

CHAPTER XXVI.

MINERAL INDUSTRY.

§ 1. The Mineral Wealth of Australia.

1. *Place of Mining in Australian Development.*—The discovery of gold in payable quantities first attracted population to Australia in large numbers and was thus a significant factor in its 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. However, the value of mineral production has lagged behind that recorded for Australia's large rural industries and in 1953 represented only about 10 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 in any country, is not determined fully at any point in 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. It should be noted that the statistics included in this chapter omit particulars relating to uranium-bearing minerals.

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 despatched 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 from 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.

4. **Quantity and Value of Minerals Produced, 1954.**—(i) *Quantities.* In the following table particulars of the quantities of principal minerals produced are shown for each State and the Northern Territory for 1954.

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 outlined in para. 3 above. This has involved some re-arrangement of official statistics published by Mines Departments for some States.

In these 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.

The particulars shown in the group "Construction Materials" cover, broadly, data similar to those previously included under the heading of "Quarries".

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, 1954.

Mineral.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust
METALLIC MINERALS.									
Antimony Ore and Concentrate ..	ton	(a) 156	5	16	..	45	..	..	222
Beryllium Ore ..	lb.	20,832	..	16,128	..	296,016	..	..	332,976
Copper Ore, Concentrate and Precipitate ..	ton	2,144	..	144,594	3	..	45,025	2,503	194,269
Gold Ore, Concentrate, etc. ..	"	87	15	..	..	..	..	..	102
Gold—Other Forms(b) ..	oz.	23,377	(c)	(c)	(c)	(c)	(c)	(c)	(c)
Iron Ore ..	'000 tons	..	..	..	2,867	652	..	..	3,519
Lead Ore, Concentrate ..	ton	319,184	..	121,604	55	2,167	11,618	3	454,631
Manganese Ore ..	"	(a) 1,616	..	138	..	26,448	..	..	28,202
Pyritic Ore and Concentrate ..	"	10,736	..	85,750	..	56,150	54,142	..	206,778
Rutile Concentrate ..	"	22,734	..	21,925	..	..	..	..	44,659
Tantalite-Columbite Concentrate ..	"	..	..	..	..	116,719	..	1,045	117,767
Tin Concentrate ..	"	(a) 377	36	1,035	..	121	1,374	32	2,975
Tungsten Concentrate—Schaeelite Concentrate ..	"	(a) 9	..	(d)	..	4	1,318	..	1,331
Wolfram Concentrate ..	"	(a) 3	..	58	..	..	581	80	722
Zinc Ore and Concentrate ..	"	390,741	..	38,339	..	..	54,664	..	483,744
Zircon Concentrate ..	"	27,489	..	13,064	..	..	..	..	41,453

FUEL MINERALS

Coal, Black—									
Semi-Anthracite ..	'000 tons	..	..	73	..	..	1	..	74
Bituminous ..	"	15,066	141	2,378	..	..	263	..	17,848
Sub-Bituminous ..	"	17	..	310	495	1,019	..	..	1,841
Total ..	"	15,083	141	2,761	495	1,019	264	..	19,763
Coal, Brown (including Lignite) ..	"	..	9,331	..	..	..	..	..	9,331

NON-METALLIC (EXCLUDING FUEL) MINERALS.

Asbestos ..	ton	616	..	..	..	4,097	..	..	4,713
Barite ..	"	2,000	..	..	3,828	1,044	..	..	6,872
Clays—									
Brick Clay and Shale ..	'000 tons	1,604	(e) 845	278	303	(e) 420	(e) 69	..	3,519
Other ..	"	468	(f) 115	(f) 10	(f) 91	(f) 24	(f) 8	..	(f) 716
Cupreous Ore and Concentrate—For Fertilizer ..	ton	..	..	..	..	4,748	..	18	4,766
Diatomite ..	"	3,708	905	676	..	150	..	..	5,439
Dolomite ..	"	3,855	..	2,680	118,612	..	2,847	..	127,994
Felspar (including Cornish Stone) ..	"	9,538	..	..	3,620	3,226	..	..	16,384
Glaucinite ..	"	..	..	..	..	1,776	..	..	1,776
Gypsum ..	"	128,790	75,012	..	194,772	41,142	..	..	439,716
Limestone(g) ..	'000 tons	1,544	695	74	950	..	196	(d)	3,459
Magnesite ..	ton	42,825	..	..	235	92	..	..	43,152
Mica—Muscovite ..	lb.	15,680	..	..	..	..	..	149,803	165,483
Salt ..	ton	..	(h)	(h)	303,893	(h)	..	..	380,000
Silica (Glass, Chemical, etc.) ..	"	102,044	..	..	17,912	7,803	6,169	..	133,958
Talc (including Steatite) ..	"	037	..	..	0,088	2,920	..	..	12,940

CONSTRUCTION MATERIALS.(f)

Sand ..	'000 tons	1,444	812	(c)	1,146	(i) 38	..	..	3,440
River Gravel and Gravel Boulders ..	"	1,288	97	(c)	676	(i) 225	..	..	2,286
Dimension Stone(j) ..	"	95	19	6	53	(i) 118	..	..	291
Crushed and Broken Stone ..	"	1,739	2,687	648	3,114	(i) 512	..	..	8,700
Other (Decomposed Rock, etc.) ..	"	10,013	281	(c)	78	(c)	..	..	10,372

(a) Despatches from the mine (or sales) as distinct from production. (b) Bullion, alluvial, retorted gold, etc. (c) Not available. (d) Less than half the unit of quantity shown. (e) Estimated. (f) Incomplete. (g) Excludes quantities used directly as a building or road material. (h) Not available for publication; included in total for Australia. (i) Year 1954-55. (j) Includes some quantities of stone dressed at the quarries.

(ii) *Principal Contents of Metallic Minerals.* The following table provides a summary of the principal contents of metallic minerals produced in 1954. Further particulars, including data for earlier years, are shown in the several sections dealing with individual minerals later in this chapter.

PRINCIPAL CONTENTS OF METALLIC MINERALS PRODUCED, 1954.

Content of Metallic Minerals Produced.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Antimony	ton	697	3	8	..	27	..	..	731
Cadmium .. ..	..	826	..	..	..	..	77	..	903
Cobalt .. ..	..	99	..	..	..	..	..	..	69
Copper .. ..	..	3,182	..	27,207	(a)	..	9,880	588	40,857
Gold	fine oz.	31,374	52,665	97,951	54	861,992	19,368	54,338	1,117,742
Iron	'000 tons	..	..	b	1,863	411	..	..	2,274
Lead	ton	230,392	..	41,424	14	1,497	11,533	2	284,862
Silver	'000	..	..	..	..	..	..	..	..
Sulphur(c)	fine oz.	8,680	3	3,584	1	238	1,321	(a)	13,827
Tin	ton	127,648	..	53,368	..	24,458	44,249	..	249,723
Tungsten(d) .. ..	..	272	26	730	..	80	947	20	2,075
Zinc .. ..	..	8	..	(b)	38	3	1,272	51	1,372
		202,646	..	10,615	..	74	30,324	..	252,659

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

(b) Estimated.

(c) Sulphur content of

(d) In terms of WO_3 .

(iii) *Values.* Particulars of the estimated values of minerals (mine and quarry products) produced in 1954 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, 1954.
(£'000.)

Mineral.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
METALLIC MINERALS.								
Copper Ore, Concentrate and Precipitate	118	..	(a)	(b)	..	(a)	114	9,912
Gold Ore, Concentrate, etc. ..	2	1	..	..	..	..	..	3
Gold—Other Forms	316	856	277	1	13,385	(b)	839	15,674
Iron Ore .. ..	..	..	..	(a)	(a)	..	..	3,923
Lead-Silver and Lead-Silver-Zinc Ores	20	..	..	2	20	..	(b)	42
Lead Concentrate	22,216	..	4,700	..	43	559	..	27,518
Manganese Ore	17	..	(a)	..	(a)	..	..	512
Pyritic Ore and Concentrate	(a)	..	245	..	(a)	153	..	897
Rutile Concentrate	779	..	818	..	..	..	..	1,597
Tin Concentrate	211	23	548	..	61	749	14	1,606
Tungsten Concentrates	7	..	41	..	(a)	(a)	53	2,347
Zinc Concentrate	4,273	..	571	..	..	1,687	..	6,531
Zircon Concentrate	200	..	124	..	..	..	..	324
Other Metallic Minerals	79	7	8	..	150	7	2	253
Total, Metallic Minerals	28,295	887	14,304	3,300	15,223	8,108	1,022	71,139

FUEL MINERALS.

Coal, Black	42,762	886	6,474	650	3,589	523	..	54,884
Coal, Brown .. ..	..	3,945	..	..	..	..	..	3,945
Total, Fuel Minerals	42,762	4,831	6,474	650	3,589	523	..	58,829

NON-METALLIC (EXCLUDING FUEL) MINERALS.

Total, Non-metallic (excluding Fuel) Minerals ..	2,129	1,063	518	1,949	1,078	208	123	7,068
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CONSTRUCTION MATERIALS. (c)

Total, Construction Materials	5,016	3,299	307	2,654	(d) 851	116	..	(e) 12,346
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TOTAL.

Total, All Minerals and Construction Materials	78,202	10,080	21,603	8,553	20,741	8,955	1,145	140,182
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(a) Not available for publication. (b) Less than £500. (c) Incomplete. (d) Year ended 30th June, 1955. (e) Includes Australian Capital Territory, £103,000.

5. Mine Production of Principal Metals and Production of Coal and Sulphur, 1939 and 1950 to 1954.—Particulars of the mine production of principal metals (i.e., metallic contents of minerals produced) and production of coal and sulphur in the years 1939 and 1950 to 1954 are shown in the following table.

