

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 1955, represented only about 12 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. **Standardization of Mineral Statistics.**—At the 1945 Conference of Australian Statisticians, consideration was given to the defective nature of Australian mineral production statistics arising from the widely differing methods adopted by individual States in collecting, compiling and publishing the data. Further attention was given to the problem by a conference in 1948 of officers of the Bureau of Mineral Resources, Geology and Geophysics, State Mines Departments and State and Commonwealth Statistical Bureaux. Following work subsequently undertaken by the Bureau of Mineral Resources, the Commonwealth Bureau of Census and Statistics and other authorities concerned, a specific plan for standardization of Australian mineral production statistics was adopted in 1950. In accordance with the plan, numerous improvements have been introduced and with the introduction of annual Australia-wide industrial censuses for mining and quarrying in 1952, Australian mineral statistics are now considered to be adequate for present needs.

The fundamental provision of the plan for standardization of Australian mineral statistics is that quantities and values of individual minerals produced should be 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.

The adoption of revised methods of compiling and presenting mineral statistics in 1950 caused a break in continuity of the data published for earlier years, and the introduction of industrial censuses of the mining and quarrying industry in all States in 1952 has caused a further break in continuity of data, particularly those relating to values.

In the main, the data consist of official statistics of Mines Departments furnished to this Bureau by the statisticians of the several States and by the Northern Territory Mines Branch. These statistics have been supplemented, as necessary, by data obtained from the Australian Mines and Metals Association (Inc.), the Bureau of Mineral Resources, Geology and Geophysics 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.

In the tables, individual minerals are arranged in four groups, Metallic Minerals, Fuel Minerals, Non-metallic (excluding Fuel) Minerals, and Construction Materials, to correspond with the major groups of the statistical classification of the mining industry.

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

4. Quantity and Value of Minerals Produced in 1956.—(i) *Quantities.* In the following table, particulars of the quantities of principal minerals produced are shown for each State and the Northern Territory for 1956.

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, 1956.

Mineral.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
METALLIC MINERALS.									
Antimony Ore and Concentrate	ton	(a) 468	1	..	..	78	..	..	547
Bauxite .. ..	..	4,780	4,674	875	..	..	..	..	10,329
Beryllium Ore .. ..	..	(a) 8	..	..	..	310	..	..	318
Chromite .. ..	..	..	..	..	..	6,096	..	..	6,096
Copper Ore, Concentrate and Precipitate .. ..	..	5,032	..	146,035	8	212	41,207	19,267	211,761
Gold Ore, Concentrate, etc. .. ..	..	107	..	..	..	..	..	..	107
Gold—Other Forms(b)	oz.	16,523	44,627	(c)	(c)	(c)	(c)	(c)	(c)
Ilmenite Concentrate	ton	981	..	..	..	3,293	..	..	4,274
Iron Ore	'000 tons	..	..	..	3,587	337	..	..	3,924
Lead Ore, Concentrate	ton	337,914	..	136,784	51	7,613	13,490	..	495,852
Manganese Ore .. ..	..	1,513	..	311	..	56,234	..	1,326	59,384
Pyritic Ore and Concentrate .. ..	..	1,088	..	10,250	65,097	55,680	52,373	..	184,488
Rutile Concentrate .. ..	..	64,914	..	31,902	..	..	..	..	96,816
Tantalite-Columbite Concentrate	lb.	..	..	..	..	159,655	..	..	159,655
Tin Concentrate	ton	373	..	883	..	358	1,311	1	2,926
Tungsten Concentrates—	..	..	..	..	..	..	..	..	..
Scheelite Concentrate .. ..	..	2	..	5	..	..	1,488	..	1,495
Wolfram Concentrate .. ..	..	4	..	70	..	..	647	156	877
Zinc Ore and Concentrate .. ..	..	439,566	..	31,958	14	..	59,239	..	530,777
Zircon Concentrate .. ..	..	50,660	..	21,798	..	..	..	..	72,458

FUEL MINERALS.

Coal, Black—	'000 tons	..	..	79	..	..	2	..	81
Semi-Anthracite .. ..	..	14,793	119	2,472	..	..	297	..	17,681
Bituminous .. ..	..	17	..	183	482	830	..	..	1,512
Sub-Bituminous .. ..	..	14,810	119	2,734	482	830	299	..	19,274
Total .. ..	..	..	..	..	..	..	..	..	..
Coal, Brown (including Lignite) .. ..	..	..	10,560	..	..	..	..	..	10,560

NON-METALLIC (EXCLUDING FUEL) MINERALS.

Asbestos	ton	622	..	..	4,040	8,047	..	..	8,669
Barite .. ..	..	1,042	..	..	..	927	..	..	6,009
Clays—	..	..	..	..	..	..	..	..	..
Brick Clay and Shale	'000 tons	1,521	879	264	326	362	74	..	3,426
Other .. ..	..	446	193	9	85	31	6	..	770
Cupreous Ore and Concentrate—For Fertilizer .. ..	..	..	..	..	..	7,713	..	7	7,720
Dolomite .. ..	..	7,599	..	5,510	101,496	171	788	..	115,564
Felspar (including Cornish Stone) .. ..	..	10,244	..	..	4,604	3,781	..	..	18,629
Gypsum .. ..	..	94,203	83,024	..	263,136	27,121	..	..	467,484
Limestone	'000 tons	1,700	813	139	1,076	357	179	..	4,264
Magnesite	ton	63,050	..	..	831	804	..	..	64,685
Mica—Muscovite	lb.	..	..	..	..	..	..	28,837	28,837
Salt	ton	..	d 70,800	(d) 207	331,965	(d) 5,717	..	..	e 408,689
Silica (Glass, Chemical, etc.) .. ..	..	131,155	..	..	16,532	7,343	4,858	..	159,888
Talc (including Steatite) .. ..	..	673	..	..	7,906	4,456	..	..	13,035

CONSTRUCTION MATERIALS.(f)

Sand	'000 tons	1,681	1,233	(c)	1,224	176	..	..	4,314
River Gravel and Gravel Boulders .. ..	..	1,895	221	(c)	..	..	..	..	2,116
Dimension Stone .. ..	..	89	9	4	49	80	(g)	..	231
Crushed and Broken Stone .. ..	..	1,995	4,824	914	6,059	798	227	..	14,817
Other (Decomposed Rock, etc.) .. ..	..	10,835	273	(c)	..	5	..	..	11,113

(a) Dispatches from the mine (or sales) as distinct from production. (b) Bullion, alluvial, retorted gold, etc.
(c) Not available. (d) Estimated. (e) Partly estimated. (f) Incomplete.
(g) Less than half the unit of quantity shown.

(ii) *Contents of Metallic Minerals.* The following table shows the contents of metallic minerals produced in 1956. 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, 1956.

Content of Metallic Minerals Produced.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Alumina ..	ton	1,578	2,600	440	..	..	..	..	4,618
Antimony ..	"	879	1	..	..	23	..	..	903
Beryllium Oxide (BeO) ..	unit	90	..	..	..	3,678	..	..	3,768
Bismuth ..	lb.	..	..	620	..	..	..	4,500	5,120
Cadmium ..	ton	862	..	..	..	..	60	..	922
Chromic Oxide (Cr ₂ O ₃) ..	"	..	..	..	..	2,624	..	..	2,624
Cobalt ..	"	59	..	..	..	..	..	..	59
Copper ..	"	4,289	..	34,898	1	46	8,807	5,000	53,041
Gold ..	fine oz.	28,821	38,846	56,022	43	813,537	17,131	75,421	1,029,821
Iron ..	'000 tons	..	..	..	2,332	211	..	..	2,543
Lead ..	ton	238,319	..	43,104	17	5,828	12,217	..	299,485
Manganese ..	"	5,551	..	140	..	25,280	..	..	30,971
Manganese Di- oxide (MnO ₂) ..	"	371	..	..	..	179	..	914	1,464
Molybdenum Di- sulphide (MoS ₂) ..	lb.	..	..	190	..	..	..	..	190
Monazite ..	ton	87	..	6	..	..	..	..	93
Osmiridium ..	oz.	..	..	..	..	..	25	..	25
Platinum ..	"	18	..	..	..	..	..	..	18
Silver ..	'000 fine oz.	9,289	2	3,725	1	192	1,373	4	14,586
Sulphur(a) ..	ton	187,087	..	48,928	31,248	25,295	46,455	..	339,013
Tantalite-Colum- bite (Ta ₂ O ₅ + Nb ₂ O ₅) ..	lb.	..	..	..	..	85,690	..	..	85,690
Tin ..	ton	269	..	630	..	240	938	1	2,078
Titanium Oxide (TiO ₂) ..	"	62,951	..	30,772	..	1,779	..	..	95,502
Tungstic Oxide (WO ₃) ..	"	4	..	49	..	..	1,428	101	1,582
Zinc ..	"	229,126	..	16,231	7	..	32,718	..	278,082
Zircon ..	"	50,135	..	21,634	..	..	..	..	71,769

(a) Sulphur content of lead and zinc concentrates and pyrite. In addition it was estimated that the content of spent oxide roasted in Australia was 5,877 tons.

(iii) *Values.* Particulars of the estimated values of minerals (mine and quarry products) produced in 1956 are shown in the following table. The values represent the estimated selling value at the mine or quarry of minerals produced during the year.

VALUE OF MINERALS PRODUCED, 1956.

(£'000.)

Mineral.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
METALLIC MINERALS.								
Copper Ore, Concentrate and Precipitate ..	289	..	13,182	(a)	(b)	(b)	1,360	18,182
Gold Ore, Concentrate, etc. ..	3	..	..	..	..	..	..	3
Gold—Other Forms ..	245	653	297	1	13,275	3	1,032	15,506
Iron Ore ..	..	..	..	(b)	(b)	..	..	4,449
Lead-Silver and Lead-Silver-Zinc Ores ..	240	..	..	2	93	67	..	402
Lead Concentrate ..	27,024	..	5,558	..	442	1,127	..	34,151
Manganese Ore ..	18	..	5	..	285	..	29	337
Pyritic Ore and Concentrate ..	6	..	30	(b)	(b)	(b)	..	1,023
Rutile Concentrate ..	4,704	..	1,726	..	..	..	..	6,430
Tin Concentrate ..	230	..	465	..	204	699	1	1,599
Tungsten Concentrates ..	6	..	68	..	..	3,128	130	3,332
Zinc Concentrate ..	6,565	..	597	..	..	1,052	..	8,214
Zircon Concentrate ..	407	..	197	..	..	..	..	604
Other Metallic Minerals ..	77	27	5	..	298	8	..	415
Total, Metallic Minerals ..	39,814	680	22,130	4,584	15,354	9,533	2,552	94,647

VALUE OF MINERALS PRODUCED, 1956—*continued*.

(£'000.)

Year.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	Aust.
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FUEL MINERALS.

Coal, Black	40,637	668	6,988	794	2,724	628	..	52,439
Coal, Brown	4,644	4,644
<i>Total, Fuel Minerals</i>	<i>40,637</i>	<i>5,312</i>	<i>6,988</i>	<i>794</i>	<i>2,724</i>	<i>628</i>	<i>..</i>	<i>57,083</i>

NON-METALLIC (EXCLUDING FUEL) MINERALS.

<i>Total, Non-metallic (excluding Fuel) Minerals</i>	<i>2,429</i>	<i>1,161</i>	<i>595</i>	<i>2,442</i>	<i>1,268</i>	<i>209</i>	<i>42</i>	<i>8,146</i>
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CONSTRUCTION MATERIALS.(c)

<i>Total, Construction Materials</i>	<i>5,910</i>	<i>4,738</i>	<i>491</i>	<i>4,090</i>	<i>884</i>	<i>185</i>	<i>..</i>	<i>d 16,444</i>
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TOTAL.

