production in the Northern Territory is the Harts Range area about 130 miles north-east of Alice Springs, where mining has been carried on intermittently since 1892, and the Plenty River field, 50 miles north-east of Harts Range.

The Commonwealth Mica Pool—details of which are given in § 15, Government Aid to Mining, on page 1054—purchases all mica which is in accordance with certain specifications. The following table shows the quantity of muscovite mica produced in Australia during the five years 1953 to 1957.

MUSCOVITE MICA PRODUCTION.
(lb.)

Particulars.	1953.	1954.	1955.	1956.	1957.
New South Wales—					
Scrap .. .. .	..	15,680	20,160	..	..
Northern Territory—					
Trimmed	70,684	84,619	56,649	28,837	36,713
Crude and Film	1,542	..	..	..	..
Scrap .. .. .	..	65,184	..	..	40,600

7. *Salt*.—Salt is obtained in Australia from evaporation of saline lakes and clay pans. Production satisfies local requirements and provides a considerable surplus for export. Recorded production in South Australia (the chief producing State) is shown in the following table for the years 1953 to 1957. Estimates of total Australian production are also shown.

SALT PRODUCTION.
(*000 Tons.)

Particulars.	1953.	1954.	1955.	1956.	1957.
South Australia	239	304	291	332	339
Estimated Australian Total	310	380	370	410	432

8. *Other Non-metallic Minerals*.—(i) *General*. Many other non-metallic minerals are produced in Australia in considerable quantities, and are listed separately in the following paragraphs.

(ii) *Barite*. The principal producing centre of first-grade quality barite is at Orparinna in the north Flinders Range in South Australia. The production of barite in Australia during 1957 was 9,778 tons, of which 5,415 tons came from New South Wales, 4,223 tons from South Australia and 140 tons from Western Australia.

(iii) *Diatomite*. Production of diatomite is carried on mainly in the eastern States of Australia. In 1957, 6,221 tons were produced, and of this total, New South Wales produced 4,966 tons.

(iv) *Dolomite*. Up to 1950, New South Wales was the main producer of dolomite, but in that year the Broken Hill Pty. Co. Ltd. opened up a large deposit of dolomite at Ardrossan in South Australia which now produces about 90 per cent. of the total output. In 1957, New South Wales produced 5,137 tons; Queensland, 5,493 tons; South Australia, 180,237 tons; Western Australia, 60 tons; and Tasmania, 1,176 tons, making an Australian total of 192,103 tons.

(v) *Felspar*. The main demand for felspar comes from the glass and ceramic industries. Most of the Australian production of felspar comes from New South Wales which produced 6,254 tons of the Australian total of 8,819 tons in 1957. Of the remainder, 1,565 tons came from South Australia, 995 tons from Western Australia and 5 tons from Queensland.

(vi) *Gemstones*. (a) *Diamonds*. Gem quality diamonds are not produced in Australia, but, in 1957, 312 carats of industrial diamonds valued at £4,030 were recovered during gold dredging operations on the Macquarie River in New South Wales.

(b) *Opals*. Most of the opals won in recent years came from the Coober Pedy and Andamooka fields in South Australia which produced opals worth £182,399 in 1957. Other production in 1957 was from Lightning Ridge in New South Wales, valued at £1,500, and the Quilpie district in Queensland, valued at £1,050.

(c) *Sapphires*. The Anakie field in Central Queensland is the only Australian producer of sapphires. Output in 1957 was valued at £20.

(vii) *Silica*. The production of silica is not recorded in Victoria and Northern Territory. The output of silica, which includes glass sand, quartz, quartzite, sand, sandstone, and silicious abrasives, but does not include production for use as building or road material, was 137,130 tons in New South Wales; 3,129 tons from Queensland; 13,802 tons in South Australia; 5,693 tons in Western Australia; and 6,552 tons in Tasmania, giving a total of 166,306 tons for those States during 1957.

(viii) *Sillimanite*. In 1957, 2,302 tons of sillimanite were produced in Australia. New South Wales contributed 1,491 tons and the remaining 811 tons came from South Australia.

(ix) *Talc*. The Australian output of talc (including steatite), was 14,360 tons in 1957. New South Wales produced 1,020 tons, South Australia 9,686 tons and Western Australia 3,654 tons.