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

Particulars.	Unit.	1939.	1950.	1951.	1952.	1953.	1954.
Metallic Content of Minerals Produced(a)—							
Copper	ton	20,560	17,481	17,926	18,578	36,565	40,857
Gold	fine oz.	1,645,697	869,537	895,551	980,435	1,075,181	1,117,742
Lead	ton	280,003	225,367	212,013	228,196	269,344	284,862
Iron(b)	"	1,548,031	1,417,608	1,605,400	1,883,087	2,131,865	2,274,330
Silver	'000 fine oz.			10,244	11,278	12,539	13,827
Tin	ton	15,320	10,984	10,244	11,278	12,539	13,827
Zinc	"	3,067	1,854	1,559	1,611	1,553	2,075
Production of—	"	214,823	197,783	189,227	196,450	239,324	252,659
Coal—Black ..	'000 tons	13,535	16,543	17,608	19,404	18,411	19,761
Brown	"	3,651	7,327	7,836	8,104	8,257	9,331
Sulphur(c) ..	ton	151,008	179,843	183,126	217,242	225,197	254,403

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

6. Value of Output and Value of Production for Mining and Quarrying.—(i) *Individual Industries*, 1953. 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 1953. 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 for the year 1953.

MINING AND QUARRYING : VALUE OF OUTPUT(a), 1953. (£'000.)

Industry.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Metal Mining—								
Gold Mining ..	225	1,033	271	7	13,375	..	820	15,738
Silver-Lead-Zinc Mining ..	22,817	..	(b)	(b)	310	1,903	..	31,672
Copper-Gold Mining ..	21	..	(b)	(c)	3	(b)	18	4,384
Tin Mining ..	303	..	21	..	68	1,258	15	1,855
Other Metal Mining ..	1,322	6	1,027	(b)	1,401	(b)	266	9,170
Total, Metal Mining	24,684	1,039	10,563	2,989	15,157	7,264	1,119	62,819
Fuel Mining—								
Black Coal Mining ..	41,630	946	5,861	461	3,073	453	..	52,424
Brown Coal Mining ..	..	3,628	..	..	..	..	..	3,628
Total, Fuel Mining	41,630	4,574	5,861	461	3,073	453	..	56,052
Non-metal (excluding Fuel) Mining—								
Clays	704	270	80	242	209	52	..	1,557
Gypsum	79	28	..	136	19	..	..	262
Limestone(d) ..	77b	456	(b)	487	(b)	(b)	..	2,463
Salt .. ..	..	(e)	(f)	478	(e)	..	..	478
Other Non-metal (excluding Fuel) Mining	345	7	(b)	226	(b)	(b)	102	1,474
Total, Non-metal (excluding Fuel) Mining	1,906 (g)	761	645	1,569 (g)	1,052	199	102 (g)	6,234
Total, All Mining ..	68,224 (g)	6,370	17,069	5,019 (g)	19,282	7,916	1,221 (g)	125,105
Construction Material Quarrying ..								
.. ..	4,122 (h)	2,955 (g)	215	1,184 (i)	729	121	..	9,437
Total, All Mining and Quarrying ..	72,346 (g)	9,329 (g)	17,284	6,203 (g)	20,011	8,037	1,221 (g)	134,542

(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. (c) Less than £500. (d) Excludes quarries primarily engaged in obtaining construction material. (e) Not available. (f) Not available for publication; included with "Other Non-metal Mining". (g) Incomplete. (h) Year ended 30th June, 1953. (i) Year ended 30th June, 1954. (j) Includes £111,000 for the Australian Capital Territory.

MINING AND QUARRYING : VALUE OF PRODUCTION(a), 1953.
(£'000.)

Industry.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Metal Mining—								
Gold Mining ..	142	677	200	(b)	8,837	..	744	10,600
Silver-Lead-Zinc Mining ..	16,858	..	(c)	(c)	233	1,659	..	23,319
Copper-Gold Mining ..	13	..	(c)	..	3	(c)	16	2,878
Tin Mining ..	256	..	152	..	51	1,084	12	1,555
Other Metal Mining ..	1,015	4	59	(c)	1,197	(c)	247	7,852
Total, Metal Mining	18,284	681	7,388	(c)	10,321	(c)	1,019	46,234
Fuel Mining—								
Black Coal Mining ..	34,067	790	4,874	(c)	2,501	(c)	..	42,973
Brown Coal Mining ..	..	3,266	..	..	..	..	..	3,266
Total, Fuel Mining	34,067	4,056	4,874	(c)	2,501	(c)	..	46,239
Non-metal(excluding Fuel) Mining—								
Clays ..	(d) 704	255	(c)	215	208	47	..	(e) 1,420
Gypsum ..	57	20	..	92	14	..	..	183
Limestone(f) ..	541	255	(c)	394	(c)	(c)	..	1,826
Salt ..	..	(g)	(c)	431	(g)	..	..	(e) 431
Other Non-metal (excluding Fuel) Mining ..	267	7	(c)	193	(c)	(c)	98	989
Total, Non-metal (excluding Fuel) Mining ..	1,569	(e) 537	481	1,325	(f) 702	147	98	(e) 4,856
Total, All Mining ..	53,920	(e) 5,274	12,743	4,466	(f) 13,523	6,286	1,117	(e) 97,331
Construction Material Quarrying ..	4,122	(h) 2,003	(e) 163	583	(i) 475	106	..	(j) 7,541
Total, All Mining and Quarrying ..	58,042	(e) 7,277	(e) 12,906	5,051	(e) 13,998	6,392	1,117	(e) 104,875

(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) Less than £500. (c) Not available for publication. (d) Cost of power, fuel, light and other materials have not been deducted. (e) Incomplete. (f) Excludes quarries primarily engaged in obtaining construction material. (g) Not available. (h) Year ended 30th June, 1953. (i) Year ended 30th June, 1954. (j) Includes £92,000 for the Australian Capital Territory.

(ii) *States, 1939 and 1949 to 1953.* Values for individual minerals produced based on estimated selling value at the mine or quarry are shown for the year 1954 in para. 4 (iii) above. Australian State and Commonwealth Statisticians have for many years used values for mine and refinery products as recorded by Mines Departments and other relevant data (including censuses of the industry in some States) to estimate value of output and value of production for the mining and quarrying industry as a whole. The following table shows estimates on this basis for the years 1939 and 1949 to 1951 together with the values ascertained from the Australia-wide mineral industry censuses of 1952 and 1953. The estimates for 1951 and the earlier years shown are approximate, and as value added in ore-dressing and similar treatment plants situated at or near the mine was excluded in some cases, they are not strictly comparable with the 1952 and 1953 valuations which consistently include the value of such mine treatment. The Northern Territory is omitted for years prior to 1952 and the Australian Capital Territory for years prior to 1953.

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)									
1939 ..	12,914	2,709	3,438	3,648	12,496	2,145	(b)	(b)	37,430
1949 ..	35,295	4,215	7,096	3,118	9,799	4,629	(b)	(b)	64,152
1950 ..	46,102	5,274	10,829	4,428	12,037	7,049	(b)	(b)	85,719
1951 ..	67,877	6,949	10,922	4,938	13,474	10,552	(b)	(b)	114,712
1952 ..	77,097	8,535	17,409	6,047	17,704	8,750	1,282	(b)	136,844
1953 ..	72,346	9,370	17,281	6,203	20,011	8,037	1,221	111	134,542

For footnotes see next page.

MINING AND QUARRYING: VALUE OF OUTPUT AND VALUE OF PRODUCTION—*continued.*

(£'000.)

Year.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	A.C.T.	Atct.
VALUE OF PRODUCTION.(c)									
1939 ..	10,927	2,111	2,688	3,444	9,268 (d)	2,145	(b)	(b)	30,583
1949 ..	30,191	2,263	5,606	2,941	6,697 (d)	4,629	(b)	(b)	52,327
1950 ..	39,634	2,969	8,559	4,188	8,751 (d)	7,049	(b)	(b)	71,150
1951 ..	59,385	4,209	8,632	4,646	9,775 (d)	10,552	(b)	(b)	97,199
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

(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. (d) Value of output; value of production not available.

7. Industrial Census of the Mining and Quarrying Industry, 1953.—Industrial censuses of the mining and quarrying industry (covering employment, salaries and wages paid, fixed assets, value of output, costs of materials used, etc.) have been taken in some Australian States for many years, but on different bases. In 1952 and 1953 censuses were taken 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 1953 is shown in the following table.

MINING AND QUARRYING: SUMMARY OF OPERATIONS, AUSTRALIA, 1953.

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.	1,099	285	703	2,087	679	2,766
Persons Employed(c) ..	"	21,594	28,204	2,046	52,744	3,803	56,547
Salaries and Wages Paid <i>d e</i> ..	£'000	22,282	25,654	1,684	49,620	2,007	51,627
Value of Output(f) ..	"	62,819	56,052	6,234	125,105	9,437	134,542
Total Fuel, Materials, etc., Used (g) ..	"	16,585	9,813	1,376	27,774	1,593	29,667
Value of Production(h) ..	"	46,234	16,239	4,858	97,331	7,544	104,875
Value of Fixed Assets (d)(i) ..	"	42,587	35,352	4,418	82,357	3,376	85,733

(a) Incomplete for some non-metal (excluding fuel) mining industries outside the normal administrative control of State Mine 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 (less than five persons in Western Australia).
(e) Excludes drawings by working proprietors; the amounts are net after deducting value of explosives sold to own employees. (f) Value at mine or quarry. (g) Includes value of explosives sold to own employees.
(h) Value of output less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted. (i) Depreciated value (i.e., book value less any depreciation reserves) at end of year.

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 1953.

MINING AND QUARRYING : SUMMARY OF OPERATIONS, 1953.

State or Territory.	Mines and Quarries.	Persons Employed. (a)	Salaries and Wages Paid. (b)(c)	Value of Output. (d)	Total Fuel, Materials, etc., Used. (e)	Value of Production. (f)	Value of Fixed Assets. (b)(g)
	No.	No.	£'000.	£'000.	£'000.	£'000.	£'000.
New South Wales..	907	29,798	28,898	72,346	14,304	58,042	38,947
Victoria..	259	4,816	4,108	9,329	2,052	7,277	11,966
Queensland ..	685	7,648	6,245	17,284	4,378	12,906	10,698
South Australia ..	523	2,065	1,422	6,203	1,152	5,051	5,199
Western Australia	270	8,722	7,840	20,011	6,013	13,998	14,739
Tasmania ..	72	2,984	2,850	8,037	1,645	6,392	3,088
Northern Territory	47	472	228	1,221	104	1,117	1,058
Australian Capital Territory ..	3	42	36	111	19	92	38
Australia ..	2,766	56,547	51,627	134,542	29,667	104,875	85,733

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

§ 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 1954. 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 ..	2,715	21,973	3	..	..	186	..	24,877
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 ..	560	1,052	1,021	53	8,474	130	84	11,383
1941-50 ..	573	801	749	13	6,682	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
Total, 1851-1954..	16,290	73,452	22,259	450	56,522	2,464	960	172,397

(a) Gold content of minerals produced.