<i>Total, All Minerals and Construction Materials</i>	<i>88,790</i>	<i>11,891</i>	<i>30,204</i>	<i>11,910</i>	<i>20,230</i>	<i>10,555</i>	<i>2,594</i>	<i>d176,320</i>
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(a) Less than £500. (b) Not available for publication. (c) Incomplete. (d) Includes Australian Capital Territory, £146,000.

5. Mine Production of Principal Metals and Production of Coal and Sulphur, 1952 to 1956.—Particulars of the mine production of principal metals (i.e., metallic contents of minerals produced) and production of coal and sulphur in the years 1952 to 1956 are shown in the following table. Graphs showing details of the mine production of principal metals and coal from 1930 to 1957 may be found on pp. 1029–30.

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

Particulars.	Unit.	1952.	1953.	1954.	1955.	1956.
Metallic Content of Minerals Produced(a)—						
Copper	ton	18,578	36,585	40,857	45,496	53,041
Gold	fine oz.	980,435	1,075,181	1,117,742	1,049,039	1,029,821
Lead	ton	228,196	269,344	284,862	295,944	299,485
Iron(b) .. ..	..	1,883,087	2,131,865	2,274,330	2,304,165	2,542,826
Silver	fine oz.	11,278,374	12,539,152	13,827,038	14,555,412	14,586,197
Tin	ton	1,611	1,553	2,075	2,017	2,078
Titanium (TiO ₂ Content) ..	..	36,881	37,067	43,241	57,494	95,502
Tungsten (WO ₃ Content) ..	..	1,282	1,406	1,372	1,482	1,582
Zinc .. ..	..	196,450	239,324	252,659	256,564	278,082
Production of—						
Coal—Black .. ..	..	19,404,047	18,410,845	19,763,039	19,274,751	19,273,834
Brown .. ..	..	8,103,764	8,257,299	9,331,255	10,112,206	10,559,801
Sulphur(c) .. ..	..	217,242	225,197	254,403	269,071	344,890

(a) Mine production of metals. (b) Estimated. (c) Total sulphur content of lead and zinc concentrates and pyrite produced and of spent oxide roasted.

6. Value of Output and Value of Production for Mining and Quarrying.—(i) *Individual Industries, 1956.* 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 1956. 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), 1956.
(£'000.)

Industry.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal Mining—									
Gold Mining ..	250	653	297	(b)	13,275	..	1,032	..	15,507
Silver-Lead-Zinc Mining ..	34,104	..	(c)	(b)	(c)	3,051	..	..	54,429
Copper-Gold Mining ..	22	..	(c)	(b)	(c)	(c)	1,360	..	6,667
Tin Mining ..	230	..	465	..	204	1,006	1	..	1,906
Mineral Sands Mining ..	5,130	..	1,925	..	(b)	..	(b)	..	7,055
Other Metal Mining ..	80	27	(c)	4,584	1,327	(c)	159	..	9,079
Total, Metal Mining	39,816	680	22,130	4,584	15,354	9,527	2,552	..	94,643
Fuel Mining—									
Black Coal Mining ..	40,637	668	6,988	794	2,724	628	..	..	52,439
Brown Coal Mining ..	..	4,644	..	..	..	..	..	..	4,644
Total, Fuel Mining ..	40,637	5,312	6,988	794	2,724	628	..	..	57,083
Non-metal (excluding Fuel) Mining—									
Clays(d) ..	840	452	129	278	223	48	..	(e)	1,970
Gypsum ..	171	84	..	311	21	..	..	..	587
Limestone ..	901	620	(c)	859	(c)	163	..	..	3,127
Salt(d) ..	..	..	(c)	(c)	..	..	..	..	664
Other Non-metal (excluding Fuel) Mining	499	5	17	(c)	(c)	4	42	..	1,806
Total, Non-metal (excluding Fuel) Mining ..	2,411	1,161	595	2,462	1,268	215	42	(e)	8,154
Total, All Mining ..	82,864	7,153	29,713	7,840	19,346	10,370	2,594	(e)	159,880
Construction Material Quarrying(d) ..	5,926	4,738	491	4,070	884	185	..	146	16,440
Total, All Mining and Quarrying ..	88,790	11,891	30,204	11,910	20,230	10,555	2,594	146	176,320

(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".

MINING AND QUARRYING: VALUE OF PRODUCTION(a), 1956.
(£'000.)

Industry.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal Mining—									
Gold Mining ..	134	474	251	(b)	8,898	..	809	..	10,566
Silver-Lead-Zinc Mining ..	27,105	..	(c)	(b)	(c)	2,773	..	..	44,522
Copper-Gold Mining ..	8	..	(c)	(b)	(c)	(c)	1,095	..	4,230
Tin Mining ..	196	..	312	..	104	865	1	..	1,478
Mineral Sands Mining ..	4,307	..	1,467	..	(b)	..	(b)	..	5,774
Other Metal Mining ..	66	27	(c)	4,012	1,105	(c)	137	..	7,629
Total, Metal Mining	31,816	501	17,790	4,011	10,525	7,514	2,042	..	74,199
Fuel Mining—									
Black Coal Mining ..	32,456	518	5,703	649	2,175	468	..	..	41,969
Brown Coal Mining ..	..	4,124	..	..	..	..	..	..	4,124
Total, Fuel Mining ..	32,456	4,642	5,703	649	2,175	468	..	..	46,093
Non-metal (excluding Fuel) Mining—									
Clays(d) ..	717	414	105	247	223	43	..	(e)	1,749
Gypsum ..	127	72	..	206	9	..	..	..	414
Limestone ..	595	316	(c)	703	(c)	120	..	..	2,058
Salt(d) ..	..	..	(c)	(c)	..	..	..	..	514
Other Non-metal (excluding Fuel) Mining	412	5	17	(c)	(c)	3	42	..	1,478
Total, Non-metal (excluding Fuel) Mining ..	1,851	807	345	1,986	1,016	166	42	(e)	6,213
Total, All Mining ..	66,123	5,950	23,838	6,646	13,716	8,148	2,084	(e)	126,505
Construction Material Quarrying(d) ..	5,926	3,507	310	2,841	634	151	..	105	13,474
Total, All Mining and Quarrying ..	72,049	9,457	24,148	9,487	14,350	8,299	2,084	105	139,979

(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) Incomplete. (e) Not available for publication; included with "Construction Material Quarrying".

(ii) *States, 1952 to 1956.* The following table shows the value of output and the value of production ascertained from the Australia-wide mineral industry censuses for the years 1952 to 1956. Australian Capital Territory figures for 1952 are not available.

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)									
1952	77,097	8,535	17,429	6,047	17,704	8,750	1,282	(b)	136,844
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	10,555	2,594	146	176,320
VALUE OF PRODUCTION.(c)									
1952	63,166	6,632	13,860	5,153	12,410	7,325	1,125	(b)	109,671
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

(a) Selling value of mine and quarry products at the mine or quarry.

(b) Not available.

(c) Value of output less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted.

7. Industrial Census of the Mining and Quarrying Industry, 1956.—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 1956 is shown in the following table.

MINING AND QUARRYING: SUMMARY OF OPERATIONS, AUSTRALIA, 1956.

Particulars.	Unit.	Metal Mining.	Fuel Mining.	Non-metal (excluding Fuel) Mining. (a)	Total, All Mining.	Construction Material Quarrying.(b)	Total All Mining and Quarrying.
Mines and Quarries ..	No.	896	265	833	1,994	745	2,739
Persons Employed(c) ..		23,271	25,475	2,970	51,716	4,329	56,045
Salaries and Wages Paid(d)(e) ..	£'000	29,829	28,082	2,390	60,301	2,738	63,039
Value of Output(f) ..	"	94,643	57,083	8,154	159,880	16,440	176,320
Total Fuel, Materials, etc., Used ..	"	20,444	10,990	1,941	33,375	2,966	36,341
Value of Production(g) ..	"	74,199	46,093	6,213	126,505	13,474	139,979
Value of Additions and Replacements to Fixed Assets(d) ..	"	9,609	9,421	1,725	20,755	656	21,411

(a) Incomplete for some industries outside the normal administrative control of State Mines Departments (e.g., clays and salt). (b) Incomplete in some States. (c) Average number employed (including working proprietors) during whole year.

(d) Excludes mines and quarries employing less than four persons. (e) Excludes drawings by working proprietors; the amounts are net after deducting value of explosives sold to employees. (f) Value at mine or quarry. (g) 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 1956.

MINING AND QUARRYING: SUMMARY OF OPERATIONS, 1956.

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.
New South Wales ..	839	28,316	33,330	88,790	16,741	72,049	8,401
Victoria ..	229	4,601	4,673	11,891	2,434	9,457	3,737
Queensland ..	595	9,339	10,697	30,204	6,056	24,148	3,671
South Australia ..	577	2,213	1,938	11,910	2,423	9,487	1,540
Western Australia ..	287	8,030	8,289	20,230	5,880	14,350	2,238
Tasmania ..	80	2,866	3,337	10,555	2,256	8,299	682
Northern Territory ..	128	638	730	2,594	510	2,084	960
Aust. Cap. Territory..	4	42	45	146	41	105	182
Australia ..	2,739	56,045	63,039	176,320	36,341	139,979	21,411

(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 1956. 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)	813	17	75	1,029
Total, 1851-1956	16,347	73,528	22,380	450	58,171	2,498	1,100	174,474

(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. The Gold Producers' Association was incorporated in December, 1951, to implement this decision. 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 a maximum quantity of gold for resale on premium markets, 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 have been distributed to members in proportion to their production of gold. The actual volume of sales has been largely dependent on prices offering and, during 1952 and 1953, premium sales of gold brought an additional return to the industry amounting to about £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. 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 but fell back in 1955 and 1956 under the pressure of rising costs.

3. **Sources of Production.**—(i) *New South Wales.* Gold production in 1956 was 28,821 fine oz. The only gold producer of any significance was Wellington Alluvials Ltd., who operate a dredge on the Macquarie River, but 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 1956, the gold yield in Victoria was 38,846 fine oz. This was slightly higher than in 1955 and halted the decline in production of previous years. Only five producers—four quartz mines and one dredge—produced more than 1,000 fine oz. during the year, the largest of these being the Wattle Gully mine at Chewton in central Victoria.

(iii) *Queensland.* The output of 56,022 fine oz. during 1956 was lower than the previous year owing to the lower output from Mt. Morgan, the main producer. The only other major producer is Golden Plateau N.L. at Cracow.

(iv) *South Australia.* Only 43 fine oz. of gold were won in 1956 by prospectors in central and northern parts of the State.

(v) *Western Australia.* Production of gold during 1956 was 813,537 fine oz. This was lower than production in 1955. 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 167,002 fine ozs. during 1956, and eight other mines each produced over 20,000 fine oz. in the same period.

(vi) *Tasmania.* Production of gold in Tasmania during 1956 was 17,131 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. Production is centred around Tennant Creek and mines in this area produced 68,308 fine oz., the main producer being the "Nobles Nob" mine.

4. **Refinery Production.**—The quantities and values of the refinery production of new gold of Australian origin are shown in the following table for each of the years 1947 to 1956. The value of the refined new gold is based on the price fixed by the Commonwealth Bank, but allowance is made, from 1952 onwards, for premiums on sales of gold overseas and for industrial purposes in Australia.