(x) *Other*. Other non-metallic minerals produced in Australia in small quantities during 1957 were fluorite, garnet, glauconite, mineral pigments, peat (for fertilizer), pebbles for grinding, phosphate rock, pyrophyllite, serpentine and slate.

§ 13. Persons Engaged, Wages Paid and Accidents in Mining.

1. **Total Employment in Mining.**—The number of persons engaged in the mining industry in Australia fluctuates according to economic conditions generally, the price of industrial metals, the state of the labour market, and according to the permanence of new finds and the development of the established mines. The following table shows the numbers engaged in the various mining industries in each State in 1957.

EMPLOYMENT IN MINING(a), 1957.

Industry.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
<i>Metal Mining—</i>									
Gold Mining	111	347	136	(b)	5,385	..	224	..	6,203
Silver-Lead-Zinc Mining	6,690	(c)	(c)	(b)	(c)	809	(c)	..	10,348
Copper-Gold Mining ..	64	(c)	(c)	(b)	53	(c)	251	..	2,102
Tin Mining	95	(c)	326	..	38	388	(c)	..	856
Mineral Sands Mining	1,305	(c)	(c)	..	(c)	..	..	..	2,062
Other Metal Mining ..	56	(c)	(c)	420	322	(c)	45	..	1,311
<i>Total, Metal Mining</i>	<i>8,321</i>	<i>362</i>	<i>4,904</i>	<i>420</i>	<i>6,016</i>	<i>2,290</i>	<i>569</i>	<i>..</i>	<i>22,882</i>
<i>Fuel Mining, excl. Oil(d)</i>									
Black Coal Mining—									
Underground	16,357	561	3,353	..	1,145	301	..	..	22,345
Open-cut	265	..	140	223	..	..	..	..	..
<i>Total</i>	<i>16,622</i>	<i>561</i>	<i>3,493</i>	<i>223</i>	<i>1,145</i>	<i>301</i>	<i>..</i>	<i>..</i>	<i>22,345</i>
Brown Coal Mining ..	..	1,579	..	..	..	..	..	..	1,579
<i>Total, Fuel Mining</i>	<i>16,622</i>	<i>2,140</i>	<i>3,493</i>	<i>223</i>	<i>1,145</i>	<i>301</i>	<i>..</i>	<i>..</i>	<i>23,924</i>
<i>Non-metal (excluding Fuel)</i>									
<i>Mining</i>	<i>1,111</i>	<i>327</i>	<i>251</i>	<i>731</i>	<i>437</i>	<i>157</i>	<i>34</i>	<i>(e)</i>	<i>3,048</i>
<i>Total, All Mining</i>	<i>26,054</i>	<i>2,829</i>	<i>8,648</i>	<i>1,374</i>	<i>7,598</i>	<i>2,748</i>	<i>603</i>	<i>(e)</i>	<i>49,854</i>
<i>Construction Material</i>									
<i>Quarrying(f)</i>	<i>1,245</i>	<i>1,690</i>	<i>461</i>	<i>809</i>	<i>217</i>	<i>150</i>	<i>25</i>	<i>43</i>	<i>4,640</i>
<i>Total, All Mining and Quarrying ..</i>	<i>27,299</i>	<i>4,519</i>	<i>9,109</i>	<i>2,183</i>	<i>7,815</i>	<i>2,898</i>	<i>628</i>	<i>43</i>	<i>54,494</i>

(a) Average employment during whole year. (b) Not available for publication; included with "Other Metal Mining". (c) Not available for publication. (d) Oil Mining, where available, is included in "Non-metal Mining". (e) Not available for publication; included with "Construction Material Quarrying". (f) Incomplete.

The following table shows particulars of mining employment in Australia for the years 1953 to 1957. The figures show the average number of persons employed during the whole year.

EMPLOYMENT IN MINING(a): AUSTRALIA.