(b) Less than 500 fine ounces.

The amount of gold raised 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.

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 enable the industry to meet the increase in costs, sales of gold on overseas premium markets at prices in excess of the official price were permitted from December, 1951. During 1952 and 1953, premium sales of gold brought an additional return to the industry amounting to about £1,800,000, but towards the end of 1953 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 the Commonwealth Government passed the Gold-Mining Industry Assistance Act in 1954 to prevent any serious decline in gold-mining activity. Despite the difficulties referred to above, the production of gold in Australia has increased in each successive year since 1951, mainly owing to increased output in Western Australia, Northern Territory and Queensland.

3. **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 1945 to 1954. The value of the refined new gold is based on the price fixed by the Commonwealth Bank, but allowance is made in the 1952, 1953 and 1954 figures 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.
1945	613	6,556	1950	844	13,077
1946	820	8,830	1951	850	13,172
1947	969	10,430	1952	979	16,037
1948	884	9,517	1953	1,053	16,780
1949	879	10,670	1954	1,063	16,521

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., while in 1952, 1953 and 1954 allowance was made for premiums on gold sold for industrial purposes in Australia and on premium markets overseas, the average value for these years being £16 7s. 7½d., £15 18s. 9½d. and £15 10s. 10d. per fine oz. respectively. 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 since December, 1951, is given in Chapter XIX.—Private Finance.

4 **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 1950-51 to 1954-55.

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

Particulars.	1950-51.	1951-52.	1952-53.	1953-54.	1954-55.
Mine Production of Gold (a)	891,428	908,813	1,037,885	1,111,420	1,080,190
Imports of Gold (b)(c)	158,661	208,143	228,407	189,628	173,846
Total	1,050,089	1,116,956	1,266,292	1,301,048	1,254,036
Exports of Gold (b)	19	416,652	1,250,162	863,464	864,423
Gold Content of Ores and Concentrates Exported	10,662	14,503	23,204	19,848	12,116
Net Industrial Absorption of Gold	40,425	33,838	37,816	51,543	45,253
Total	51,106	464,993	1,311,182	934,855	921,792
Changes in Stocks of Gold held in Australia(d)	+ 998,983	+ 651,963	- 44,890	+ 366,193	+ 332,244

(a) Gold content of minerals produced in Australia.

(b) Includes gold contained in matte.

(c) Excludes gold imports in some minor minerals.

(d) Includes gold content of mineral products awaiting refining; excludes gold specie.

5 **Production in Principal Countries.**—The quantities of gold produced in the principal producing countries in each of the years 1939 and 1949 to 1953 are shown in the table hereunder.

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

Country.	1939.	1949.	1950.	1951.	1952.	1953.
Union of South Africa ..	12,822	11,705	11,664	11,516	11,819	11,941
Canada	5,094	(a)4,124	(a)4,441	(a)1,303	(a)4,472	(a)4,061
United States of America ..	4,673	1,902	2,394	1,081	1,803	1,958
Australia	1,646	889	870	896	980	1,075
British West Africa(b) ..	843	682	695	703	695	733
Rhodesia	800	529	513	488	499	504
Mexico	842	406	408	393	459	483
Philippines	999	288	334	394	469	481
Colombia	570	385	406	431	422	437
Belgian Congo	465	334	330	352	369	371

(a) Includes Newfoundland.

(b) Includes Gold Coast, Nigeria and Sierra Leone.

6. **Employment in Gold Mining.**—Particulars of the numbers of persons employed in gold mining are shown in § 13 (page 1021).

7. **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. The subsidy payable to small producers whose annual output does not exceed 500 fine oz. of gold is a flat rate of £1 10s. od. per fine oz. For large producers the formula for determining the amount of subsidy payable is:—

Three-quarters of the excess of average cost of production per fine oz. over £13 10s. od.

The maximum rate of subsidy which may be paid is £2 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 centum 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. In 1956 the operation of the Act was extended for a further three years to 1958-59.

§ 3. Silver, Lead and Zinc.

1. Mine Production.—(i) *Australia*. The following table shows for 1953 and 1954 the mine production (metallic contents 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.

Mineral in which contained.	Silver (fine oz.).		Lead (tons).		Zinc (tons).	
	1953.	1954.	1953.	1954.	1953.	1954.
Copper Ore and Concentrate ..	853,176	1,069,600	1,744	2,845	869	..
Gold Concentrate, etc. ..	241,870	245,691	..	..	..	..
Lead-Silver Ore ..	26,833	27,398	1,079	627	..	..
Lead-Silver-Zinc Ore ..	5,193	2,118	255	93	68	74
Lead Concentrate ..	10,804,437	11,838,567	261,289	275,955	1,367	..
Silver Ore ..	8,160	..	..	..	..	..
Zinc Concentrate ..	599,513	643,664	4,977	5,342	237,020	252,585
Total ..	12,539,152	13,827,038	269,344	284,862	239,324	252,659

The following table shows the mine production of silver, lead and zinc in Australia for the years 1950 to 1954 compared with 1939.

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

Metal.	Unit.	1939.(a)	1950.	1951.	1952.	1953.	1954.
Silver ..	'000 fine oz.	15,320	10,984	10,244	11,278	12,539	13,827
Lead ..	ton	280,003	225,367	212,013	228,196	269,344	284,862
Zinc ..	..	217,256	197,783	189,227	196,450	239,324	252,659

(a) Source : Australian Mines and Metals Association.

The following table shows the quantities of silver, lead and zinc contained in minerals won in the several States of Australia in the years 1953 and 1954 :—

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

State.	Silver (fine oz.)		Lead (tons).		Zinc (tons).	
	1953.	1954.	1953.	1954.	1953.	1954.
New South Wales ..	8,069,013	8,680,114	217,574	230,392	189,526	202,646
Victoria ..	6,268	3,443	..	..	..	..
Queensland ..	2,980,669	3,583,776	37,012	41,424	19,961	19,615
South Australia ..	699	625	20	14	..	..
Western Australia ..	241,629	237,639	4,700	1,497	68	74
Tasmania ..	1,240,619	1,321,385	10,038	11,533	29,769	30,324
Northern Territory ..	255	56	..	2	..	..
Australia ..	12,539,152	13,827,038	269,344	284,862	239,324	252,659

Particulars of the values ascribed to the various minerals containing silver, lead and zinc for the year 1954 are shown in the detailed table relating to mineral production on page 986.

(ii) *New South Wales.* By far the most silver-lead-zinc ore in New South Wales, in fact 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 Limited, which mines the northern limb of the ore-bearing structure, 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. About half of the zinc concentrates produced at Broken Hill are exported from Australia. Most of the remainder are treated at Risdon in Tasmania and a small proportion are roasted by fertilizer plants in South Australia for the recovery of sulphur dioxide for sulphuric acid manufacture.

At Captain's Flat, Lake George Mines Limited 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 despatched to Port Kembla, New South Wales, for further treatment. Concentrates of copper, pyrites 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. The Conrad Mine at Howell in northern New South Wales is being re-opened.

(iii) *Victoria.* Small quantities of lead sulphide ore occur on most of Victoria's goldfields 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 of 6,268 fine oz. in 1953 and 3,443 fine oz. in 1954 was won as a by-product of the gold mining industry.

(iv) *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. An exception is the ore at the Silver Phantom Mine in the Cloncurry district, which produced 32,848 oz. of silver from 27 tons of ore during 1954. The total production of silver in Queensland was 2,980,669 fine oz. in 1953 and 3,583,776 fine oz. in 1954.

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. After concentration by flotation in the concentrating mill, the silver-lead concentrate is converted to bullion in the smelter. 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. During the 1939-45 War, operations on silver-lead-zinc ores at Mt. Isa were suspended while the mine was engaged in mining copper, but in 1946 copper mining ceased, and operations on silver-lead-zinc ores were resumed. Copper mining has recommenced at Mt. Isa with the opening there of a new copper smelting plant in 1953.

(v) *South Australia.* Output of lead from local ores has been very small in recent years. In 1954, 55 tons of lead-silver ore valued at £1,472 were produced, containing 14 tons of lead and 625 fine oz. of silver.

There has been no recorded zinc production since 1903, when the zinc was contained in lead ores and concentrates which came mainly from the Glen Osmond and Strathalbyn districts.

(vi) *Western Australia.* During recent years, lead-silver-zinc ore and lead concentrates have been produced in Western Australia. Main centres of production have been the Northampton area, the Ashburton area and the West Kimberley district.

The bulk of the mine production of silver in Western Australia is obtained as a by-product of the gold-mining industry.

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

The lead concentrates and copper-lead concentrates produced at Rosebery are exported overseas.

The zinc concentrates, containing some lead, which are the principal product from the mine, are sent to Risdon for roasting and refining. 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 and Mount Farrell. Some silver is obtained from the Mount Lyell copper refinery tank house slimes which are treated at Port Kembla in New South Wales.

(viii) *Northern Territory*. There was no production of lead-silver ore in the Northern Territory in 1953. However, 3 tons of ore valued at £198 and with a content of 56 fine oz. of silver and 2 tons of lead were won in 1954 from Murray Downs, 150 miles north-east of Alice Springs.

2. **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 from other sources. The figures shown for refined silver production include small quantities recovered from imported materials. The data relating to lead production include small quantities recovered from scrap for the year 1939.

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

Particulars.	1939.	1950.	1951.	1952.	1953.	1954.
SILVER ('000 fine oz.).						
Production (a)	9,552	6,882	6,870	6,773	6,595	8,505
Sold to Australian consumers (b) ..	1,794	1,324	1,939	1,045	1,447	1,977
Exported or sold for export (b) ..	7,518	5,745	4,924	5,876	4,755	6,989
LEAD (tons).						
Refined Lead—						
Production (a)	199,437	160,526	165,758	156,630	172,468	200,409
Sold to Australian consumers (b) ..	32,217	43,661	54,620	31,566	31,667	42,088
Exported or sold for export (b) ..	164,684	121,380	112,332	119,648	141,007	153,847
Lead Bullion—						
Produced for export (a)	43,955	37,021	31,872	37,700	34,050	38,146
ZINC (tons).						
Production (a)	71,220	83,652	77,010	87,438	90,178	104,523
Sold to Australian consumers (b) ..	31,088	45,141	45,950	50,174	58,524	61,478
Exported or sold for export (b) ..	43,137	38,553	29,411	38,132	32,881	36,130

(a) Source : Bureau of Mineral Resources.