GOLD : REFINERY PRODUCTION OF NEWLY WON GOLD OF AUSTRALIAN ORIGIN.

Year.			Quantity.	Value.	Year.			Quantity.	Value.
			'000. fine oz.	£'000.				'000. fine oz.	£'000.
1947	..	..	969	10,430	1952	..	..	979	16,037
1948	..	..	884	9,517	1953	..	..	1,053	16,780
1949	..	..	879	10,670	1954	..	..	1,063	16,589
1950	..	..	844	13,077	1955	..	..	1,055	16,503
1951	..	..	850	13,172	1956	..	..	1,044	16,346

The unit value of refinery production of newly won gold of Australian origin rose to £12 2s. 10d. in 1949 as a result of the increase in the price to £15 9s. 10d. per fine oz. fixed by the Commonwealth Bank on 19th September, 1949, consequent upon alteration in the rate of exchange. In 1950 and 1951, the unit values were the Bank's price of £15 9s. 10d. per fine oz., and since 1952 allowance has been made for premiums on gold sold for industrial purposes in Australia and on premium markets overseas, the average value per fine oz. being £16 7s. 7½d. in 1952; £15 18s. 9½d. in 1953; £15 12s. 0d. in 1954; £15 12s. 11½d. in 1955 and £15 13s. 1d. in 1956. From 1st May, 1954, the official price of gold in Australia was raised to £15 12s. 6d. per fine oz. The previous gold price was based on the price for which gold could be sold abroad in official markets less costs of movement. The new price reflects the "parity" value of Australian currency established by the International Monetary Agreement Act 1947. Further information regarding the price of gold realized, including particulars of prices for newly won gold sold on overseas premium markets, is given in Chapter XX.—Private Finance (see page 723.)

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 1952–53 to 1956–57.

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

Particulars.	1952-53.	1953-54.	1954-55.	1955-56.	1956-57.
Mine Production of Gold(a)	1,037,885	1,111,420	1,080,249	1,032,436	1,062,128
Imports of Gold(b)(c) ..	228,407	189,628	175,166	175,649	144,192
<i>Total</i>	<i>1,266,292</i>	<i>1,301,048</i>	<i>1,255,415</i>	<i>1,208,085</i>	<i>1,206,320</i>
Exports of Gold(b) ..	1,250,162	863,464	864,391	531,664	908,283
Gold Content of Ores and Concentrates Exported ..	12,441	12,526	11,133	13,427	21,817
Net Industrial Absorption of Gold	37,816	51,543	45,253	34,678	39,815
<i>Total</i>	<i>1,300,419</i>	<i>927,533</i>	<i>920,777</i>	<i>579,769</i>	<i>969,915</i>
Changes in Stocks of Gold held in Australia(d) ..	- 34,127	+ 373,515	+ 334,638	+ 628,316	+ 236,405

(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 1956 are shown in the table hereunder.

GOLD : PRODUCTION IN PRINCIPAL COUNTRIES AND WORLD TOTAL.
(’000 fine oz.)

Country	1952	1953.	1954.	1955	1956.
Union of South Africa ..	11,819	11,941	13,237	14,601	15,891
Canada	4,472	4,056	4,366	4,556	4,379
United States of America ..	1,893	1,958	1,832	1,884	1,850
Australia	980	1,075	1,118	1,049	1,030
Gold Coast	691	731	787	687	638
Rhodesia	499	504	538	527	537
Colombia	422	437	377	381	440
Philippines	469	481	416	419	400
Belgian Congo	369	371	365	369	374
Mexico	459	483	387	383	350
<i>Estimated World Total(a)</i> ..	<i>24,300</i>	<i>24,200</i>	<i>25,700</i>	<i>26,900</i>	<i>28,000</i>

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

7. **Employment in Gold Mining.**—Particulars of the numbers of persons employed in gold mining are shown in § 13 (page 1040).

8. **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. Further relief was given to the gold-mining industry in 1952 and 1953 by permitting sales of gold on overseas premium markets, but with the disappearance of high premium prices overseas in late 1953, 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 operates from 1st July, 1957, the subsidy payable to small producers whose annual output does not exceed 500 fine ozs. 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, that is: Three-quarters of the excess of average cost of production per fine oz. over £13 10s. 0d.

However, 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 overseas 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 during 1955, 1956 and 1957 are shown in the following table.

NET SUBSIDY PAYMENTS TO GOLD PRODUCERS.
(£.)

Year.	New South Wales.	Vict.	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

§ 3. Silver, Lead and Zinc.

1. **Mine Production.**—The following table shows for 1956 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, 1956.

Mineral in which contained.	Silver (fine oz.).	Lead (tons).	Zinc (tons).
Copper Ore and Concentrate	1,016,671	2,355	..
Gold Concentrate, etc.	205,388	..	..
Lead-Silver Ore	474,629	3,990	..
Lead Concentrate	12,241,159	286,020	..
Zinc Concentrate	648,350	7,120	278,082
Total	14,586,197	299,485	278,082

The following table shows the mine production of silver, lead and zinc in Australia, for the years 1952 to 1956.

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

Metal.	Unit.	1952.	1953.	1954.	1955.	1956.
Silver	'000 fine oz.	11,278	12,539	13,827	14,555	14,586
Lead	ton	228,196	269,344	284,862	295,944	299,485
Zinc	„	196,450	239,324	252,659	256,564	278,082

The following table shows the quantities of silver, lead and zinc contained in minerals won in the several States of Australia in the year 1956:—

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

State.	Silver (fine oz.).	Lead (tons).	Zinc (tons).
New South Wales	9,289,583	238,319	229,126
Victoria	2,255	..	..
Queensland	3,724,596	43,104	16,231
South Australia	653	17	7
Western Australia	192,589	5,828	..
Tasmania	1,372,881	12,217	32,718
Northern Territory	3,640	..	..
Australia	14,586,197	299,485	278,082

Particulars of the values ascribed to the various minerals containing silver, lead and zinc for the year 1956 are shown in the detailed table relating to mineral production on page 1004.

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 (galena) 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. 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 from Australia. 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 Omeo, Bethanga and Cassilis districts. There has been no production of lead ore in recent years, the total recorded production being about 800 tons valued at £5,892.

The whole of the Victorian mine production of silver, 2,255 fine oz. in 1956, was 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. In 1956, 51 tons of lead-silver ore, containing 17 tons of lead and 653 fine oz. of silver and 14 tons of zinc concentrate with a zinc content of seven tons, were produced. This was the first recorded production of zinc in South Australia since 1903.

(v) *Western Australia.* Production of lead concentrate in Western Australia was considerably higher in 1956 than in the previous year. During 1956, 1,282 tons of lead-silver ore and 6,331 tons of lead concentrate were produced, mainly from the Northampton area and from Braeside, east of Port Hedland.

Silver in Western Australia is obtained as a by-product of the gold-mining industry, which produced 182,820 fine oz. of silver out of the State's total production of 192,589 fine ozs. in 1956. There was no production of zinc in Western Australia during 1956.

(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 lead-silver ore in the Northern Territory in 1956.

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 Australian Mines and Metals Association and the Bureau of Mineral Resources. The figures shown for refined silver production include small quantities recovered from imported materials.

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

Particulars.	1952.	1953.	1954.	1955.	1956.
SILVER ('000 fine oz.).					
Production (a)	6,773	6,595	8,474	7,818	8,232
Sold to Australian consumers (b) ..	1,045	1,447	1,977	1,928	1,893
Exported or sold for export (b) ..	5,876	4,755	6,989	5,793	6,214
LEAD (tons).					
Refined Lead—					
Production (a)	156,639	172,468	200,409	187,134	194,506
Sold to Australian consumers (b) ..	31,566	31,663	42,088	45,851	38,616
Exported or sold for export (b) ..	119,648	141,007	153,847	148,189	151,628
Lead Bullion—					
Produced for export (a)	37,709	34,050	38,146	37,392	47,658
ZINC (tons).					
Production (a)	87,438	90,178	104,523	101,090	104,993
Sold to Australian consumers (b) ..	50,174	58,524	61,478	71,355	69,760
Exported or sold for export (b) ..	38,132	32,881	36,130	34,049	32,718

(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 1954 to 1956, 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 Overseas Geological Surveys.

SILVER, LEAD AND ZINC : MINE PRODUCTION IN PRINCIPAL COUNTRIES AND WORLD TOTAL, 1954 TO 1956.

Country.	1954.	1955.	1956.
SILVER (fine oz.).			
Mexico	39,896,467	47,957,655	43,077,046
United States of America	36,941,384	37,197,742	37,127,149
Canada	31,117,949	27,984,204	28,794,573
Peru	20,405,883	22,947,625	22,328,755
Australia	13,827,038	14,555,412	14,586,197
Bolivia	5,043,680	5,851,242	7,543,304
Japan	6,162,815	5,948,627	6,166,963
Belgian Congo	4,533,000	4,083,000	3,794,000
<i>Estimated World Total</i>	<i>189,000,000</i>	<i>197,000,000</i>	<i>195,000,000</i>
LEAD (long tons).			
United States of America	290,553	301,808	311,008
U.S.S.R.	(a) 275,000	(a) 290,000	(a) 305,000
Australia	284,862	295,944	299,485
Mexico	213,203	207,486	196,457
Canada	195,085	181,037	166,674
Peru	108,328	116,875	127,035
<i>Estimated World Total</i>	<i>2,028,000</i>	<i>2,110,000</i>	<i>2,140,000</i>
ZINC (long tons).			
United States of America	422,742	459,528	484,232
Canada	336,153	386,926	378,232
Australia	252,659	256,564	278,082
U.S.S.R.	(a) 240,000	(a) 255,000	(a) 270,000
Mexico	220,215	265,144	244,956
Peru	156,058	163,459	152,623
Poland	139,900	153,700	150,900
<i>Estimated World Total</i>	<i>2,560,000</i>	<i>2,770,000</i>	<i>2,880,000</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 1952 to 1956. 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.	1952.	1953.	1954.	1955.	1956.
<i>Australian Prices, in Australian currency—</i>					
Silver, per fine oz. (a) ..	s. d. 7 9	s. d. 7 8	s. d. 7 8	s. d. 8 1	s. d. 8 3
Lead, per ton	£ 75	£ 104	£ 114	£ 127	£ 140
Zinc, per ton	(b) 75	(c) 92	101	114	122
<i>London Metal Exchange Prices, in sterling—</i>					
Silver, per fine oz. ..	s. d. 6 2	s. d. 6 2	s. d. 6 2	s. d. 6 4	s. d. 6 7
Lead, per ton	£ 135	£ 91	£ 96	£ 106	£ 116
Zinc, per ton	(b) 150	75	78	91	98

(a) Silver prices shown represent export parity calculated from London Metal Exchange prices.
 (b) Prices fixed by regulation.
 (c) Price regulation was abandoned from 21st April, 1953; average market prices have been used thereafter.
 (d) Price regulation was abandoned from 1st October, 1952; 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 1040.

§ 4. Copper.

1. **Mine Production.**—Copper is widely distributed throughout Australia. However, the principal producing States in 1956 were Queensland, Tasmania, Northern Territory and New South Wales, in that order of magnitude. The opening of a new smelting plant at Mt. Isa in Queensland early in 1953 doubled the output of copper in Australia over the previous year, and production in 1956 was 53,041 tons. The table hereunder shows the quantity of mine production of copper (copper content of ores and concentrates produced) in Australia for the years 1952 to 1956. 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.	1952.	1953.	1954.	1955.	1956.
Copper Ore, Concentrate and Precipitate	16,125	33,007	37,041	41,674	48,860
Gold Ore, Concentrate, etc.	1	1	(a)	..	(a)
Lead Ore and Concentrate	2,163	3,037	3,241	3,224	3,462
Zinc Concentrate	289	540	575	598	719
Total	18,578	36,585	40,857	45,496	53,041

(a) Less than half a ton.