Industry.	1953.	1954.	1955.	1956.	1957.
Metal Mining—					
Gold Mining	7,050	7,192	6,753	6,488	6,203
Silver-Lead-Zinc Mining	9,686	9,397	10,076	10,623	10,348
Copper-Gold Mining	2,025	1,957	2,062	2,210	2,102
Tin Mining	1,063	969	937	938	856
Mineral Sands Mining	597	598	891	1,592	2,062
Other Metal Mining	1,601	1,253	1,273	1,420	1,311
Total, Metal Mining	22,022	21,366	21,992	23,271	22,882
Fuel Mining, excluding oil(b)—					
Black Coal Mining	26,606	26,614	25,660	23,895	22,345
Brown Coal Mining	1,598	1,598	1,502	1,566	1,579
Total, Fuel Mining	28,204	28,212	27,162	25,461	23,924
Non-metal (excluding Fuel) Mining	2,946	2,914	2,943	2,984	3,048
Total, All Mining	53,172	52,492	52,097	51,716	49,854
Construction Material Quarrying(c)	3,803	4,121	4,197	4,329	4,640
Total, All Mining and Quarrying	56,975	56,613	56,294	56,045	54,494

(a) Average employment during whole year.
 " Non-metal Mining".

(b) Oil Mining, where available, is included with
 (c) Incomplete.

2. **Salaries and Wages Paid in Mining.**—Statistics of total salaries and wages paid in the mining and quarrying industry are now available from the annual industrial censuses of the industry taken from 1952 onwards. Salaries and wages paid in the mining and quarrying industries in Australia during each year 1953 to 1957 are shown in the following table. Information regarding rates of wages paid in the mining industry is shown in Chapter XII.—Labour, Wages and Prices (p. 415) and also in the *Labour Report*.

SALARIES AND WAGES PAID IN MINING(a): AUSTRALIA.
 (£'000.)

Industry.	1953.	1954.	1955.	1956.	1957.
Metal Mining—					
Gold Mining	6,291	6,450	6,344	6,551	6,422
Silver-Lead-Zinc Mining	12,359	12,761	15,154	17,299	16,241
Copper-Gold Mining	1,608	1,786	1,867	2,098	2,289
Tin Mining	715	704	734	733	753
Mineral Sands Mining	362	412	819	1,644	2,177
Other Metal Mining	1,380	1,195	1,328	1,504	1,402
Total, Metal Mining	22,715	23,308	26,246	29,829	29,284
Fuel Mining, excluding oil(b)—					
Black Coal Mining	24,171	25,988	26,065	26,422	25,105
Brown Coal Mining	1,483	1,557	1,761	1,649	1,640
Total, Fuel Mining	25,654	27,545	27,826	28,071	26,745
Non-metal (excluding Fuel) Mining	1,684	1,693	2,270	2,401	2,517
Total, All Mining	50,053	52,546	56,342	60,301	58,546
Construction Material Quarrying (c)	2,007	2,045	2,439	2,738	3,219
Total, All Mining and Quarrying	52,060	54,591	58,781	63,039	61,765

(a) Excludes mines and quarries employing less than four persons.
 available, is included with " Non-metal Mining".

(b) Oil Mining, where
 (c) Incomplete.

3. **Accidents in Mining.**—Particulars of numbers of persons killed and injured in accidents in mines and associated treatment plants are recorded by State Mines Departments. Numbers injured are not reported on a uniform basis in all States as varying criteria are used in determining what constitutes injury for the purpose of these records. In 1957, 43 persons were recorded as having been killed and 1,525 as having been injured in mining (excluding quarrying) accidents. Of the total of 43 persons killed, 16 were in black coal mines, 10 in gold mines and 10 in silver-lead-zinc mines. Reported injuries were highest in black coal mines (445), gold mines (396), and silver-lead-zinc mines (400).

§ 14. Oversea Trade in Minerals and Metals.

Particulars of the quantity and value of imports and exports of the principal minerals and metals for Australia are shown in the following table for the years 1955-56, 1956-57 and 1957-58. In addition to the unfabricated metals shown, considerable quantities of partly fabricated metals (bars, rods, wire, etc.) enter into Australia's oversea trade.

IMPORTS AND EXPORTS OF PRINCIPAL MINERALS AND METALS : AUSTRALIA.