(b) Source : Australian Mines and Metals Association.

3. **Silver, Lead and Zinc : Production in Principal Countries and World Total, 1953.**—The following table shows, for the year 1953, 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 Colonial Geological Surveys.

**SILVER, LEAD AND ZINC: MINE PRODUCTION IN PRINCIPAL COUNTRIES
AND WORLD TOTAL, 1953.**

Country.	Silver.	Lead.	Zinc.
	'000 fine oz.	Tons.(a)	Tons.(a)
United States of America	37,571	305,183	488,777
Australia	12,539	269,344	239,324
U.S.S.R.	(b)	(c) 240,000	(c) 225,000
Mexico	47,886	218,049	213,119
Canada	28,299	176,097	356,093
Peru	19,216	120,958	132,009
Yugoslavia	3,048	83,807	59,023
Italy	699	36,304	96,786
Bolivia	6,787	23,412	23,595
Poland	(b)	(c) 21,000	(c) 140,000
Japan	6,028	18,359	93,563
Belgian Congo	4,951	..	123,809
Estimated World Total	190,000	1,908,000	2,587,000

(a) Long tons.

(b) Not available.

(c) Estimated.

In 1954, the Australian mine production of lead, 284,862 tons, was the highest in the world for the first time in the history of the lead-zinc industry. This was due not only to increased production in Australia, but also to the continued fall in production in the former leading country, the United States of America.

4. Prices of Silver, Lead and Zinc.—In view of the close association in Australia, particularly in New South Wales, of ores containing these metals, relevant particulars of the prices of each of the metals have been included in the following table. The table shows average prices in Australia and on the London Metal Exchange during the years 1938 and 1950 to 1954. 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 and the United Kingdom.

PRICES OF SILVER, LEAD AND ZINC.

Metal.	1938.	1950.	1951.	1952.	1953.	1954.
Australian Prices, in Australian currency—						
Silver, per fine oz. (a) ..	s. d. 2 2	s. d. 6 9	s. d. 8 2	s. d. 7 9	s. d. 7 8	s. d. 7 5
Lead, per ton (b)(c) 22	(b)(c) 22	(b) 44	(b) 65	(b) 75	(d) 104	(e) 114
Zinc, per ton (b)(c) 22	(b)(c) 22	(b) 47	(b) 65	(b) 75	(d) 92	(e) 101
London Metal Exchange Prices, in sterling—						
Silver, per fine oz. (e) ..	s. d. 1 9	s. d. 5 5	s. d. 6 6	s. d. 6 2	s. d. 6 2	s. d. 6 2
Lead, per ton (b) 15	(b) 15	(b) 106	(b) 162	(f) 135	(e) 91	(e) 96
Zinc, per ton (b) 14	(b) 14	(b) 119	(b) 172	(b) 150	(e) 75	(e) 78

(a) Silver prices have not been fixed by regulation in Australia, the prices shown representing export parity calculated from London Metal Exchange prices. (b) Prices fixed by regulation. (c) From February, 1940. (d) Price regulation was abandoned from 21st April, 1953; average market prices have been used for balance of year. (e) Average market prices. (f) Price regulation was abandoned from 1st October, 1952; average market prices have been used for balance of year.

5. Employment in Silver, Lead and Zinc Mining.—Particulars of the number of persons employed in mining for these metals are shown in § 13, page 1021.

§ 4. Copper.

1. **Production.**—Copper is widely distributed throughout Australia. However, the principal producing States in 1954 were Queensland, Tasmania 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 the production of 40,857 tons in 1954 was the highest recorded since 1913. The table hereunder shows the quantity of mine production of copper (copper content of ores and concentrates produced) in Australia for the years 1951 to 1954. 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.	1951.	1952.	1953.	1954.
Copper Ore, Concentrate and Precipitate	15,739	16,125	33,007	37,041
Gold Ore, Concentrate, etc.	5	1	1	(a)
Lead Ore and Concentrate	1,874	2,163	3,037	3,241
Zinc Concentrate	308	289	540	575
Total	17,926	18,578	36,585	40,857

(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 published by the Australian Mines and Metals Association for the year 1939, and as recorded by this Bureau from data obtained from the several State Mines Departments and other sources for the years 1950 to 1954, are shown in the table below.

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

State.	1939.	1950.	1951.	1952.	1953.	1954.
New South Wales	1,155	3,893	3,679	3,562	3,626	3,182
Queensland	5,798	5,424	5,432	6,966	23,955	27,207
South Australia	110	..	(a)	2	1	(a)
Western Australia	1	1	7	7	15	..
Tasmania	13,453	7,884	8,657	7,722	8,902	9,880
Northern Territory	43	279	151	319	86	588
Australia	20,560	17,481	17,926	18,578	36,585	40,857

(a) Less than half a ton.

2. **Sources of Production.**—(i) *New South Wales.* The copper content of ores and concentrates produced in New South Wales amounted to 3,626 tons in 1953 and to 3,182 tons in 1954. The principal sources of this production were ores mined at Broken Hill and Captain's Flat.

(ii) *Queensland.* In 1954 mine production of copper in this State amounted to 27,207 tons compared with 23,955 tons in 1953 and 6,966 tons in 1952. The bulk of the production in 1950, 1951 and 1952 came from Mt. Morgan. In February, 1953, a new copper smelter was brought into operation at Mt. Isa to treat ore from Mt. Isa Mines, the Cloncurry field generally and other centres. Copper was produced from copper ore at Mt. Isa during the 1939-45 War, but production was suspended in 1946 and until 1953 operations had been confined to silver-lead-zinc ores. Mt. Isa now produces about half the total Australian output of copper. Some of the blister copper produced at Mt. Isa is exported to the United States of America, but the bulk is sent to Port Kembla in New South Wales for refining.

(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.* The ore sent to smelters in 1953 amounted to 50 tons, containing 15 tons of copper. In 1954 there was no production of copper. Cupreous ore is mined in Western Australia and details of its production are given in § 12. Non-Metallic Minerals (see page 1020).

(v) *Tasmania*. The quantity of copper produced in Tasmania during 1953 was 8,902 tons and during 1954, 9,880 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*. Copper has been found at various places in the Territory. In 1953 the output of copper fell to 86 tons owing to the cessation of copper mining operations at Barrow Creek and the interruption of mining at the Peko Mine at Tennant Creek while new surface treatment plant was being installed. Although the Peko Mine was 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. The total output of copper in the Northern Territory during 1954 was 588 tons.

3. **Production and Sales of Refined Copper.**—There are two refining plants in Australia, one operated by the Electrolytic Refining and Smelting Co., Port Kembla, New South Wales, and the other by The Mount Lyell Mining and Railway Co. Ltd., Mt. Lyell, Tasmania. The electrolytic process has been employed in both refineries up to 1954. As blister copper from Mt. Isa can be satisfactorily fire-refined and the process is cheaper, part of the blister copper sent from Mt. Isa to Port Kembla is now refined by that process. The quantity of copper refined by this method in 1954 was 2,935 tons. At Mt. Lyell, copper is produced in cathode form, which, with the exception of a quantity sold to the trade in Tasmania, is shipped to Port Kembla for conversion into the various customary refinery shapes. 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 other sources.

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

Particulars.	1939.	1950.	1951.	1952.	1953.	1954.
Production(b) ..	17,867	13,231	13,543	19,623	16,682	29,287
Sold to Australian consumers(c).	18,808	11,632	14,806	17,884	15,115	29,361
Exported or sold for export (c)	100	..	..	..	2,607	..

(a) Refined from domestic primary copper.

(b) Source : Bureau of Mineral Resources.

(c) Source : Australian Mines and Metals Association.

Although the embargo on the export of copper in any form from Australia remains in force, it has been relaxed during recent years to meet varying circumstances. Up to 1952, local demand for copper considerably exceeded Australian refinery production and substantial quantities of copper were imported. A large proportion of the imports in 1948 and later years comprised blister copper imported mainly from South Africa and refined in Australia. However, in 1953 the large increase in blister copper production from the Mt. Isa smelter could not be handled with available refining capacity and considerable quantities of blister copper were exported for treatment overseas. During that year, imports of copper were very small. In 1954 imports of copper in primary shapes were considerably higher than in the previous year, due partly to the return from overseas treatment of Mt. Isa blister copper as refinery shapes.

4. **World Production of Copper.**—The world's estimated mine production of copper during the years 1939 and 1949 to 1953 is shown below.

COPPER : WORLD MINE PRODUCTION.
(Tons.)

1939.	1949.	1950.	1951.	1952.	1953.
2,160,000	2,250,000	2,490,000	2,620,000	2,720,000	2,750,000

The yields in 1953 from the principal copper-producing countries reporting, as published by the Mineral Resources Division of the Colonial Geological Surveys, were as follows :—

COPPER : MINE PRODUCTION IN PRINCIPAL COUNTRIES, 1953.

(Tons.)(a)

Country.	Production.	Country.	Production.
United States of America ..	827,186	Japan ..	57,953
Rhodesia ..	367,245	Australia ..	36,585
Chile ..	357,400	Union of South Africa ..	35,575
U.S.S.R. ..	(b) 340,000	Yugoslavia ..	34,759
Canada (c) ..	224,654	Peru ..	33,836
Belgian Congo ..	210,734	Turkey ..	26,913
Mexico ..	59,198	Cyprus ..	22,100

(a) Long tons.

(b) Estimated.

(c) Includes Newfoundland.

During 1953 the share of the United States of America in the world's mine production of copper amounted to 30 per cent. while the Australian proportion was only 1.3 per cent.

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.	December, 1939.	1950.	1951.	1952.	1953.	1954
Australia — in Aust. currency	64	189	254	309	330	(b) 310
United Kingdom — in sterling ..	62	179	220	259	(c) 253	249

(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 1021.

§ 5. Tin.