Particulars of the copper content of ores and concentrates produced in each producing State and the Northern Territory, as recorded by this Bureau from data obtained from the several State Mines Departments and other sources for the years 1952 to 1956, are shown in the table below.

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

State.	1952.	1953.	1954.	1955.	1956.
New South Wales	3,562	3,626	3,182	3,492	4,289
Queensland	6,966	23,955	27,207	30,738	34,898
South Australia	2	1	(a)	..	1
Western Australia	7	15	..	3	46
Tasmania	7,722	8,902	9,880	8,394	8,807
Northern Territory	319	86	588	2,869	5,000
Australia	18,578	36,585	40,857	45,496	53,041

(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 4,289 tons in 1956. 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 1956, mine production of copper amounted to 34,898 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 present 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 1956, 212 tons of copper concentrate containing 46 tons of copper were produced. The bulk of copper ore mined in Western Australia in recent years has been for use in fertilizers as a trace-element and details of its production are given in § 12, Non-metallic Minerals (*see* page 1039).

(v) *Tasmania.* The quantity of copper produced in Tasmania during 1956 was 8,807 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 5,000 tons of copper in the Northern Territory during 1956, 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. but details are not available for publication and are not included in the Northern Territory total.

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 1956 was 49,030 tons compared with 37,439 tons in 1955 and 20,008 tons before the opening of the Mt. Isa smelter in 1952.

At present Mt. Isa has no facilities for refining copper, and depending on local requirements and the refining capacity available at Port Kembla, the excess blister copper is exported to the United States of America for refining. Mt. Isa Mines are at present constructing an electrolytic refinery near Townsville, Queensland with an initial annual capacity of 30,000 tons. Blister copper produced at Mt. Morgan is shipped to Port Kembla for refining and the recovery of gold, which in 1956 averaged just over 7 fine ozs. 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.	1952.	1953.	1954.	1955.	1956.
Production (b)	19,623	16,682	29,287	28,148	29,307
Sold to Australian consumers (c)	17,884	15,415	29,361	27,366	29,038
Exported or sold for export (c) .. .. .	..	2,607	..	..	650

(a) Refined from domestic primary copper.

(b) Source: Bureau of Mineral Resources.

(c) Source: Australian Mines and Metals Association.

4. **Production in Principal Countries and World Total.**—The following table shows the mine production of copper during 1954, 1955 and 1956 from the principal producing countries as published by the Minerals Resources Division of the Overseas Geological Surveys and their estimate of total world production in those years.

COPPER: MINE PRODUCTION IN PRINCIPAL COUNTRIES AND WORLD TOTAL, 1954 TO 1956.
(Long Tons.)

Country.	1954.	1955.	1956.
United States of America	745,957	891,580	982,417
Chile	368,093	438,859	494,851
U.S.S.R.	(a) 355,000	(a) 400,000	(a) 425,000
Rhodesia	392,000	354,016	399,095
Canada	270,296	291,066	315,440
Belgian Congo	220,257	231,394	246,016
Mexico	53,940	53,812	82,528
Japan	65,228	71,845	77,230
Australia	40,857	45,496	53,041
Union of South Africa	41,641	43,963	45,762
Peru	37,818	42,718	45,618
<i>Estimated World Total</i>	<i>2,820,000</i>	<i>3,110,000</i>	<i>3,450,000</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.	1952.	1953.	1954.	1955.	1956.
Australia — in Australian currency(a)	309	330	(b) 310	437	435
United Kingdom—in sterling	259	(c) 253	249	352	304

(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 1040.

§ 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 1952 to 1956 as recorded by this Bureau.

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

State.	1952.	1953.	1954.	1955.	1956.
New South Wales	396	342	272	270	269
Victoria	39	31	26	2	..
Queensland	330	292	730	770	630
Western Australia	65	76	80	119	240
Tasmania	772	788	947	853	938
Northern Territory	9	24	20	3	1
Australia	1,611	1,553	2,075	2,017	2,078

2. **Sources of Production.**—(i) *New South Wales.* Production of tin concentrates in 1956 was 373 tons, with a tin content of 269 tons, compared with 378 tons (tin content 270 tons) in 1955. 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 1955 amounted to 3 tons of concentrates, with a tin content of 2 tons. In 1956, there was no production in the State.

(iii) *Queensland.* The chief districts in Queensland producing tin concentrates during 1956 were Herberton, 793 tons; Cooktown, 29 tons; Kangaroo Hills, 17 tons; Chillagoe, 22 tons; and Stanthorpe, nine tons. The total production in 1956 amounted to 883 tons, compared with 1,092 tons in 1955. The tin content in 1956 and 1955 was 630 tons and 770 tons respectively. 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 concentrates reported in this State in 1956 amounted to 358 tons with a tin content of 240 tons, compared with 180 tons in 1955 (tin content, 119 tons). Production was mainly in the Pilbara and Greenbushes fields.

(v) *Tasmania.* For 1956, the output amounted to 1,311 tons of tin concentrates, an increase of 79 tons on the output of the previous year. The tin content for 1956 was 938 tons and for 1955, 853 tons.

(vi) *Northern Territory.* The production for 1956 amounted to one ton of concentrate compared with five tons of concentrate produced during 1955. The tin content for 1956 and 1955 was one ton and three tons respectively.

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 1,850 tons in 1956, compared with 2,004 tons in 1955.

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 Nigeria 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, *in terms of metal*, as published by the International Tin Study Group and other authorities, for the principal producing countries in 1955 and 1956, was as follows.

TIN : PRODUCTION IN PRINCIPAL COUNTRIES.

(Long Tons.)

Country.	Production.		Country.	Production.	
	1955.	1956.		1955.	1956.
Malaya	61,244	62,296	Australia	2,017	2,078
Indonesia	33,366	29,579	Union of South Africa	1,283	1,442
Bolivia	27,921	26,421	Portugal	1,445	1,276
Belgian Congo ..	15,303	14,764	United Kingdom ..	1,037	1,066
Thailand	11,022	12,481			
Nigeria	8,159	9,067	<i>Estimated World</i>		
China	8,400	8,400	<i>Total(a)</i> ..	177,400	174,600

(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.		1952.	1953.	1954.	1955.	1956.
Australia—in Australian currency (a)	.. ..	1,151	919	911	947	1,014
United Kingdom—in sterling (b)	.. ..	965	731	720	741	788

(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 1040).

§ 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, 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 ore content are shown below for the years 1952 to 1956:—

IRON ORE : PRODUCTION, AUSTRALIA.
(Tons.)

Particulars.		1952.	1953.	1954.	1955.	1956.
Production of Iron Ore	..	2,907,754	3,298,718	3,518,804	3,572,609	3,923,985
Estimated Iron Content	..	1,883,087	2,131,865	2,274,330	2,304,165	2,542,826

(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 1956, 3,527 tons of oxide were won.

(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 1955, 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 4,093 tons of iron oxide for 1956 came from the Townsville district.

(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 in the Middleback Ranges near Whyalla. Production in 1956 reached a record level of 3,587,095 tons (estimated iron content, 2,331,611 tons). The deposits of iron ore at Iron Baron and Iron Prince are

now being developed. 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 1956 was 336,890 tons with an estimated iron content of 211,215 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 1956, 5,685 tons of iron oxide were produced for fluxing and other purposes.

(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.**—Imports of iron ore from New Caledonia began in 1956. 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. During 1956, 14,052 tons of iron ore were imported into Australia, compared with 32 tons in 1955.

4. **Sources of Production.**—(i) *Australia.* The production of pig-iron and steel 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, 1948 to 1957.

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.
1948	1,235,574	1,344,692	1953	1,691,693	1,801,028
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

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

In 1957, 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.

(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 Australian Iron and Steel Ltd. at Port Kembla. The expansion of the steelworks at Port Kembla was carried a step further in October, 1956, when two new open hearth steel furnaces, each of 275 tons capacity, were brought into operation. In January, 1957, the iron ore sintering plant was installed to handle the fine friable iron ore from Yampi Sound in Western Australia. The hot-dip tinplate mill at Port Kembla began production in August, 1957. Plant capacity is 70,000 tons a year, about 60 per cent of present Australian requirements, but 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. 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 1955-56 amounted to 12,028 tons and during 1956-57 to 14,020 tons. At Kwinana in Western Australia, the 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 1955 and 1956 according to figures published by the Mineral Resources Division of the 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.	
	1955.	1956.	1955.	1956.
United States of America	70,771	69,264	104,497	102,872
U.S.S.R.	32,800	35,200	44,600	47,800
Germany—				
Federal Republic	16,222	17,299	20,999	22,823
Eastern	1,492	1,549	2,468	2,697
United Kingdom	12,470	13,170	19,791	20,659
France	10,787	11,299	12,393	13,186
Japan	5,357	6,168	9,259	10,931
Belgium	5,302	5,670	5,807	6,286
Italy	1,706	1,964	5,309	5,814
Poland	3,063	3,451	4,357	4,935
Czechoslovakia	2,950	3,230	4,403	4,805
Canada	3,018	3,402	4,044	4,737
China	3,700	4,700	2,740	4,280
Luxemburg	3,036	3,261	3,174	3,401
Saar	2,833	2,983	3,115	3,321
Australia	1,798	2,074	2,201	2,584
Sweden	1,227	1,386	2,093	2,366
India	1,895	1,958	1,704	1,738
<i>Estimated World Total ..</i>	<i>189,300</i>	<i>197,500</i>	<i>264,700</i>	<i>278,000</i>

(a) Long tons.

§ 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. Production of tungsten concentrates and contents during 1956 in each producing State and Territory is shown below:—

TUNGSTEN CONCENTRATES : PRODUCTION, 1956.
(Tons.)

Particulars.	N.S.W.	Q'land.	Tas.	N. Terr.	Australia.
Scheelite Concentrate ..	2	5	1,488	..	1,495
WO ₃ Content ..	2	3	985	..	990
Wolfram Concentrate ..	4	70	647	156	877
WO ₃ Content ..	2	46	443	101	592

The following table shows production for Australia for the years 1952 to 1956:—

TUNGSTEN CONCENTRATES : PRODUCTION, AUSTRALIA.
(Tons.)

Particulars.	1952.	1953.	1954.	1955.	1956.
Scheelite Concentrate ..	989	1,185	1,331	1,449	1,495
WO ₃ Content ..	602	729	861	960	990
Wolfram Concentrate ..	1,035	1,008	722	788	877
WO ₃ Content ..	672	672	511	522	592

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 1952 to 1956 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.	
1952	38,014	36,861	48	20	36,881
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

(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 1952 to 1956 is shown in the following table:—

ZIRCON PRODUCTION, AUSTRALIA.

(Tons.)

State.	1952.	1953.	1954.	1955.	1956.
New South Wales	17,156	15,528	27,489	32,827	50,660
Queensland	10,540	11,679	13,964	15,846	21,798
<i>Total</i>	27,696	27,207	41,453	48,673	72,458
Zircon Content	27,571	26,858	40,920	48,209	71,769

3. *Cadmium and Cobalt.*—The sources of cadmium in Australia are lead and zinc concentrates. The cadmium content of these concentrates produced was 844 tons during 1955 and 922 tons in 1956. 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 61 tons in 1955 and at 59 tons in 1956.