Item.	Unit of Quantity.	1955-56.		1956-57.		1957-58.	
		Quantity.	Value. (£A.f.o.b.)	Quantity.	Value. (£A.f.o.b.)	Quantity.	Value. (£A.f.o.b.)
IMPORTS.							
Minerals—							
Antimony ore and concentrate	cwt.	10,639	52,570	10,593	45,548	2,060	9,215
Asbestos	cental	723,695	2,394,810	521,936	1,708,751	731,532	2,524,495
Chromium ore and concentrate	cwt.	146,246	94,776	120,788	63,983	173,207	117,045
Coal	ton	4,117	29,973	6,191	29,239	9,335	44,383
Coke	"	3,444	53,191	8,206	125,229	9,778	166,777
Diatomite	"	87,879	139,095	95,895	146,466	64,162	100,345
Industrial diamonds	cwt.	258,321	543,657	192,295	420,539	221,346	464,134
Mica	lb.	764,347	56,049	437,289	46,019	1,000,533	64,664
Sulphur	ton	205,880	2,740,044	138,083	1,707,168	208,028	2,130,464
Metals—							
Aluminium (pigs, ingots, etc.)	"	240,651	2,924,968	207,917	2,764,067	203,780	2,522,169
Copper pigs, ingots, blocks and powder	"	94,791	2,087,810	66,019	1,171,474	32,708	437,520
Gold bullion (ingots, bar, etc.)	fine oz.	175,649	2,745,143	143,852	2,270,632	169,119	2,631,443
Iron and Steel— Bar and rod	cwt.	2,040,376	6,734,571	625,364	3,106,731	342,293	2,531,755
Ingots, blooms, slabs, etc.	"	14,761	76,597	8,362	54,206	5,872	69,439
Nickel (pigs, ingots, etc. and powder)	"	14,732	528,299	16,178	556,601	15,467	585,986
Tin	"	10,358	471,761	16,599	803,498	22,201	1,025,553
EXPORTS.							
Minerals—							
Asbestos	cental	155,633	693,521	262,307	1,043,486	225,464	1,371,312
Coal	ton	193,813	780,284	545,101	2,196,044	836,336	3,390,628
Coke	"	66,590	537,841	129,397	1,072,699	112,760	957,659
Copper—							
Ore and concentrate	cwt.	63,809	314,767	382,975	1,356,636	380,673	879,089
Copper-lead dross, etc. and concentrate	"	152,130	1,174,004	188,327	1,317,037	203,370	750,019
Lead and silver-lead ore and concentrate, etc.	"	1,312,432	4,369,378	1,637,724	5,585,631	1,981,705	5,898,900
Rutile concentrates	"	1,394,970	4,627,553	2,273,540	8,499,133	1,959,304	6,246,209
Tungsten (scheelite and wolfram concentrates)	"	47,537	3,708,473	41,343	2,758,476	30,717	1,656,468
Zinc ore and concentrate, etc.	"	5,823,602	4,647,977	5,902,684	5,067,900	5,736,880	4,065,464
Zircon concentrates	"	1,094,007	596,022	1,839,239	1,130,402	1,225,578	774,832
Metals—							
Copper, blister	"	291,170	5,845,048	311,924	5,109,509	330,295	3,193,632
Gold bullion (ingot, bar, dust, sheet, etc.)	fine oz.	531,664	8,323,118	908,266	14,225,889	405,307	6,352,070
Iron and Steel— Bar and rod	cwt.	143,476	362,369	549,698	1,437,201	446,957	1,106,777
Ingots, blooms, slabs, etc.	"	19,742	22,587	34,734	82,186	50,579	146,906
Pig iron	"	291,659	324,051	349,712	460,438	329,100	434,935
Lead—							
Pig	"	2,922,883	19,560,181	3,347,804	22,915,913	3,281,454	15,820,747
Bullion	"	596,231	4,639,155	1,070,623	8,263,757	970,929	5,582,381
Silver bullion (ingot, bar, dust, sheet, etc.)	fine oz.	6,485,356	2,620,905	16,570,469	5,594,400	3,078,824	1,218,964
Zinc, ingots	cwt.	674,295	4,107,141	793,514	4,665,974	604,200	2,623,792

Considerable quantities of metallic ores, concentrates, slags and residues are exported from Australia for refining overseas. The following table shows the quantities of such items exported during 1957-58 and their principal metallic content as estimated by assay.