1. Production.—Tasmania, Queensland and New South Wales are the principal producing States.

The following table shows the tin content of concentrates produced in each State and the Northern Territory for the year 1939 as published by the Australian Mines and Metals Association, and the years 1950 to 1954 as recorded by this Bureau.

TIN : CONTENT OF TIN CONCENTRATES PRODUCED : STATES.

(Tons.)

State.	1939.	1950.	1951.	1952.	1953.	1954.
New South Wales ..	775	482	413	396	342	272
Victoria ..	118	29	36	39	31	26
Queensland ..	867	600	340	330	292	730
Western Australia ..	7	36	41	65	76	80
Tasmania ..	1,250	685	706	772	788	947
Northern Territory ..	20	22	23	9	24	20
Australia ..	3,067	1,854	1,559	1,611	1,553	2,075

2. **Sources of Production.**—(i) *New South Wales.* Production of tin concentrates in 1954 was 377 tons, with a tin content of 272 tons, compared with 483 tons (tin content 342 tons) in 1953. A large proportion of the output in this State is obtained by dredging and sluicing, principally in the New England district.

(ii) *Victoria.* The tin produced in this State was obtained solely as a by-product from the gold dredging operations at Eldorado. With the closing down of the Eldorado gold dredge in July, 1954, the production of tin in Victoria ceased. The production in 1954 amounted to 36 tons of concentrates, with a tin content of 26 tons, compared with 44 tons (tin content, 31 tons) in 1953.

(iii) *Queensland.* The chief districts in Queensland producing tin concentrates during 1954 were Herberton, 850 tons; Cooktown, 68 tons; Chillagoe, 64 tons; Kangaroo Hills, 25 tons and Stanthorpe, 16 tons. The total production in 1954 amounted to 1,034 tons, compared with 411 tons in 1953. The tin content in 1953 and 1954 was 292 tons and 730 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 1954 amounted to 121 tons (tin content, 80 tons), compared with 113 tons in 1953 (tin content, 76 tons). Production was mainly in the Pilbara and Greenbushes fields.

(v) *Tasmania.* For 1954 the output amounted to 1,374 tons of tin concentrates, an increase of 242 tons on the output of the previous year. The tin content for 1954 was 947 tons and for 1953, 788 tons.

(vi) *Northern Territory.* The production for 1954 amounted to 32 tons of concentrates compared with 40 tons of concentrates produced during 1953. The tin content for 1954 and 1953 was 20 tons and 24 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. The following table shows details of refined tin produced in Australia during the years 1939, and 1950 to 1954.

REFINED TIN PRODUCTION (a) : AUSTRALIA.
(Tons.)

—	1939.	1950.	1951.	1952.	1953.	1954.
Production of Refined Tin	3,294	2,014	1,459	1,700	1,443	2,063

(a) Source : Bureau of Mineral Resources.

4. **World Production.**—The world production of tin ore, *in terms of metal*, during each of the years 1939 and 1949 to 1953, as published by the Mineral Resources Division of the Colonial Geological Surveys, was as follows :—

TIN : WORLD PRODUCTION.
(Tons.)

1939.	1949.	1950.	1951.	1952.	1953.
174,000	161,500	167,200	167,300	171,000	175,800

The production of tin reached its maximum in 1941 when 241,400 tons were recorded. The following are the chief producing countries of the world :—Federation of Malaya, Bolivia, Indonesia, Belgian Congo, Thailand and Nigeria. 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 1953 was as follows.

TIN : PRODUCTION IN PRINCIPAL COUNTRIES, 1953.
(Tons.) (a)

Country.	Production.	Country.	Production.
Malaya, Federation of ..	56,254	Australia	1,553
Bolivia	34,825	Portugal	1,367
Indonesia	33,750	Union of South Africa ..	1,361
Belgian Congo	15,293	Burma	(b) 960
Thailand	10,126	United Kingdom	935
Nigeria	8,228	Spain	795
China	(b) 6,300	Japan	737

(a) Long tons.

(b) Estimated.

5. Prices.—At the outbreak of war in September, 1939, the price of tin in Australia and 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 shown 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.	December, 1939.	1950.	1951.	1952.	1953.	1954.
Australia — in Aust. currency (a)	299	725	1,222	1,151	919	911
United Kingdom — in sterling (b)	(c) 271	746	1,080	965	731	720

(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. (c) Prices fixed by regulation for standard tin.

6. Employment in Tin Mining.—The number of persons employed in tin mining is shown in § 13 (page 1021).

§ 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. Production.—(i) *Australia.* Production of iron ore for smelting purposes and estimated iron ore content are shown below for the years 1939 and 1950 to 1954 :—

IRON ORE : PRODUCTION, AUSTRALIA.
(Tons.)

Particulars.	1939.	1950.	1951.	1952.	1953.	1954.
Production of Iron Ore	2,575,758	2,364,719	2,436,229	2,907,754	3,298,718	3,518,804
Estimated Iron Content	1,548,031	1,417,608	1,605,400	1,883,087	2,131,865	2,274,330

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

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 1954, 5,221 tons of oxide were won.

(iii) *Queensland.* Extensive deposits of iron ore are known to exist in Queensland. Their location and size, however, in comparison with the more favourable deposits of South Australia and Western Australia, preclude their exploitation. The output of 162 tons of iron oxide for 1954 came mainly from the Biggenden district.

(iv) *South Australia.* The main production of iron ore in Australia is from the deposits worked by The Broken Hill Proprietary Co. Ltd. in the Middleback Ranges near Whyalla. Production in 1954 reached a record level of 2,867,060 tons (estimated iron content, 1,863,589 tons).

(v) *Western Australia.* Plans drawn up in 1927 to develop the rich iron ore deposits on Koolon and Cockatoo Islands in Yampi Sound were realized on 24th July, 1951 when regular shipments of ore for smelting at the steelworks at Newcastle and Port Kembla commenced from Yampi Sound. Iron ore is also obtained from deposits at Wundowie and Koolyanobbing. Production of iron ore during 1954 amounted to 634,514 tons at Yampi Sound, 9,825 tons at Koolyanobbing and 7,405 tons at Wundowie, giving a total production of 651,744 tons with an estimated iron content of 410,741 tons.

The whole iron pyrite production of Western Australia is won at the Iron King and Norseman mines and is railed, in the form of ores and concentrates, to superphosphate manufacturers in Perth.

(vi) *Tasmania.* There has been no production of ironstone in Tasmania since 1943 when 7 tons were produced. The iron pyrite concentrate produced, which in 1954 amounted to 54,142 tons (sulphur content, 26,757 tons), is a by-product from the flotation of copper ores at Mount Lyell. This product is exported to the mainland, where it is used in the manufacture of chemical fertilizers.

In 1954, 6,380 tons of iron oxide were produced for gas purification and fluxing purposes.

3. *Production of Iron and Steel.*—(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, 1946 to 1955.

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.
1946	906,283	1,061,918	1951	1,313,332	1,443,831
1947	1,143,132	1,312,439	1952	1,430,027	1,521,386
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	1,865,487	2,208,700

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

The principal producers in Australia are The Broken Hill Proprietary Co. Ltd. and Australian Iron and Steel Ltd., both in New South Wales, the former situated at Newcastle and the latter at Port Kembla. The steelworks at Port Kembla are being further expanded by the construction of two new open hearth steel furnaces which will add a further 350,000 tons to the annual output of steel. During 1955 the new hot strip mill came into full production at Port Kembla. The new mill has an installed capacity of 1,500,000 tons of wide continuously-rolled hot strip a year. Work has also begun on a tinplate plant which will produce initially 70,000 tons of tinplate a year by the hot dip method. At Newcastle steelworks a beginning has been made on the installation of a new skelp mill. In South Australia, at Whyalla, The Broken Hill Proprietary Co. Ltd. operate a blast furnace, and also produce a small quantity of steel ingots by means of an electric furnace.

In Western Australia, pig iron is produced under the direction of the State Department of Industrial Development at Wundowie. The output during the year 1953-54 amounted to 10,515 tons. At Kwinana the construction of a merchant steel rolling mill is proceeding and production there on a limited scale, mainly of steel fencing posts, has already begun.

(ii) *Principal Countries.* Particulars of the production in the principal countries and the estimated world total production during the years 1939, 1952 and 1953, according to figures published by the Mineral Resources Division of the Colonial Geological Surveys, are shown in the next table. Australia ranked fifteenth in order of output of both pig-iron and steel production in 1953.

PIG-IRON AND STEEL : PRODUCTION IN PRINCIPAL COUNTRIES.

('000 Tons.) (a)

Country.	Pig-iron and Ferro-alloys.			Steel Ingots and Castings.		
	1939.	1952.	1953.	1939.	1952.	1953.
U.S. of America	31,855	56,566	68,973	47,142	83,186	99,652
U.S.S.R. (b)	15,000	24,900	27,100	18,500	33,900	37,400
United Kingdom	7,980	10,728	11,175	13,221	16,418	17,609
Germany (Federal Republic) ..	17,202	12,673	11,470	22,123	15,556	15,176
France	7,304	9,615	8,527	7,783	10,695	9,839
Japan	3,144	3,529	4,579	6,588	6,878	7,541
Belgium	3,010	4,713	4,150	3,955	4,987	4,375
Estimated World Total	100,000	149,900	165,400	134,000	207,000	230,000

(a) Long tons.

(b) Estimated.

(c) Pre-war Germany.

§ 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 with 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 1954 in each State, etc., is shown below :—

TUNGSTEN CONCENTRATES : PRODUCTION, 1954.

(Tons.)

Particulars.	N.S.W.	Q'land.	W. Au-t.	Tas.	N. Terr.	Australia.
Scheelite Concentrate	9	(a)	4	1,318	..	1,331
WO ₃ Content	6	(a)	3	852	..	861
Wolfram Concentrate	3	58	..	581	80	722
WO ₃ Content	2	38	..	420	51	511

(a) Less than half a ton.

The following table shows production for Australia for the years 1939 and 1950 to 1954 :—

TUNGSTEN CONCENTRATES : PRODUCTION, AUSTRALIA.

(Tons.)