Production of refined cadmium and cobalt oxide for the years 1952 to 1956 is shown in the following table:—

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

(Tons.)

Year.	Cadmium (Refined). Extracted from Ores Mined in—			Cobalt Oxide. Extracted from Ores Mined in New South Wales.(b)
	New South Wales.	Tasmania.	Total.	
1952	245	41	286	16
1953	257	40	297	17
1954	239	49	288	18
1955	261	40	301	18
1956	232	44	276	19

(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 increased output in Western Australia at Ragged Hills, 250 miles south-east of Port Hedland, and at Horseshoe, north of Meekatharra. In 1955, the mining of manganese commenced near Muchetty in the Northern Territory and 1,462 tons of ore with a manganese dioxide content of 975 tons were produced during 1955, and 1326 tons with a manganese dioxide content of 914 tons during 1956.

The following table shows the production of metallurgical grade and battery and other grades of manganese ore for the years 1952 to 1956:—

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.
1952 ..	981	..	5,045	6,026	1,043	..	..	1,043
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

5. **Other.**—The production, in 1956 (1955 shown in parentheses) of other metallic minerals worthy of note, is as follows:—

Antimony. The antimony content of antimony-bearing minerals produced was 903 tons (922 tons). Of this amount, 616 tons (615 tons) were in lead concentrate and 287 tons (307 tons) in 547 tons (650 tons) of antimony ore and concentrate.

Bauxite. 10,329 tons (7,563 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 beryl ore was 318 tons (206 tons) which came mainly from Western Australia where the Pilbara gold field was the main producing area. The beryllium oxide content of the beryl ore was 3,768 units (2,428 units).

Chromium. Production of chromite was recorded as 6,096 tons in 1956, with a chromic oxide content of 2,624 tons. This all came from Coobina in Western Australia. There was no production recorded in 1955.

Tantalite-Columbite. The production of tantalite-columbite concentrate was 159,655 lb. (27,139 lb.) and the whole of this output came from Western Australia. The tantalum pentoxide and columbium pentoxide content of the concentrates was 85,690 lb. (15,454 lb.).

Other. Other metallic minerals produced in Australia in small quantities during 1956 were bismuth, molybdenite 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 1952 to 1956 are shown in the following table. Of the total production of black coal in 1956, 81,143 tons were classified as semi-anthracite, 17,681,258 tons as bituminous and 1,511,433 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).

1952	..	15,022	144	2,742	418	830	248	19,404	8,104
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

VALUE(a) (£'000).

1952	..	43,283	724	5,956	430	2,457	475	53,325	3,259
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	2,905	629	52,621	4,635

(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 1956 it was 2,149,952 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 and 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 1952 to 1956 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.
1952 ..	Underground ..	12,492	144	2,006	..	419	240	15,301
	Opencut ..	2,530	..	736	418	411	8	4,103
	Total ..	15,022	144	2,742	418	830	248	19,404
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

(a). Less than 500 tons.

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 1952 to 1956:—

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

Particulars.	1952.	1953.	1954.	1955.	1956.
Semi-anthracite ..	420	..	..	1,658	..
Bituminous ..	15,008,489	14,164,603	15,065,979	14,718,426	14,792,853
Sub-bituminous ..	13,191	9,228	17,281	16,313	17,312
<i>Total</i> ..	<i>15,022,100</i>	<i>14,173,831</i>	<i>15,083,260</i>	<i>14,736,397</i>	<i>14,810,165</i>
Underground mines ..	12,491,904	12,451,741	13,703,289	13,834,824	13,999,615
Open-cut mines ..	2,530,196	1,722,090	1,379,971	901,573	810,550

(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 1956, production of bituminous coal was 118,827 tons compared with 132,888 tons in 1955.

(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 10,559,801 tons of brown coal produced in 1956, 9,661,180 tons, or 91 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 635,716 tons in 1955. 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 1951–52 to 1955–56.

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

Year.	Production.	Consumption as Fuel.			Consumption as Raw Material in Briquette Manufacture.	Balance (available for consumption and accumulation of stocks).	Briquettes Manufactured.
		Electricity Generation.	Briquette Factory.	Other Factories. (a)			
1951–52 ..	8,096	4,784	776	876	1,553	107	568
1952–53 ..	8,075	4,933	729	837	1,457	119	545
1953–54 ..	8,731	5,307	780	920	1,560	164	587
1954–55 ..	9,668	5,899	842	1,088	1,684	155	631
1955–56 ..	10,383	6,517	843	1,191	1,686	146	634

(a) Recorded consumption.

(iii) *Queensland.* The production of coal classified according to rank and type of mining during the years 1952 to 1956 was as follows:—

COAL : PRODUCTION IN QUEENSLAND.
(Tons.)

Particulars.	1952.	1953.	1954.	1955.	1956.
Semi-anthracite ..	83,373	80,979	72,459	80,442	79,316
Bituminous ..	2,312,167	2,215,078	2,377,883	2,459,727	2,472,692
Sub-bituminous ..	346,696	220,755	310,468	206,996	182,651
<i>Total ..</i>	<i>2,742,236</i>	<i>2,516,812</i>	<i>2,760,810</i>	<i>2,747,165</i>	<i>2,734,659</i>
Underground mines ..	2,006,321	1,941,631	2,066,788	2,108,065	2,103,641
Open-cut mines ..	735,915	575,181	694,022	639,100	631,018

The principal coal-producing districts in Queensland are Ipswich, Clermont, Mount Morgan and Bowen; output from these areas in 1956 amounted to 2,294,076 tons or 84 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 1956, the output from opencuts declined to 631,018 tons, or 23 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 481,463 tons in 1956.

(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 1956 was 830,007 tons, compared with 903,793 tons in 1955. 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 1956, 208,540 tons, or about one quarter 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, 1,827 tons in 1956, 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 1956, output amounted to 298,713 tons of which 18,381 tons came from opencut mining.

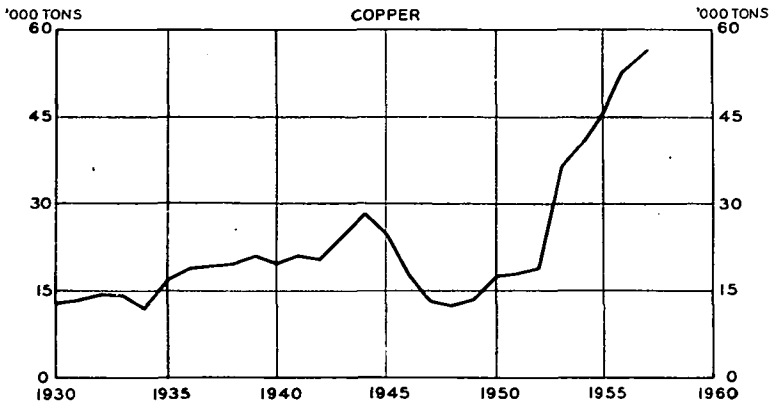
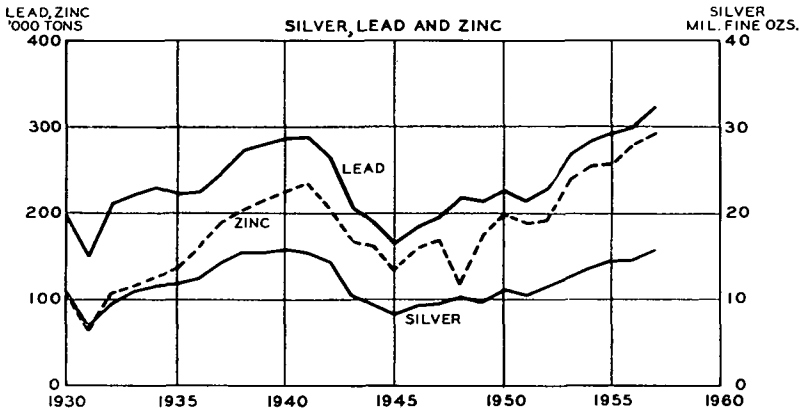
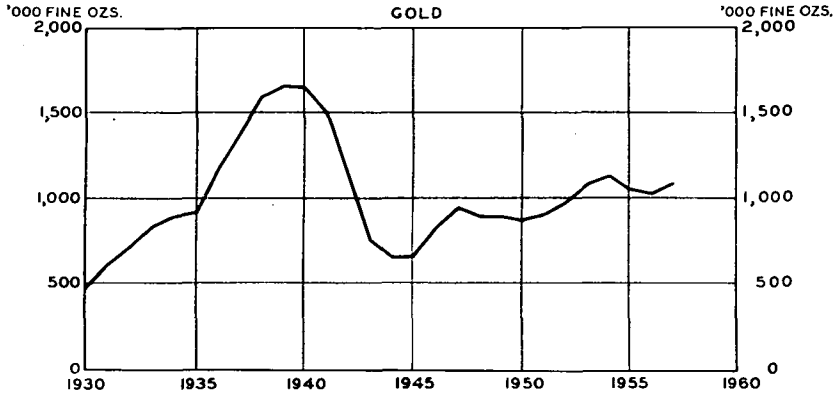
(vii) *Australia's Coal Reserves.* The latest available estimate of the actual and probable coal reserves of Australia is that prepared by the Coal and Lignites Panel of the Power Survey Sectional Committee of the Standards Association of Australia, and is shown in the following table.

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

MINE PRODUCTION OF PRINCIPAL METALS (METALLIC CONTENT OF MINERALS)

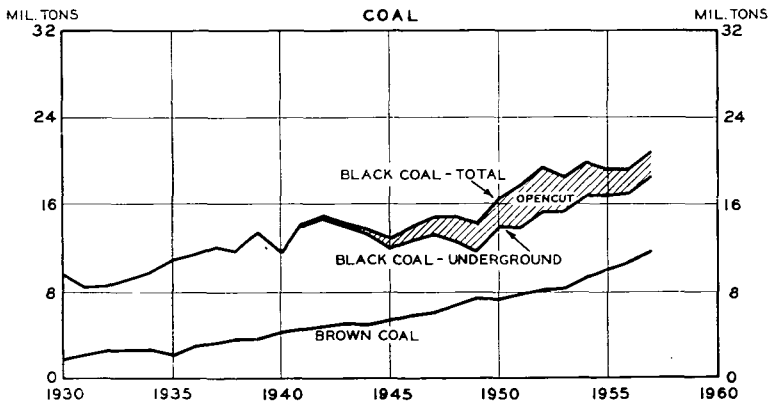
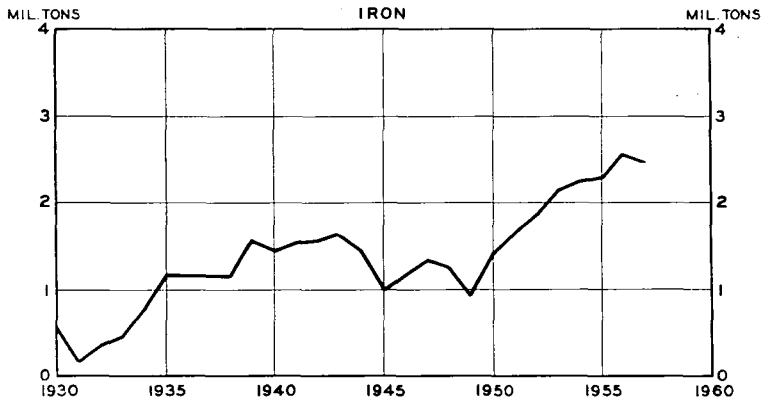
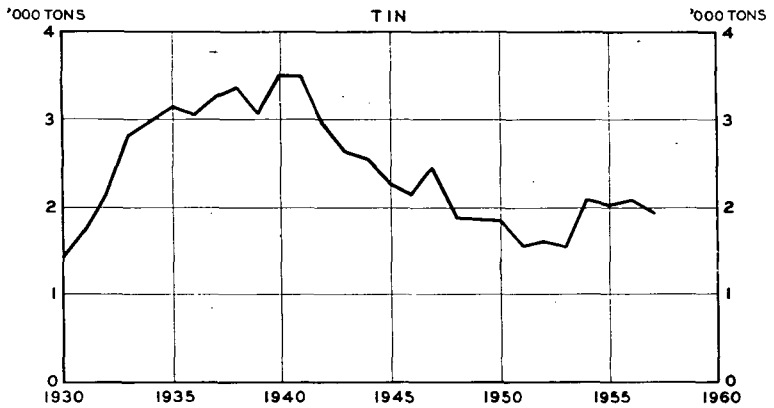
AUSTRALIA, 1930 TO 1957



MINE PRODUCTION OF PRINCIPAL METALS AND PRODUCTION OF COAL

(METALLIC CONTENT OF MINERALS)

AUSTRALIA, 1930 TO 1957



3. **Production in Principal Countries.**—The following table shows the production of the principal countries in 1955 and 1956 as published by the Mineral Resources Division of the Overseas Geological Surveys.