**PRINCIPAL METALLIC CONTENT OF ORES AND CONCENTRATES EXPORTED
FROM AUSTRALIA DURING 1957-58.**

Ore, Concentrate, etc.	Quantity Ex- ported.	Estimated Metallic Content.						
		Copper.	Gold.	Lead.	Silver.	Tin.	Tungsten (WO ₃ Content).	Zinc.
		cwt.	cwt.	fine oz.	cwt.	fine oz.	cwt.	cwt.	cwt.
Wolfram Ores and Concentrates	7,734	..	..	..	..	..	5,532	..
Scheelite Ores and Concentrates	22,983	..	..	..	..	..	15,145	..
Copper Ores and Concentrates	380,673	95,029	6,399	..	131,662	91	..	..
Copper-Lead Dross and Speiss	166,383	44,977	88	75,509	336,060	..	..	..
Other Copper Slags and Residues	27,137	4,019	..	81	39,760	74	..	337
Copper Matte	9,850	2,890	5	1,608	8,087	..	..	..
Lead Ores and Concentrates	1,942,119	30,566	17,295	1,296,888	2,176,698	68	..	132,360
Lead Slags and Residues	39,586	38	..	25,333	192	271	..	9
Zinc Ores and Concentrates	5,667,498	..	..	50,818	101,641	..	..	2,977,683
Zinc Slags and Residues	69,382	225	..	59	..	8	..	54,667
Tin Ores and Concentrates	3,239	52	..	..	..	2,148	..	..
Gold Ores and Concentrates	..	..	..	..	..	..	..	..
Blister Copper	330,295	326,448	..	..	..	..	..	..
Silver-Lead Bullion	970,939	..	..	963,323	3,991,803	..	..	..
Total metallic contents	9,637,818	504,244	23,787	2,413,619	6,785,903	2,660	20,677	3,165,056

§ 15. Government Aid to Mining, and Mineral Control.

1. Aid to Mining.—(i) *Commonwealth.* (a) *Assistance to marginal and sub-marginal gold mines.* Under the terms of the Gold-Mining Industry Assistance Act 1954, large producers received a subsidy of up to three-quarters of that portion of the cost of production in excess of £13 10s. per fine oz., the maximum rate of subsidy being limited to £2 per fine oz. Persons producing less than 500 fine oz. a year received a flat rate subsidy of £1 10s. per fine oz. regardless of the cost of production. The Act remained in force for two years from 1st July, 1954, and was extended for a further three years to 30th June, 1959. In 1957, the flat rate to small producers was increased to £2 per fine oz. and the maximum rate to large producers was increased to £2 10s. per fine oz.

(b) *Rewards for Discovery of Uranium Ore.* To encourage the search for and discovery of deposits of uranium ore, the Commonwealth Government approved the granting of monetary rewards up to a maximum of £25,000 for any one deposit.

(c) *Copper Bounty.* For particulars of the bounty paid on copper sold on the Australian market, see page 1028.

(d) *Bureau of Mineral Resources, Geology and Geophysics.* The Bureau of Mineral Resources, Geology and Geophysics has sections dealing with geology, geophysics, mining engineering, petroleum technology and mineral economics. The geological section provides geologists to conduct all surveys required in Commonwealth Territories, and makes detailed and regional surveys in conjunction with or by arrangement with the State Mines Departments, surveys of possible oil-fields in Australia and New Guinea, surveys of mines for which financial assistance is sought, and investigations of deposits of radio-active minerals. The geophysical section conducts investigations throughout Australia and New Guinea connected with the search for metalliferous, radio-active and other mineral deposits; investigations connected with exploration for coal, oil and water; regional magnetic and gravity surveys; engineering and military geophysics; and the operation of geophysical (magnetic and seismic) observatories. The Bureau works in close co-operation with the Mines Departments of the States. It has assumed full responsibility for geological and geophysical surveys in Commonwealth Territories, but suitable arrangements have been made to ensure that the local Administrations have the necessary technical advice directly available to them.

(e) *Diamond Drilling.* The drilling plant operated by the Bureau of Mineral Resources consists of two heavy, two medium and five light prospecting drills. These drills are used mainly in connexion with the Bureau's comprehensive programme of prospecting by aerial, geological, geophysical and geochemical methods.

(f) *Search for Oil.* No variation has been made in the policy described in Official Year Book No. 37, page 850, regarding the search for petroleum throughout Australia and its Territories. In addition to its activities set out in that Year Book, the Bureau of Mineral Resources, Geology and Geophysics in Canberra tests bore cores for density, porosity, permeability and fluid content on behalf of companies engaged in drilling for oil. The Bureau also maintains three portable rotary plants for scout boring for geological information.

The Commonwealth Government has encouraged the search for oil in Australia, Papua and New Guinea; details of the efforts made are outlined in earlier issues of the Official Year Book and in § 10, Mineral Oils (p. 1045).