Particulars.	1939.	1950.	1951.	1952.	1953	1954.
Scheelite Concentrate	191	800	1,031	989	1,185	1,331
WO ₃ Content	124	532	632	602	729	861
Wolfram Concentrate	726	282	697	1,035	1,008	722
WO ₃ Content	482	198	467	672	672	511

2. **Mineral Sands.**—The recovery of mineral sands from beaches in northern New South Wales and Queensland commenced in 1934. The industry was expanded considerably following the 1939-45 War and Australia is now one of the world's largest producers of the two principal minerals obtained from treatment of the sands, namely, rutile and zircon. Small quantities of ilmenite and monazite are also produced, but most producers either prepare a low grade concentrate which is stockpiled or make no attempt to recover the ilmenite and monazite from the beach sands, the tailings being dumped after extraction of rutile and zircon. Particulars of the quantity of rutile and zircon concentrates produced are shown in the following table for the years 1950 to 1954.

RUTILE AND ZIRCON PRODUCTION, AUSTRALIA.
(Tons.)

Year.	Rutile Concentrates.		Zircon Concentrates.	
	Quantity.	TiO ₂ Content.	Quantity.	Zircon Content.
1950	18,312	18,089	21,805	21,536
1951	35,189	33,432	42,410	41,420
1952	38,014	36,861	27,696	27,371
1953	38,039	37,067	27,207	26,858
1954	44,659	43,011	41,453	40,920

3. **Cadmium and Cobalt.**—The sources of cadmium in Australia are lead and zinc concentrates. The cadmium content of these concentrates produced during 1953 was 806 tons and in 1954, 903 tons. Most of the concentrates are treated at Risdon, Tasmania and at Port Pirie, South Australia, for the extraction of cadmium. The remainder are 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 in 1953 is estimated at 53 tons and in 1954 at 69 tons.

Production of refined cadmium and cobalt oxide for the years 1939 and 1950 to 1954 is shown in the following table :—

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

Year.	Cadmium (Refined).			Cobalt Oxide.
	Extracted from Ores Mined in—			Extracted from Ores Mined in New South Wales.(b)
	New South Wales.	Tasmania.	Total.	
1939	124	48	172	20
1950	250	44	294	16
1951	195	36	231	13
1952	245	41	286	16
1953	257	40	297	17
1954	239	49	288	18

(a) Source : Bureau of Mineral Resources.
from Tasmanian ores in each of the years shown.

(b) Excludes less than a ton of cobalt oxide produced

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 east of Port Hedland, and at Horseshoe, north of Meekatharra. Export of manganese ore is prohibited under the Commonwealth Government's policy to conserve strategic minerals of which domestic reserves are limited. Permits were granted in 1953 for some shipments to the United States, and this led to the opening up of the Ragged Hills deposits which are of high grade (84% MnO₂).

The following table shows the production of metallurgical grade and battery and other grades of manganese ore for the years 1939 and 1950 to 1954.

MANGANESE ORE PRODUCTION : AUSTRALIA.

(Tons.)

Year.	Metallurgical Grade.					Battery and Other Grades.
	New South Wales.	Queensland.	South Australia.	Western Australia.	Australia.	
1939 ..	146	..	7	..	153	(a)
1950 ..	1,673	..	237	11,962	13,872	(b) 997
1951 ..	1,054	..	..	5,257	6,311	(c) 1,658
1952 ..	981	..	..	5,045	6,026	(d) 1,043
1953 ..	1,015	43	..	30,457	31,515	(d) 1,428
1954 ..	749	138	..	26,448	27,335	(d) 867

(a) Included with "Metallurgical Grade". (b) New South Wales 426 tons; Queensland 571 tons (includes some "Metallurgical Grade"). (c) New South Wales 1,631 tons; South Australia 27 tons. (d) New South Wales only.

5. Other.—The production, in 1954 (1953 shown in parentheses) of other metallic minerals worthy of note, is as follows:—

Antimony. The antimony content of antimony-bearing minerals produced was 731 tons (791 tons). Of this amount 614 tons (578 tons) were in lead concentrate and 117 tons (213 tons) in 222 tons (450 tons) of antimony ore and concentrate.

Bauxite. 5,487 tons (4,052 tons) of bauxite ore were produced mainly in New South Wales and Victoria. At present it is not intended to mine bauxite in Australia for the production of aluminium at the Australian Aluminium Production Commission's smelter at Bell Bay, Tasmania which began operations in 1955, bauxite being imported from Malaya for that purpose.

Beryllium. Production of beryl ore was 332,976 lb. (280,941 lb.) of which 296,016 lb. (279,149 lb.) came from Western Australia where the Pilbara gold field was the main producing area. The beryllium oxide content of the beryl ore was 38,602 lb. (33,747 lb.)

Chromite. Western Australia was the main source of chromite, producing 4,270 tons (1,968 tons) of the total output of 4,943 tons (2,741 tons), the remaining production being from Queensland. The chromium sesquioxide content of the total Australian production was 2,094 tons (1,131 tons).

Tantalite-Columbite. The production of tantalite-columbite concentrate was 117,767 lb. (18,124 lb.) and the whole of this output, excepting 1,048 lb. produced in the Northern Territory in 1954, came from Western Australia. The tantalum pentoxide and columbium pentoxide content of the concentrates was 60,348 lb. (13,304 lb.).

Other. Other metallic minerals produced in Australia in small quantities during 1954, were bismuth concentrate, molybdenite concentrate, native osmiridium, and platinum concentrate.

§ 8. Coal.

1. Total Production of Coal.—An account of the discovery of coal in each State appears in preceding issues of the Official Year Book (*see* No. 3, pp. 515-16). The quantity and value of the production in each State and in Australia for 1939, and for each of the years 1950 to 1954 are shown in the following table. Of the total production of black coal in 1954, 73,621 tons were classified as semi-anthracite, 17,848,220 tons as bituminous and 1,841,198 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).								
1939 ..	11,196	365	1,317	..	558	99	13,535	3,651
1950 ..	12,798	127	2,321	261	814	222	16,543	7,327
1951 ..	13,513	148	2,474	388	848	237	17,608	7,836
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
VALUE (a) (£'000).								
1939 ..	7,027	260	1,168	..	363	74	8,892	386
1950 ..	22,121	382	3,562	131	1,185	232	27,613	1,707
1951 ..	29,326	601	4,490	400	1,717	305	36,839	2,755
1952 ..	43,283	728	5,956	430	2,457	475	53,329	3,255
1953 ..	41,630	946	5,861	461	3,073	453	52,124	3,628
1954 ..	42,762	886	6,474	650	3,589	523	54,884	3,945

(a) At the mine.

The mining of black coal on a large scale by open-cut methods first began in Australia at Blair Athol in Queensland, where in 1937, the first year of production, 18,494 tons were produced. Open-cut 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 open-cuts rose slowly up to 1943 when 119,406 tons were produced, but increased rapidly from 1944 reaching an output of over four million tons in 1952, from which level it declined to 3,138,976 tons in 1953 and 2,989,795 tons in 1954. This decline has been mainly due to the closing down of large open-cuts in New South Wales, as overproduction of coal began to occur late in 1952 and it was the policy of the Joint Coal Board that open-cut mining should provide the quantity of coal by which underground mine production failed to meet total requirements.

The production of black coal from underground and open-cut mines in each State for the years 1939 and 1950 to 1954 is shown in the following table.

BLACK COAL PRODUCTION : UNDERGROUND AND OPEN-CUT.
(^{'000} Tons.)

Year.	Method of Mining.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	Aust.
1939 ..	Underground ..	11,196	365	1,274	..	558	99	13,492
	Open-cut ..	..	..	43	..	..	..	43
	Total ..	11,196	365	1,317	..	558	99	13,535
1950 ..	Underground ..	11,196	127	1,860	..	556	222	13,961
	Open-cut ..	1,602	..	461	261	258	(a)	2,582
	Total ..	12,798	127	2,321	261	814	222	16,543
1951 ..	Underground ..	11,224	148	1,857	..	480	231	13,940
	Open-cut ..	2,280	..	617	388	368	6	3,668
	Total ..	13,513	148	2,474	388	848	237	17,608
1952 ..	Underground ..	12,492	144	2,006	..	419	210	15,301
	Open-cut ..	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
	Open-cut ..	1,722	..	576	448	393	(a)	3,130
	Total ..	14,174	152	2,517	448	886	234	18,411
1954 ..	Underground ..	13,703	141	2,067	..	608	254	16,773
	Open-cut ..	1,380	..	694	495	411	10	2,990
	Total ..	15,083	141	2,761	495	1,019	264	19,763

(a) Less than 500 tons.

2. **Production of Coal in each State.**—(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 type of mining and rank during the five years 1950 to 1954 compared with 1939. Small quantities of semi-anthracite coal produced in some years are included with bituminous.

COAL : PRODUCTION, NEW SOUTH WALES.

('000 Tons.)

Particulars.		1939.	1950.	1951.	1952.	1953.	1954.
Underground Mines ..	..	11,196	11,196	11,224	12,492	12,452	13,703
Open-cut Mines ..	..	..	1,602	2,289	2,530	1,722	1,380
Total ..	..	11,196	12,798	13,513	15,022	14,174	15,083
Bituminous ..	..	11,194	12,786	13,508	15,009	14,165	15,066
Sub-bituminous ..	..	2	12	5	13	9	17

(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 1954, production of bituminous coal was 141,318 tons compared with 151,907 tons in 1933. 1953

(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; these, when completed, will greatly reduce the dependence on fuel from other States. Brown coal produced in Victoria in 1954 amounted to 9,331,255 tons, of which 8,393,263 tons, or 90 per cent., were won at the State open-cuts at Yallourn. During 1953-54, 7,980,844 tons of brown coal were produced at Yallourn, of which 5,306,825 tons went to electricity generating stations, and 2,339,470 tons to the briquette factory.

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 587,252 tons in 1953-54. Approximately two and a half tons of brown coal are required to make one ton of briquettes.

A brown coal gasification plant is at present being established at Morwell near the new open-cut brown coal mine and briquetting plants of the State Electricity Commission of Victoria. The Gas and Fuel Corporation plans to commence gas making at this plant in 1956 with an initial output of 18 million cubic feet per day, increasing to 144 million cubic feet per day over the next 20 years. The brown coal gas will be made by the Lurgi process which is widely used in Germany.

The table following shows the production and distribution of brown coal and the production of briquettes in Victoria for the years 1949-50 to 1953-54, compared with 1938-39.