COAL: PRODUCTION IN PRINCIPAL COUNTRIES.
(’000 Tons.)(a)

Country.	Black Coal.		Brown Coal and Lignite.	
	1955.	1956.	1955.	1956.
United States of America ..	435,422	469,318	2,827	2,627
U.S.S.R.	272,300	298,900	112,800	123,500
United Kingdom	221,551	222,006	..	..
Germany—				
Federal Republic	130,452	134,051	88,910	93,729
Eastern	3,000	3,000	198,200	202,600
China	91,000	103,200	..	..
Poland	92,984	93,646	5,949	6,085
France	54,461	54,257	2,021	2,220
Japan	41,750	45,819	1,346	1,496
India	38,213	39,430	..	..
Union of South Africa	31,639	33,071	..	..
Belgium	29,503	29,088	..	..
Czechoslovakia	21,785	23,041	40,107	45,568
Australia	19,275	19,274	10,112	10,560
Saar	17,056	16,818	..	..
Spain	12,228	12,649	1,807	1,901
Netherlands	11,707	11,469	251	265
Canada	11,183	11,227	2,048	2,091
Hungary	2,649	2,334	19,314	17,932
Yugoslavia	1,119	1,213	13,848	15,618
<i>Estimated World Total</i> ..	<i>1,584,000</i>	<i>1,665,000</i>	<i>518,000</i>	<i>545,000</i>

(a) Long tons.

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 1952–53 to 1956–57 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.	£
1952–53	255,832	1,178,466	42,623	215,776
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

(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 1956–57 (15,175,232 tons), 12,442,107 tons (82 per cent.) were available for consumption in the State, 2,003,588 tons (13 per cent.) were exported interstate and 729,537 tons (5 per cent.) were exported overseas or 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 1951–52 to 1955–56.

BLACK COAL : PRODUCTION AND DISPOSAL.
(^{'000} Tons.)

Particulars.	1951-52.	1952-53.	1953-54.	1954-55.	1955-56.
Production(a)	19,170	18,545	19,424	19,352	19,033
Imports	285	146	2	5	4
Total	19,455	18,691	19,426	19,357	19,037
Disposals—					
<i>Consumption as Fuel—</i>					
Electricity Generation ..	5,042	5,071	5,590	5,916	5,922
Factories	3,090	3,097	3,367	3,329	3,101
Railway Locomotives(b)..	3,291	3,110	3,208	3,112	2,963
<i>Bunker Coal—</i>					
Oversea Vessels ..	54	43	32	25	39
Interstate Vessels ..	227	229	228	218	198
Total	11,704	11,550	12,425	12,600	12,223
<i>Consumption as raw material—</i>					
Gas works	2,097	2,081	2,047	2,063	2,031
Coke works	2,835	3,071	3,252	3,314	3,258
Total	4,932	5,152	5,299	5,377	5,289
Exports (Oversea) ..	139	256	386	291	194
Balance—Unrecorded consumption, other purposes(c)	2,680	1,733	1,316	1,089	1,331
Grand Total ..	19,455	18,691	19,426	19,357	19,037

(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 1956-57, exports of black coal were 545,101 tons and imports were 6,191 tons.

6. Value at the Mine in New South Wales.—Particulars of the average values at the mine (or at screens 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 1952 to 1956. Saleable coal is taken to exclude miners' coal, coal consumed at the mines and other producer-consumed coal. Stocks of coal held at grass by the Commonwealth Government are also excluded. 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.
1952.. ..	62 3	60 3	56 7	61 2
1953.. ..	62 1	61 0	56 9	61 1
1954.. ..	59 11	59 0	57 1	59 3
1955.. ..	59 3	58 10	55 3	58 7
1956.. ..	58 2	58 0	54 4	57 8

7. Values in New South Wales, Great Britain and the United States of America.—The following table shows, for the years 1952 to 1956, 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, GREAT
BRITAIN AND UNITED STATES OF AMERICA.**

Country.	1952.	1953.	1954.	1955.	1956.
	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>	<i>s. d.</i>
New South Wales—Bituminous(a) ..	61 2	61 1	59 3	58 7	57 8
Great Britain—Deep mined(b)	57 3	61 1½	63 6	68 0½	77 0
United States of America— Bituminous and lignite(c) ..	\$ 4.90	\$ 4.92	\$ 4.51	\$ 4.49	\$ 4.93

(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 1952 to 1956 is shown in the following table.

COAL-MINES : PERSONS EMPLOYED.

Year.	New South Wales.	Victoria.		Queensland.	South Australia.	Western Australia.	Tasmania.	Australia.
		Black.	Brown.					
1952 ..	20,151	848	1,694	3,715	220	1,326	349	28,303
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	3,618	280	1,432	367	27,146
1956 ..	17,918	610	1,561	3,568	260	1,190	349	25,456

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 1956, it was 25,456. In New South Wales in 1956, 9,243,545 tons of coal, or 66 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 1952 to 1956. 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.
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PRODUCTION PER MAN-SHIFT WORKED AT COAL FACE.

1952 ..	10.06	2.24	6.36	6.82	6.03	8.88
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

PRODUCTION PER MAN-SHIFT WORKED BY ALL EMPLOYEES.

1952 ..	3.00	0.83	2.55	1.64	3.01	2.81
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

(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 1952 to 1956. 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.
1952	7.92	11.78	(a) 3.22	6.13	4.63	7.07
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

(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 1955–56 it reached the record level of 2,058,426 tons. Imports exceeded exports prior to 1952–53 but in 1952–53 and later years there has been a net export surplus. In 1955–56, exports amounted to 66,590 tons and 3,444 tons were imported, while in 1956–57 exports further increased to 129,397 tons (126,527 tons to New Caledonia) and imports amounted to 8,206 tons.

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 1,031,135 tons.

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 1951–52 to 1955–56. The figures exclude output of coke breeze, which in 1955–56 amounted to 340,834 tons.

COKE PRODUCTION : AUSTRALIA.
(Tons.)

Industry.	1951–52.	1952–53.	1953–54.	1954–55.	1955–56.
Coke Works	1,636,982	1,858,428	2,010,404	2,046,790	2,058,426
Gas Works	1,203,602	1,071,106	943,344	1,099,859	1,031,135
Total	2,840,584	2,929,534	2,953,748	3,146,649	3,089,561

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 1955–56 (1954–55 in parentheses) were crude tar, 54,352,000 gallons (46,609,000 gallons); refined tar 25,914,000 gallons (17,120,000 gallons); and ammonium sulphate 75,321 tons (78,434 tons).

§ 10. Mineral Oils.

1. **Australia.**—Natural oil has been proved to exist in Queensland and Victoria and also in Western Australia, where, in 1953, potential oil production was found at Rough Range. Following this discovery, structural control drilling and field exploration have increased enormously.

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

Individual subsidies will be limited to not more than half the cost of each hole.

Oil companies responded well to this offer and, at the end of February 1958, applications were receiving attention.

Drilling programmes are being carried out in all States of the Commonwealth except Tasmania and in the Northern Territory. A brief outline of these activities during 1957 and up to February, 1958, is given below.

2. **New South Wales.**—The Australian Oil & Gas Corporation Ltd. drilled Dural No. 1 to 5,203 feet. Low pressure methane gas was recorded at several horizons and salt water was encountered at 5,200 feet. Kurrajong Heights No. 1 was abandoned at 4,755 feet.

Dural No. 2 is drilling ahead and a number of shallow stratigraphical and geological holes are being drilled in the Camden, Morisset, and Yass districts.

3. **Victoria.**—Woodside (Lakes Entrance) Oil Co. Ltd. drilled Woodside No. 2 to 8,862 feet before abandoning. The casing was perforated over the intervals 1,310 to 1,345 feet and 5,583 to 5,618 feet, and a drill stem test held but no flow oil was recovered.

Oilco No. 1 reached basement at 1,366 feet and Hedley No. 1 was drilling ahead at 3,650 feet.

Frome Lakes Pty. Ltd.'s No. 3 in Gippsland was abandoned in brown coal at 1,876 feet.

4. **Queensland.**—Associated Australian Oilfields N.L. drilled a well at Arcadia to 3,280 feet.

Frome Broken Hill Pty. Ltd. in association with other companies reached basement at 2,822 feet in a hole at Wyaaba.

South Pacific Pty. Ltd. drilled to 5,186 feet at Tambo before abandoning the well as a dry hole. Zinc Corporation Ltd. drilled a hole at Weipa on the Cape York Peninsula to a depth of 3,243 feet. Australian Oil and Gas Corporation Ltd. drilled a shallow stratigraphic test at Talbalba.

5. **South Australia.**—Following extensive seismic surveys by the Commonwealth Bureau of Mineral Resources, Santos Ltd. drilled a series of shallow stratigraphical holes in the Wilkatana, Oodnadatta and Cordillo Downs areas. Minor showings of oil were reported.

6. **Western Australia.**—West Australian Petroleum Pty. Ltd. drilled a number of structure holes in the Exmouth Gulf and Canning Basin areas. Dirk Hartog Island No. 1 and Rough Range No. 10 were completed as dry holes at 4,998 and 3,740 feet, and Learmonth No. 1 was drilling ahead at 5,228 feet. Yanrey No. 1 on the East Coast of Exmouth Gulf encountered basement at 1,395 feet, and a shallow stratigraphical hole at Wallal in the Kimberleys was drilled to 1,010 feet.

Seismic surveys followed gravity and magnetometer work in the Samphire Marsh area of the Kimberleys and the Meda area of the North Fitzroy Basin. Associated Freney Oilfields N.L. drilled their Sisters Well in the Kimberleys to 9,825 feet in grey, medium to coarse, micaceous sandstone before abandoning as a dry hole.

7. **Papua.**—Australasian Petroleum Co. Pty. Ltd. and Island Exploration Co. Pty. Ltd., the joint exploration companies operating in Western Papua, continued extensive geological and geophysical surveys and also drilled a series of deep tests. Komewa was completed in basement at 6,393 feet. Kuru No. 2 was abandoned at 7,305 feet due to formation difficulties. Morehead was abandoned at 8,087 feet after a velocity survey showed the close proximity of basement.