(g) *Ore-dressing and Mineragraphic Investigations.* These investigations are conducted by the Commonwealth Scientific and Industrial Research Organization as required by the industry. Ore-dressing investigations are carried out at the Ore-Dressing Laboratory, situated in the Department of Mining, University of Melbourne, and at the Ore-Dressing Laboratory, Kalgoorlie, situated at the School of Mines. The Mineragraphic Investigations Section is located in the Geology Department, University of Melbourne.

These two groups of laboratories perform complementary services—the Mineragraphic Investigations Section assesses microscopically the state of dispersion and the mineral association of ore bodies while the Ore-Dressing Laboratories investigate the composition of ores and provide advice on suitable methods for their full-scale treatment. Much of this research is carried out on a co-operative research basis with the mining industry.

(ii) *States.* (a) *General.* In addition to free assays and determinations of rocks and minerals carried out for prospectors by the Mines Departments of the States and Territories, technical officers of these departments provide advice to the mining and allied industries where required, carry out field examinations of mining prospects, advise on exploration and development, select sites for water supply, and in general give a free technical service to the mining industry.

(b) *New South Wales.* State aid to assist metalliferous mining may consist of grants to assist the prospecting and/or mining for gold and minerals and for the purchase, removal and installation of mining plant or equipment.

(c) *Victoria.* Loans may be granted to assist prospecting and development or the purchase of machinery. The Mines Department has stamp batteries in different parts of the State to crush ore for prospectors at nominal rates. Small mining companies may avail themselves of these facilities. Drilling with diamond, rotary and percussion drills is carried out by the Mines Department for mining companies and for general mineral exploration. A survey of the State's underground water reserves is in progress, in conjunction with the opening up of town water supplies from underground sources for which new deep drilling equipment has been obtained.

(d) *Queensland.* The Mines Department maintains a treatment works for tin ores, etc., at Irvinebank, an assay office at Cloncurry and diamond-drilling plants in several parts of the State. The Venus State Mill at Charters Towers is available for the treatment of gold-bearing ores. In addition, many departmental compressor plants, pumping plants and other mining equipment are provided and made available on hire on the principal mining fields.

(e) *South Australia.* The Department of Mines provides the following services and facilities to the mineral industry:—(i) Hire of boring plants and mining equipment; boring and testing of mineral deposits; financial subsidies in approved cases for prospecting and mining development; development of sub-surface water supplies for farming, pastoral, irrigation and mining purposes; purchase of basic metal ores from prospectors. (ii) Geological examination of mineral deposits, water supply, dam, foundation and drainage problems; guidance on mining legislation; publication and issue of geological bulletins and maps. (iii) Chemical and metallurgical analytical and assay investigation; testing and treatment of ores and minerals; petrographic, mineragraphic and radiometric determinations. Pilot scale metallurgical and chemical treatment plants are maintained and operated for the development of mineral extraction processes.

(f) *Western Australia.* Assistance is given to prospectors to the extent of £4 10s. 0d. a week south of the 26th parallel of latitude, and of £5 10s. 0d. a week north of that parallel; also provision is made of some tools required for prospecting.

There are twenty-one State batteries operating throughout the gold-fields for the treatment of ore from prospectors and small mine-owners, at a nominal charge. A cartage subsidy is also granted to such operators sending ore to State batteries for treatment.

Provision is made for loans to mine-owners who require assistance to develop mines. The Government also has a drilling scheme, financing mine-owners on a £1 for £1 basis.

(g) *Tasmania.* The Department of Mines provides financial assistance to mining lessees for the purchase of plant and machinery, for sinking, repairing or dewatering of shafts, for construction of dams and water races, for testing and proving a deposit of any mining product, for developmental work and for diamond and other types of drilling.

Other assistance is rendered to the industry by geological and engineering advice and through ore-dressing research into metallurgical recoveries and the selection and design of treatment plant.

(h) *Northern Territory.* In order to encourage the development of the mining industry, the Northern Territory Administration provided Government batteries at Tennant Creek, Hatches Creek, and Maranboy for the treatment of miners' ores. The Hatches Creek battery is the only one in operation at the present time but, because of the low price of wolfram, little crushing is done. The Tennant Creek battery has been reconstructed and was reopened in September, 1958, but the re-opening of the Maranboy battery will depend

on a revival of small scale tin mining at that centre. The crushing charges are subsidized by Government grants. In addition, the Administration provides cartage subsidies and financial advances to encourage miners to carry out developmental work. Roads and water supply services are provided and maintained for mines under active development throughout the Territory.