BROWN COAL : PRODUCTION AND UTILIZATION, VICTORIA.
(^{'000 Tons.})

Year.	Total 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)			
1938-39 ..	3,663	2,096	516	(b)	1,031	20	400
1949-50 ..	7,637	4,408	776	764	1,553	136	589
1950-51 ..	7,300	4,338	696	746	1,391	129	511
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

(a) Recorded consumption.

(b) Not available.

(iii) *Queensland.* The production of coal classified according to type of mining and rank during the years 1939 and 1950 to 1954 was as follows :—

COAL : PRODUCTION IN QUEENSLAND.
(^{'000 Tons.})

Particulars.		1939.	1950.	1951.	1952.	1953.	1954.
Underground Mines ..	..	1,274	1,860	1,857	2,006	1,941	2,067
Open-cut Mines ..	..	43	461	617	736	576	694
Total ..	..	1,317	2,321	2,474	2,742	2,517	2,761
Semi-anthracite ..	..	1,317	99	81	83	81	72
Bituminous ..	..		2,057	2,138	2,312	2,215	2,378
Sub-bituminous ..	..		165	255	347	221	311

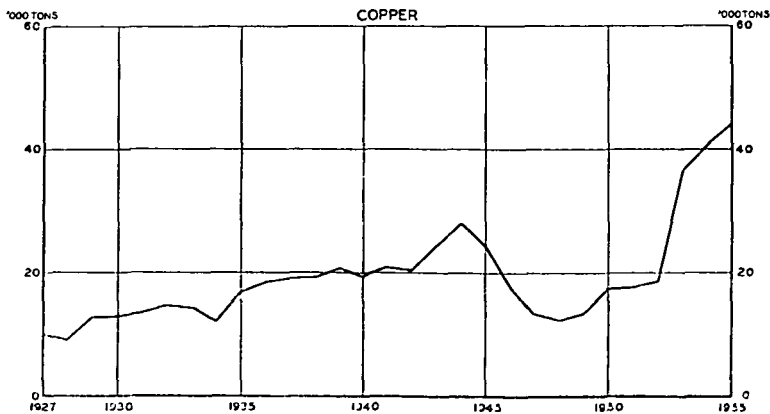
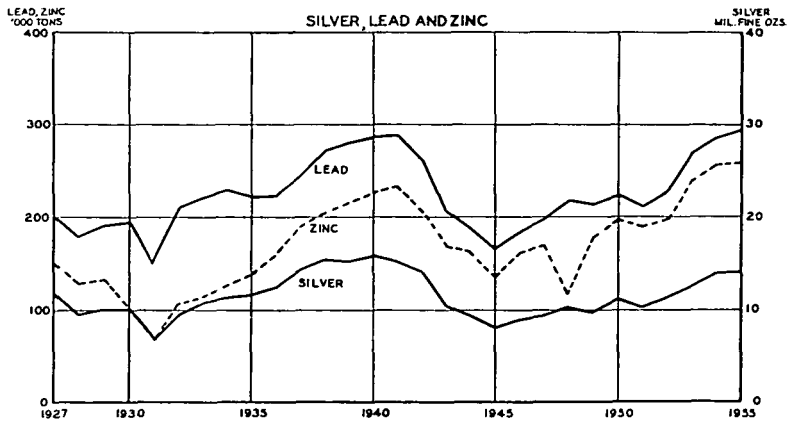
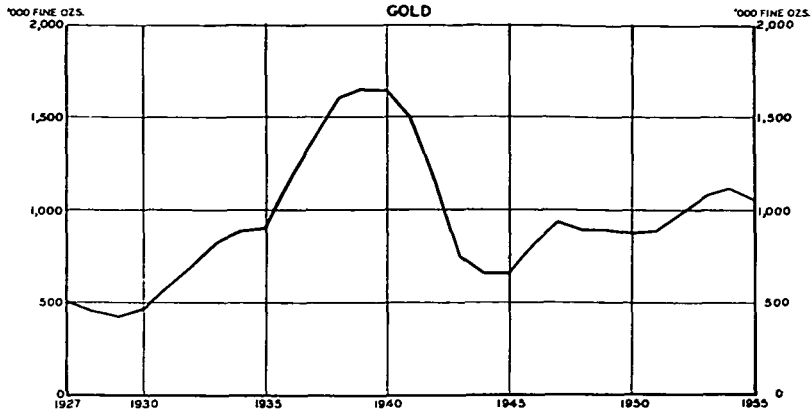
The principal coal-producing districts in Queensland are Ipswich, Clermont, Mt. Morgan and Bowen; output from these areas in 1954 amounted to 2,299,942 tons or 83 per cent. of the total.

The open-cut 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 open-cuts while in 1954, 694,022 tons (25 per cent.) were mined in this manner.

(iv) *South Australia.* Coal mined in South Australia is won by open-cut 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 the first year of major production of the Leigh Creek mine in 1944, 34,620 tons were won. Production has risen considerably in more recent years, and amounted to 495,106 tons in 1954.

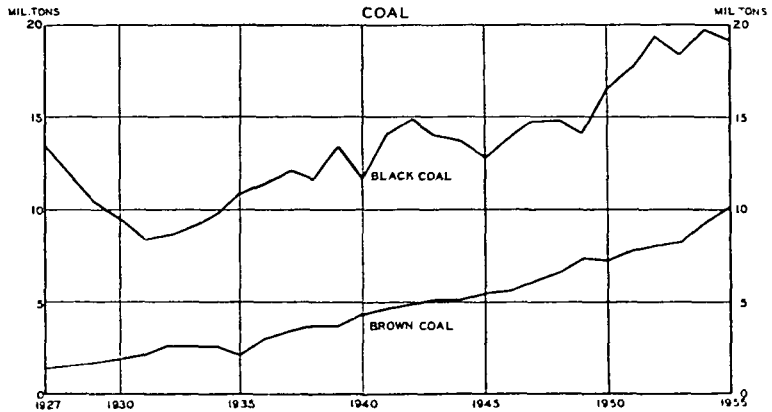
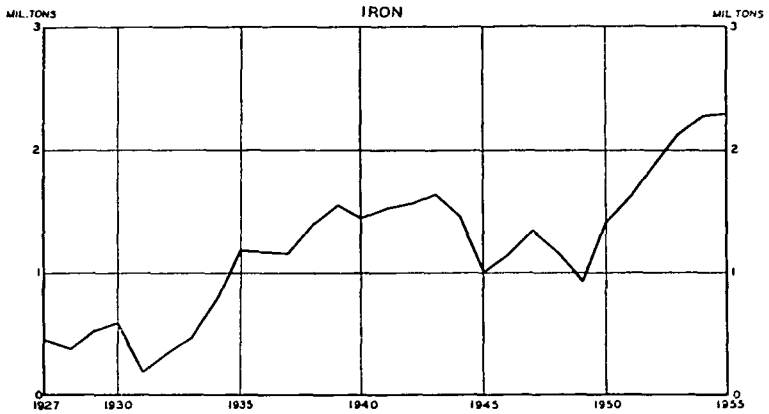
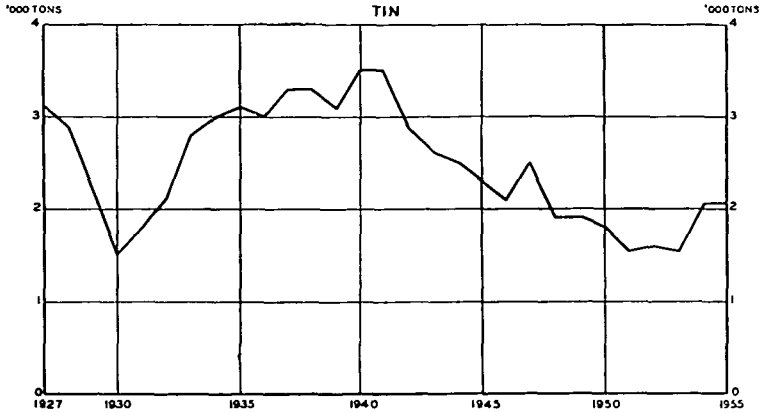
(v) *Western Australia.* The only coal deposits which have been developed on a commercial scale are at Collie in the south-west of the State. Collie coal is sub-bituminous in rank. Production in 1954 was 1,018,343 tons, compared with 557,535 tons in 1939.

MINE PRODUCTION OF PRINCIPAL METALS
(METALLIC CONTENT OF MINERALS)
AUSTRALIA, 1927 TO 1955



MINE PRODUCTION OF PRINCIPAL METALS (METALLIC CONTENT OF MINERALS) AND PRODUCTION OF COAL

AUSTRALIA, 1927 TO 1955



Although a large proportion of the coal produced in Western Australia comes from open-cut mines, the amount available from these mines is limited, as present surveys estimate that only 8,000,000 tons can be extracted by open-cut methods.

(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 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 1954, output amounted to 264,202 tons compared with 99,392 tons in 1939.

(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 in March, 1953. This places total Australian reserves at about 56,830 million tons, of which 14,250 million tons are of anthracitic and bituminous rank and 42,580 million tons of sub-bituminous and lignitic rank. New South Wales has the largest reserves of anthracitic and bituminous coal (about 10,000 million tons) while the greater part of the sub-bituminous and lignitic reserves comprise brown coal in Victoria (40,000 million tons).

3. *Production in Principal Countries.*—The following table shows the production of the principal countries in 1953 as published by the Mineral Resources Division of the Colonial Geological Surveys.

COAL : PRODUCTION IN PRINCIPAL COUNTRIES, 1953.

('000 Tons.) (a).

Country.	Black Coal.	Brown Coal, Lignite.
United States of America	430,495	2,496
U.S.S.R.	(b) 316,000	..
United Kingdom	224,195	..
Germany, Federal Republic	124,163	83,219
Poland	87,197	5,200
France	51,757	1,917
China	(b) 50,000	..
Japan	45,789	1,462
India	35,979	..
Belgium	29,586	..
Union of South Africa	28,010	..
Czechoslovakia	20,020	32,250
Australia	18,411	8,257
Saar	16,160	..
Canada	12,388	1,805
Netherlands	12,103	..
Spain	11,964	1,760
East Germany	3,500	173,500
Hungary	(c) 2,100	(c) 18,897
Yugoslavia	910	10,158
Bulgaria	(d)	(c) 8,563

(a) Long tons.
available.

(b) Estimated.

(c) Source : United Nations Statistical Office.