Sireru No. 1 was completed at 1,510 feet.

Barikewa No. 1 was drilling ahead at 8,025 feet and locations were being prepared to drill Kuru No. 3 and Puri No. 1

Papuan Apinaipi Petroleum Co. Ltd. were preparing to spud in on the Kaufana Anticline.

§ 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.

Production of pyrite concentrate at Nairne in South Australia commenced early in 1955. The output from this mine is supplied to the new sulphuric acid plant which was opened at Port Adelaide in August, 1955. This new plant has an annual capacity of 100,000 tons of sulphuric acid and requires 70,000 tons of pyrite concentrate from Nairne annually. The production of pyritic ore and pyrite concentrate in Australia during 1956 is shown in the following table:—

PYRITE PRODUCTION: STATES, 1956.

(Tons.)

Item.	N.S.W.	Q'land.	S. Aust.	W. Aust.	Tas.	Australia.
Pyritic Ore ..	..	..	..	12,629	..	12,629
Pyrite Concentrate	1,088	10,250	65,097	43,051	52,373	171,859

The following table shows for the years 1952 to 1956 the sulphur content of sulphur-bearing minerals produced, quantities of sulphur recoverable therefrom, production of monohydrate acid (100 per cent. sulphuric acid), and sulphur content of monohydrate acid produced. Particulars regarding spent oxide roasted have been included to complete the statistics relating to recovery of sulphur and monohydrate acid production.

SULPHUR PRODUCTION : AUSTRALIA.

(Tons.)

Item.	1952.	1953.	1954.	1955.	1956.
<i>Sulphur contained in—</i>					
Zinc concentrate	119,515	141,954	152,074	155,836	168,714
Lead concentrate .. ..	..	..	..	..	83,512
Pyrite	93,516	77,811	97,649	107,724	86,787
Spent Oxide Roasted (a) ..	4,211	5,432	4,680	5,511	5,877
<i>Total Sulphur Content</i> ..	217,242	225,197	254,403	269,071	344,890
<i>Recoverable Sulphur (a)</i> ..	189,436	195,471	221,265	232,552	268,443
<i>Monohydrate Acid Produced</i> ..	628,302	671,471	778,008	895,765	841,225
<i>Quantity of Sulphur in Monohydrate Acid produced from—</i>					
Sulphur (Elemental) (b) ..	112,225	123,469	154,337	187,015	146,816
Zinc concentrate	33,115	31,270	33,564	30,412	29,061
Lead concentrate .. ..	..	..	..	..	16,090
Pyrite	57,891	60,811	62,533	71,179	76,780
Spent Oxide	3,231	3,973	3,973	4,295	4,643
Other Materials .. ..	..	..	..	..	1,694
<i>Total</i>	206,462	219,523	254,407	292,901	275,084

(a) Estimated.

(b) 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 and crocidolite, the former being the most important type economically. The deposits of chrysotile, however, are relatively small and widely scattered. The principal deposits of asbestos are of crocidolite, and they occur in the Hammersley Ranges in Western Australia, about 200 miles south-east of Roebourne. 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. However, high costs of production due to heavy freight charges and the difficulty of retaining labour in an isolated community have prevented greater development of the project.

The production of chrysotile and crocidolite in Australia during the five years 1952 to 1956 is shown in the following table:—

PRODUCTION OF ASBESTOS : STATES.
(Tons.)

Year.	Chrysotile.			Crocidolite.	
	New South Wales.	Western Australia.	Australia.	Western Australia.	Australia.
1952	466	652	1,118	2,940	2,940
1953	569	606	1,175	3,795	3,795
1954	616	303	919	3,794	3,794
1955	590	275	865	4,487	4,487
1956	622	761	1,383	7,286	7,286

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 1956.

PRODUCTION OF CLAYS : STATES, 1956.
(Tons.)

Type.	New South Wales.	Victoria.	Queensland	South Australia.	Western Australia.	Tasmania.	Total.
Bentonite	63	..	..	..	1,404	..	1,467
Brick Clay and Shale	1,521,267	878,799	264,260	325,788	(a) 361,923	(a) 74,292	3,426,329
Cement Clay and Shale	115,564	..	..	19,220	18,314	..	153,098
Damourite .. ..	..	..	..	472	..	..	472
Fireclay	82,219	27,020	8,508	18,711	9,437	..	145,895
Fuller's Earth	195	..	..	..	40	..	235
Kaolin	23,007	5,867	341	3,517	2,090	6,267	41,089
Stoneware Clay	80,609	..	217	42,441	..	..	123,267
Tile Clay	136,757	(a) 53,422	..	..	..	..	190,179
Other Clays	7,749	106,478	..	..	..	..	114,227

(a) Estimated.

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 1956 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 1952 to 1956.

PRODUCTION OF GYPSUM : STATES.

(Tons.)

Year.	New South Wales.	Victoria.	South Australia.	Western Australia.	Australia.
1952	89,226	47,295	164,825	50,332	351,678
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

4. **Limestone.**—Limestone is quarried in all States, but statistics of production are incomplete as Queensland figures do not include limestone quarried for cement manufacture. Limestone is used mainly for the manufacture of cement, other uses being in the steel industry as a metallurgical flux, in the chemical industry, and in agriculture.

The recorded statistics of limestone production in each State of Australia during 1955 and 1956 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, 1955 AND 1956.

('000 Tons.)

Year.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Total.
1955 ..	1,690	714	121	987	(b) 280	206	3,998
1956 ..	1,700	814	139	1,076	356	179	4,264

(a) Includes shell and coral.

(b) Estimated.

5. **Magnesite.**—The major sources of magnesite at present are deposits at Fifield and Thuddungra 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 1952 to 1956, are set out in the table below.

PRODUCTION OF MAGNESITE : STATES.

(Tons.)

Year.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Australia.
1952	40,333	164	13	572	1,055	42,137
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

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 1045—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 1952 to 1956.

MUSCOVITE MICA PRODUCTION.

(lb.)

Particulars.	1952.	1953.	1954.	1955.	1956.
New South Wales—					
Scrap .. ..	..	..	15,680	20,160	..
Northern Territory—					
Trimmed	71,929	70,684	84,619	56,649	28,837
Crude and Film ..		1,542	..	..	..
Scrap .. ..		..	65,184	..	..

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 1952 to 1956. Estimates of total Australian production are also shown.

SALT PRODUCTION.

('000 Tons.)

Particulars.	1952.	1953.	1954.	1955.	1956.
South Australia	203	239	304	291	332
Estimated Australian Total ..	277	310	380	370	410

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 barite is at Orparinna in the north Flinders Range in South Australia where the deposits are of first-grade quality. The production of barite in Australia during 1956 was 6,009 tons, of which 4,040 tons came from South Australia, 1,042 tons from New South Wales, and 927 tons from Western Australia.

(iii) *Cupreous Ore and Concentrate*. Cupreous ore is mined in Western Australia for mixing with superphosphate fertilizer. The quantity produced in 1956 was 7,713 tons with an average grade of 8.60 per cent.

(iv) *Diatomite*. Production of diatomite is carried on mainly in the eastern States of Australia. In 1956, 5,789 tons were produced, and of this total, New South Wales produced 5,002 tons.

(v) *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 1956, New South Wales produced 7,599 tons; Queensland, 5,510 tons; South Australia, 101,496 tons; Western Australia, 171 tons; and Tasmania, 788 tons, making an Australian total of 115,564 tons.

(vi) *Felspar*. The main demand for felspar comes from the glass and ceramic industries. About half the Australian production of felspar comes from New South Wales which produced 10,244 tons of the Australian total of 18,629 tons in 1956. Of the remainder, 4,604 tons came from South Australia and 3,781 tons from Western Australia.

(vii) *Gemstones*. (a) *Diamonds*. Gem quality diamonds are not produced in Australia, but, in 1956, 383 carats of industrial diamonds valued at £3,834 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 £120,529 in 1956. Other production in 1956 was from the Quilpie district in Queensland, valued at £1,337, and £2,750 from Lightning Ridge in New South Wales.

(c) *Sapphires*. The Anakie field in Central Queensland is the only Australian producer of sapphires. Output in 1956 was valued at £691.

(viii) *Silica*. The production of silica is not recorded in Victoria and Queensland. The output of silica, which includes glass sand, quartz, quartzite, sand, sandstone, and silicious abrasives, was 131,155 tons in New South Wales; 16,532 tons in South Australia; 7,343 tons in Western Australia; and 4,858 tons in Tasmania, giving a total of 159,888 tons for those States during 1956.

(ix) *Sillimanite*. In 1956, 2,181 tons of sillimanite were produced in Australia. New South Wales contributed 1,585 tons and the remaining 596 tons came from South Australia.

(x) *Talc*. The Australian output of talc (including steatite), was 13,035 tons in 1956. New South Wales produced 673 tons, South Australia 7,906 tons and Western Australia 4,456 tons.

(xi) *Other*. Other non-metallic minerals produced in Australia in small quantities during 1956 were fluorite, garnet, graphite, glauconite, mineral pigments, pebbles for grinding, phosphate rock, pyrophyllite, serpentine, slate and vermiculite.

§ 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 and Australia as a whole in 1956.

EMPLOYMENT IN MINING, 1956. (a)

Industry.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal Mining—									
Gold Mining ..	107	379	133	(b)	5,612	..	257	..	6,488
Silver-Lead-Zinc Mining ..	6,784	..	(c)	(b)	(c)	764	(c)	..	10,623
Copper-Gold Mining ..	47	..	(c)	(b)	(c)	(c)	195	..	2,210
Tin Mining ..	113	..	320	..	62	435	8	..	938
Mineral Sands Mining ..	986	..	598	..	(c)	..	(c)	..	1,592
Other Metal Mining ..	45	14	(c)	414	322	(c)	93	..	1,420
Total, Metal Mining	8,082	393	5,326	414	6,162	2,301	593	..	23,271
Fuel Mining—									
Black Coal Mining—									
Underground ..	17,598	610	3,393	..	1,190	349	..	..	23,895
Open-cut ..	320	..	175	260					
Total ..	17,918	610	3,568	260	1,190	349	..	..	23,895
Brown Coal Mining ..	..	1,566	..	..	..	..	..	..	1,566
Oil Mining ..	(d)	(d)	..	..	..	..	14	..	14
Total, Fuel Mining	17,918	2,176	3,568	260	1,190	349	14	..	25,475
Non-metal (excluding Fuel)									
Mining ..	1,071	350	205	735	436	142	31	(e)	2,970
Total, All Mining	27,071	2,919	9,099	1,409	7,788	2,792	638	(e)	51,716
Construction Material									
Quarrying ..	1,245	1,682	240	804	242	74	..	42	4,329
Total, All Mining and Quarrying ..	28,316	4,601	9,339	2,213	8,030	2,866	638	42	56,045

(a) Average employment during whole year. (b) Not available for publication; included with "Other Metal Mining". (c) Not available for publication. (d) Not available for publication; included with "Non-Metal Mining". (e) Not available for publication; included with "Construction Material Quarrying".

The following table shows particulars of mining employment in Australia for the years 1952 to 1956. The figures show for 1952 the average number of persons employed during the period worked by individual mines or quarries, and for 1953 and later years the average number of persons employed during the whole year.

EMPLOYMENT IN MINING : AUSTRALIA.