2. **Control of Minerals.**—(i) *Mica Production.* The Commonwealth Mica Pool purchases mica won in the Harts Range and Plenty River mica fields, Northern Territory, thus ensuring the miners a ready market for their output at fixed prices and also permitting an orderly distribution of mica to the trade. The Pool is controlled by a Committee of Management consisting of representatives of the Commonwealth Government, producers and consumers.

(ii) *Control of Exports of Metals and Minerals.* Certain metals and minerals produced in Australia are subject to export control for one or more of the following reasons:—

- (a) the necessity of conserving resources (e.g., iron ore and manganese);
- (b) inadequacy of local production to fulfil domestic demand (e.g., mica);
- (c) the strategic importance of the minerals (e.g., beryllium ores, concentrates and metal; monazite; uranium ore, concentrates, residues and metal; mica).

Mixed concentrates of beach sand minerals are prohibited exports, but rutile, zircon and ilmenite may be exported.

(iii) *Radio-active Minerals.* Since the discovery of the possibility of using atomic energy, considerable attention has been paid to the occurrence of uranium in Australia. To encourage the search for and discovery of deposits of uranium ore, the Commonwealth Government grants monetary rewards for such discoveries.

Up to the end of 1949, important deposits had been found only in the north-eastern part of South Australia where the Mt. Painter and Radium Hill fields had been investigated, largely by the South Australian Government, but in that year the presence of uranium was discovered in the Rum Jungle district of the Northern Territory, and investigations carried out by the Commonwealth Bureau of Mineral Resources, Geology and Geophysics in the years 1949–1952 proved that these deposits were of substantial importance.

Towards the end of 1952, the Commonwealth Government placed the Rum Jungle deposits under the control of Territory Enterprises Pty. Ltd., a subsidiary of Consolidated Zinc Corporation Limited, to carry on the investigations on its behalf and to mine and treat the ore. The treatment plant at Rum Jungle was officially opened on 17th September, 1954. Work ceased on 30th September, 1958, at White's open-cut, the scene of the original discovery at Rum Jungle. Work is still proceeding at Dyson's open-cut and some smaller ore bodies.

In South Australia, the South Australian Government extensively explored the Radium Hill deposit by underground development and diamond drilling. A primary treatment plant was erected at the mine and went into operation in November, 1954; the concentrate is transported to a plant at Port Pirie, completed in mid-1955, where it is further reduced. During 1952, arrangements were completed between the Governments of the United States of America, South Australia and the Australian Commonwealth, for the purchase of ores by the United States.

The construction of a plant for the extraction of uranium oxide at Mary Kathleen in north-west Queensland commenced in 1956. By the end of 1957, a township had been built, and a dam constructed. Operations in the plant started in June, 1958, and the mine was officially opened by the Prime Minister on 27th October, 1958.

Uranium deposits were found in the South Alligator River area in 1953. As a result of prolonged exploration and development, sufficient ore was proved to justify a treatment plant. Following negotiations between the United Kingdom Atomic Energy Authority and producers in the area, a contract has been arranged for the purchase of uranium oxide by the Authority. A gold plant in the neighbourhood was under conversion at the end of 1958 to treat the uranium ore.

The Bureau of Mineral Resources is carrying out further airborne scintillograph surveys and extensive geological, geophysical and geochemical surveys and diamond drilling operations, with a view to discovering further deposits and to assessing the value of known deposits.

During 1953, Commonwealth Legislation was enacted to set up an Atomic Energy Commission which is responsible, in an overall sense, for the production and utilization of uranium in Australia. This Act, the Atomic Energy Act of 1953, supersedes the Atomic Energy (Control of Materials) Act of 1946, but retains a provision of that Act which provides for control of substances which could be used for production or use of atomic energy. It gives the Commonwealth power to acquire such substances in their natural state and in waste materials from mining operations, to carry on mining and other operations necessary for the recovery of such substances, and to pay compensation for such acquisition. It also gives the Commonwealth power to obtain possession of such substances held by any person.

Further reference to the Atomic Energy Commission appears in Chapter XXX.—Miscellaneous.