Industry.	1952.	1953.	1954.	1955.	1956.
<i>Metal Mining—</i>					
Gold Mining	6,583	7,050	7,192	6,753	6,488
Silver-Lead-Zinc Mining	9,497	9,686	9,397	10,076	10,623
Copper-Gold Mining	2,112	2,025	1,957	2,062	2,210
Tin Mining	999	1,063	969	937	938
Mineral Sands Mining	619	597	598	891	1,592
Other Metal Mining	1,601	1,601	1,253	1,273	1,420
<i>Total, Metal Mining</i>	<i>21,411</i>	<i>22,022</i>	<i>21,366</i>	<i>21,992</i>	<i>23,271</i>
<i>Fuel Mining—</i>					
Black Coal Mining	26,612	26,606	26,614	25,660	23,895
Brown Coal Mining	1,691	1,598	1,598	1,502	1,566
Oil Mining	112	(a)	56	68	14
<i>Total, Fuel Mining</i>	<i>28,415</i>	<i>28,204</i>	<i>28,268</i>	<i>27,230</i>	<i>25,475</i>
<i>Non-metal (excluding Fuel) Mining</i>	<i>3,070</i>	<i>(b) 2,946</i>	<i>2,858</i>	<i>2,875</i>	<i>2,970</i>
<i>Total, All Mining</i>	<i>52,896</i>	<i>53,172</i>	<i>52,492</i>	<i>52,097</i>	<i>51,716</i>
<i>Construction Material Quarrying</i>	<i>4,162</i>	<i>3,803</i>	<i>4,121</i>	<i>4,197</i>	<i>4,329</i>
<i>Total, All Mining and Quarrying</i>	<i>57,058</i>	<i>56,975</i>	<i>56,613</i>	<i>56,294</i>	<i>56,045</i>

(a) Not available separately; included with "Non-metal (excluding Fuel) Mining". (b) Includes "Oil Mining".

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 1952 to 1956 are shown in the following table. Information regarding rates of wages paid in the mining industry is shown in Chapter VI.—Labour, Wages and Prices (p. 161) and also in the *Labour Report*.

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

Industry.	1952.	1953.	1954.	1955.	1956.
<i>Metal Mining—</i>					
Gold Mining	5,952	6,291	6,450	6,344	6,551
Silver-Lead-Zinc Mining	12,690	12,359	12,761	15,154	17,299
Copper-Gold Mining	1,655	1,608	1,786	1,867	2,098
Tin Mining	562	715	704	734	733
Mineral Sands Mining	481	362	412	819	1,644
Other Metal Mining	1,027	1,380	1,195	1,328	1,504
<i>Total, Metal Mining</i>	<i>22,367</i>	<i>22,715</i>	<i>23,308</i>	<i>26,246</i>	<i>29,829</i>
<i>Fuel Mining—</i>					
Black Coal Mining	23,565	24,171	25,988	26,065	26,422
Brown Coal Mining	1,450	1,483	1,557	1,761	1,649
Oil Mining	44	(a)	(a)	(a)	(a)
<i>Total, Fuel Mining</i>	<i>25,059</i>	<i>25,654</i>	<i>27,545</i>	<i>27,826</i>	<i>28,071</i>
<i>Non-metal (excluding Fuel) Mining</i>	<i>1,617</i>	<i>1,684</i>	<i>1,693</i>	<i>2,270</i>	<i>2,401</i>
<i>Total, All Mining</i>	<i>49,043</i>	<i>50,053</i>	<i>52,546</i>	<i>56,342</i>	<i>60,301</i>
<i>Construction Material Quarrying (b)</i>	<i>2,020</i>	<i>2,007</i>	<i>2,045</i>	<i>2,439</i>	<i>2,738</i>
<i>Total, All Mining and Quarrying</i>	<i>51,063</i>	<i>52,060</i>	<i>54,591</i>	<i>58,781</i>	<i>63,039</i>

(a) Not available for publication; included with "Non-metal Mining". (b) 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 1955, 62 persons were recorded as having been killed and 1,788 as having been injured in mining and quarrying accidents. Of the total of 62 persons killed, 25 were in black coal mines, 11 in gold mines and 8 in silver-lead-zinc mines. Reported injuries were highest in black coal mines (552), gold mines (504), and silver-lead-zinc mines (398).

§ 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 1954-55, 1955-56 and 1956-57. 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.	1954-55.		1955-56.		1956-57.	
		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.	27,094	142,821	10,639	52,570	10,593	45,548
Asbestos	"	853,811	3,246,480	646,156	2,394,810	466,014	1,708,751
Chromium ore and concentrate	"	99,242	59,296	146,246	54,776	120,788	63,983
Coal	ton	4,994	26,185	4,117	29,973	6,191	29,239
Coke	"	5,900	71,114	3,444	53,191	8,206	125,229
Diatomite	cwt.	78,873	123,182	87,879	139,095	95,895	146,466
Industrial diamonds	carat	265,144	531,968	258,321	543,657	192,295	420,539
Mica	lb.	1,021,777	93,450	764,347	56,049	437,289	46,019
Sulphur	cwt.	3,851,674	2,720,089	4,117,595	2,740,044	2,761,667	1,707,168
Metals—							
Aluminium (pigs, ingots, etc.)	"	255,250	2,748,466	240,651	2,924,968	207,917	2,764,067
Copper—							
Blister	"	10,000	150,597	..	..	..	..
Pigs, ingots, powder, etc.	"	562,505	9,549,183	94,791	2,087,810	66,019	1,171,474
Gold bullion (ingots, bar, etc.)	fine oz.	175,166	2,720,834	175,649	2,745,143	143,852	2,270,632
Iron and Steel—							
Bar and rod	cwt.	1,198,833	3,935,534	2,040,376	6,734,571	625,364	3,106,731
Ingots, blooms, slabs, etc.	"	10,319	56,140	14,761	76,597	8,362	54,206
Nickel (pigs, ingots, etc.)	"	10,299	320,280	14,732	528,299	16,178	556,601
Tin	"	11,582	515,711	10,358	471,761	16,599	803,498
EXPORTS.							
Minerals—							
Asbestos	cwt.	66,013	380,383	138,958	693,521	234,203	1,043,486
Coal	ton	291,226	1,147,441	193,813	780,284	545,101	2,196,044
Coke	"	21,885	180,321	66,590	537,841	129,397	1,072,699
Copper—							
Ore and concentrate	cwt.	110,924	352,068	63,809	314,767	382,975	1,356,636
Copper-lead dross, etc.	"	163,349	902,594	152,130	1,174,004	188,327	1,317,037
Lead and silver-lead ore and concentrate	"	1,217,112	3,933,923	1,312,432	4,369,378	1,637,724	5,585,631
Rutile concentrates	"	1,116,966	2,375,165	1,394,970	4,627,553	2,273,540	8,499,133
Tungsten (scheelite and wolfram concentrates)	"	41,776	3,188,416	47,537	3,708,473	41,343	2,758,476
Zinc ore and concentrate	"	4,076,586	2,837,629	5,823,602	4,647,977	5,902,684	5,392,781
Zircon concentrates	"	931,104	518,150	1,094,007	596,022	1,839,239	1,130,402
Metals—							
Copper, blister	"	102,463	1,513,844	291,170	5,845,048	311,924	5,109,509
Gold bullion (ingot, bar, dust, sheet, etc.)	fine oz.	864,391	13,716,622	531,664	8,323,118	908,283	14,225,889
Iron and Steel—							
Bar and rod	cwt.	266,182	567,727	143,476	362,369	549,698	1,437,201
Ingots, blooms, slabs, etc.	"	156,131	228,149	19,742	22,587	34,734	82,186
Pig iron	"	1,205,561	1,021,107	291,659	324,051	349,712	460,438
Lead—							
Pig	"	2,805,126	17,182,339	2,922,883	19,560,181	3,347,804	22,915,913
Bullion	"	816,369	6,133,238	596,231	4,639,155	1,070,623	8,337,514
Silver bullion (ingot, bar, dust, sheet, etc.)	fine oz.	6,147,155	2,356,908	6,485,356	2,620,905	16,570,469	5,594,400
Zinc, ingots	cwt.	654,180	3,408,244	674,295	4,107,141	793,514	4,665,974

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 1956-57 and their principal metallic content as estimated by assay.

PRINCIPAL METALLIC CONTENT OF ORES AND CONCENTRATES EXPORTED FROM AUSTRALIA DURING 1956-57.

Ore, Concentrate, etc.	Quantity Ex-ported.	Estimated Metallic Content.						Zinc.
		Copper.	Gold.	Lead.	Silver.	Tin.	Tungsten (WO ₃ Content).	
	cwt.	cwt.	fine oz.	cwt.	fine oz.	cwt.	cwt.	cwt.
Copper Ore, Concentrate, Slag and Residues ..	571,302	146,559	9,317	70,867	389,396	179	..	206
Gold Ores and Concentrates ..	274	..	110	..	..	..	..	..
Lead Bullion ..	1,070,623	..	..	1,063,110	4,797,845	..	..	..
Lead Ore, Concentrate, Slag and Residues ..	1,637,724	16,269	12,390	1,097,281	1,901,575	177	..	113,653
Scheelite Ore and Concentrate ..	25,332	..	..	..	..	..	16,691	..
Tin Ore and Concentrate ..	1,225	..	..	..	..	761	..	..
Wolfram Ore and Concentrate ..	16,011	..	..	..	..	68	10,937	..
Zinc Ore, Concentrate, Slag and Residues ..	5,902,684	75	..	40,473	79,919	5	..	3,091,486

§ 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. per 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 has approved the granting of monetary rewards up to a maximum of £25,000 for any one deposit.

(c) *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, 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.

(d) *Diamond Drills.* 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.

(e) *Search for Oil.* No variation has been made in the policy described in Official Year Book No. 37, p. 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 Melbourne tests bore cores for porosity and permeability on behalf of companies engaged in drilling for oil. The Bureau also maintains two 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. 1035).

(f) *Survey of North Australia.* Reference to this survey which was completed at the end of 1940 appears in Official Year Book No. 35, p. 744.

(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.

(h) *Petroleum Legislation.* The petroleum ordinances of Papua and New Guinea have been amended and combined in a single ordinance entitled Petroleum (Prospecting and Mining) Ordinance 1951. Further minor amendments were passed in 1954 and 1957. A new Petroleum Ordinance for the Northern Territory was brought into force on 27th May, 1954. New legislation covering petroleum was brought down in New South Wales under the Petroleum Act, 1955, and several amendments to the Petroleum Act, 1951, were passed in Western Australia.

(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 States' 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. per week south of the 28th parallel of latitude, and of £5 10s. 0d. per 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 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. The Tennant Creek battery is being reconstructed and is expected to reopen shortly, but the re-opening of the Maranboy battery will depend on a revival of 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, 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, manganese ore, copper, iron and steel);
- (c) the strategic importance of the minerals (e.g., beryllium ores, concentrates and metal; monazite; tantalite and tantalum products; uranium ore, concentrates, residues and metal; mica).

Mixed concentrates of beach sand minerals are prohibited exports, but rutile, zircon and ilmenite may be exported. Some non-ferrous scrap is also subject to control.

(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 are 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 by the Prime Minister on 17th September, 1954. Investigation of an area adjacent to Rum Jungle was carried out by the Bureau, using an airborne scintillograph. This survey indicated the presence of many radio-active anomalies, and demonstrated the effectiveness of this method of search. 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.

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.

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, a dam constructed, and considerable progress made in the erection of the mill and treatment plant. Developmental work also continued and ore has been stockpiled.

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.