(d) Not

4. *Exports.*—(i) *General.* The quantity of coal of Australian production exported to other countries in 1954-55 was 291,226 tons, valued at £1,147,441, shipped mainly from New South Wales. These figures of overseas exports exclude bunker coal supplied to overseas vessels, which in 1954-55 amounted to 25,363 tons, valued at £111,625. The quantities and values of the overseas exports of Australian coal and of bunker coal for overseas vessels for a series of years are shown in the following table.

COAL : OVERSEA EXPORTS AND BUNKERS, AUSTRALIA.

Year.	Oversea Exports.(a)		Bunker Coal for Oversea Vessels.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
1938-39	382,085	347,054	549,453	561,063
1950-51	72,283	242,649	69,299	284,824
1951-52	139,140	608,045	54,207	246,258
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

(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 1954-55 (14,661,061 tons), 11,820,199 tons (81 per cent.) were available for consumption in the State, 2,520,673 tons (17 per cent.) were exported interstate and 320,189 tons (2 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 1949-50 to 1953-54, compared with 1938-39.

BLACK COAL : PRODUCTION AND DISPOSAL.

('000 Tons.)

Particulars.	1938-39.	1949-50.	1950-51.	1951-52.	1952-53.	1953-54.
Production(a)	12,198	14,918	16,418	19,170	18,545	19,424
Imports	87	494	598	285	146	2
Total	12,285	15,412	17,016	19,455	18,691	19,426
Disposals—						
Consumption as fuel—						
Electricity Generation ..	1,927	3,828	4,672	5,042	5,071	5,836
Factories	2,227	2,635	2,967	3,090	3,097	3,367
Railway Locomotives (c)	2,403	3,099	3,183	3,291	3,110	3,208
Bunker Coal—						
Oversea Vessels	550	135	69	54	43	32
Interstate Vessels	411	231	225	227	229	211
Total	7,518	9,928	11,116	11,704	11,550	12,654
Consumption as raw material—						
Gas works	1,177	1,865	1,964	2,097	2,081	2,047
Coke works	1,708	1,973	2,618	2,835	3,071	3,252
Total	2,885	3,838	4,582	4,932	5,152	5,299
Exports (Oversea)	382	68	72	139	256	386
Balance—Unrecorded consumption, other purposes(d)	1,500	1,578	1,246	2,680	1,733	1,087
Grand Total	12,285	15,412	17,016	19,455	18,691	19,426

(a) Includes miners' and colliery coal.

(b) Estimated.

(c) Government railways only.

(d) Includes net change in stocks.

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 1954 exports of black coal were 391,226 tons and imports were 4,994 tons.

6. Coal 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 1938 and 1950 to 1954. Saleable coal is taken to exclude miners' coal, coal consumed at the mines and other producer-consumed coal. For the years 1951 to 1954 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.
1938	..	..	..	12 0	14 0	9 6	12 0
1950	..	..	..	36 5	39 1	29 4	35 10
1951	..	..	..	51 5	50 8	42 10	49 8
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

7. Values in New South Wales, Great Britain and the United States of America.—The following table shows, for the years 1938 and 1950 to 1954, 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.

The series of average values for the United States of America replaces the series of prices shown for this country in earlier Year Books.

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

Country.	1938.	1950	1951.	1952.	1953.	1954.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
New South Wales—Bituminous(a)	12 0	35 10	49 8	61 2	61 1	59 3
Great Britain—Deep mined(b)	16 8	47 9½	51 2½	57 3	61 1½	63 6
United States of America—Bituminous and lignite (c)	\$ 1.95	\$ 4.84	\$ 4.92	\$ 4.90	\$ 4.92	\$ 4.82

(a) Average selling value at the mine per ton of 2,240 lb.: the figures relate to saleable coal and include excise duty from November, 1949. (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 1939 and each of the years 1950 to 1954 is shown in the following table.

COAL-MINES : PERSONS EMPLOYED.

Year.	New South Wales.	Victoria.		Queens-land.	South Australia.	Western Australia.	Tasmania.	Australia
		Black.	Brown. (a)					
1939	16,581	1,376	449	2,615	..	752	238	22,011
1950	18,540	777	889	3,495	408	1,099	334	25,542
1951	18,747	773	808	3,503	434	1,125	329	25,809
1952	20,151	851	1,697	3,715	220	1,326	349	28,415
1953	19,961	900	1,598	3,701	250	1,478	345	28,233
1954	19,979	786	1,598	3,743	270	1,583	358	28,317

(a) Prior to 1952, persons engaged in removing overburden were not included.

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. Since 1933 there has been a gradual increase, but the numbers employed in 1953 were only 86 per cent. of the maximum figure already quoted. In New South Wales in 1954, 7,973,737 tons of coal, or 53 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 1950 to 1954. 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.(a)
(Tons.)

Year.	N.S.W.	Vic.	Q'land.	W. Aust.	Tas.	Australia.
PRODUCTION PER MAN-SHIFT WORKED AT COAL FACE.						
1950	10.28	2.41	6.18	8.80	5.40	9.01
1951	10.82	2.43	6.40	8.22	6.01	9.39
1952	10.06	2.24	6.36	6.82	6.03	8.88
1953	9.72	2.11	6.37	4.86	6.15	8.50
1954	10.16	2.03	6.54	4.82	5.95	8.81
PRODUCTION PER MAN-SHIFT WORKED BY ALL EMPLOYEES.						
1950	2.95	0.91	2.52	2.17	2.76	2.78
1951	2.96	0.93	2.55	1.85	3.03	2.78
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	1.92	3.07	3.00

(a) As calculated by Joint Coal Board. (b) In April, 1952, persons working "at coal face" were re-defined resulting in a considerable increase in persons in this category in New South Wales.

(ii) *Open-cut Mines.* In the next table, the Joint Coal Board's estimates of production of black coal per man-shift worked by all employees in open-cut mines are shown for the years 1950 to 1954. There are no open-cuts producing black coal in Victoria.

PRODUCTION OF BLACK COAL PER MAN-SHIFT : OPEN-CUT MINES.(a)
(Tons.)

Year.	N.S.W.	Q'land.	S. Aust.	W. Aust.	Tas.	Australia
1950	8.33	10.16	2.17	7.17	5.74	6.57
1951	8.02	11.80	3.05	6.73	5.28	7.03
1952	7.92	11.78	3.22	6.13	4.63	7.07
1953	8.51	10.97	3.57	5.37	..	6.92
1954	8.97	12.27	(b) 4.52	4.74	7.91	7.31

(a) Production per man-shift worked by all employees, as calculated by Joint Coal Board.

(b) Figures prior to July, 1954 include manshifts on other than mine work.

10. Joint Coal Board.—After the 1939-45 War, the Governments of the Commonwealth and New South Wales mutually agreed to create jointly an 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 previous 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 1953-54 reached the record level of 2,010,404 tons. Until recent years, imports have exceeded exports but in 1953-54 exports amounted to 28,223 tons (27,439 tons to New Caledonia) while 10,981 tons were imported.

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 1953-54 was 839,793 tons compared with 757,046 tons in 1938-39.

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 1938-39 and 1949-50 to 1953-54. The figures exclude output of coke breeze, which in 1953-54 amounted to 366,041 tons.

COKE PRODUCTION(a) : AUSTRALIA.

(Tons.)

Industry.	1938-39.	1949-50.	1950-51.	1951-52.	1952-53.	1953-54.
Coke Works ..	1,164,873	1,182,773	1,515,782	1,636,982	1,858,428	2,010,404
Gas Works ..	757,046	1,094,982	1,111,854	1,203,602	1,071,106	839,793
Total ..	1,921,919	2,277,755	2,627,636	2,840,584	2,929,534	2,850,197

(a) Excludes coke breeze; see letterpress above.

2. Other By-products from Coal.—In addition to coke, other products are obtained from the treatment of coal by coke and gas works. Details of some of these are given in the following table.

OTHER BY-PRODUCTS FROM COAL : AUSTRALIA.

Commodity.	1938-39.	1949-50.	1950-51.	1951-52.	1952-53.	1953-54.
Tar—Crude (a) .. '000 gals.	34,614	38,178	41,239	42,586	44,402	46,517
Refined (a)	3,752	12,324	12,449	12,514	15,699	17,725
Tar Oils (crude)	1,254	3,758	3,960	4,101	3,674	3,799
Ammoniacal Liquor	5,388	18,120	24,210	23,449	21,956	22,763
Ammonium Sulphate (a) .. tons	24,251	48,736	57,893	63,814	70,174	70,811

(a) Includes production in works other than coke and gas works.

§ 10. Mineral Oils.

1. **Australia.**—Natural oil has been proved to exist in Queensland, Victoria and Western Australia, and in the latter State in 1953, potential oil production was found at Rough Range. Many of the conditions favourable to the accumulation of oil in commercial quantities have been shown to be present in Queensland, Western Australia and New South Wales, but in the latter State no strong positive evidence of its existence has been recorded.

Reference is made in § 15 page 1023, to the assistance afforded by the Commonwealth Government in the search for oil.

Structure control drilling has been carried out following the Rough Range discovery and field exploration increased enormously. The drilling of a number of wells has commenced at various places throughout the Commonwealth. These include all the States with the exception of Tasmania and the Northern Territory.

2. **New South Wales.**—During 1955 Australian Oil and Gas Corp. commenced drilling at Kurrajong and Clarence River Basin Oil Exploration Co. N.L. started drilling at Grafton.

3. **Victoria.**—Drilling for oil commenced in 1955 in the Gippsland area of Victoria when Frome Lakes Pty. Ltd. drilled Darriman No. 1 to 4,730 feet. The well was abandoned without testing. Woodside (Lakes Entrance) Oil Co. N.L. also commenced drilling near Woodside.

4. **Queensland.**—At Roma, Queensland, Associated Australian Oilfields N.L. after testing uneconomical sands in the Roma Blocks area north of Roma in mid-1955, moved to Hospital Hill. One gas well with a potential of 1,195 m.c. ft. and two unsuccessful wells were drilled. Operations in this area have been temporarily suspended.

Two wells were drilled at Reid's Dome near Springsure, one at Wellington Point, two near Maryborough and seven in the Longreach area. None of these succeeded in finding commercial oil or gas production during 1955.

5. **South Australia.**—Under prescribed conditions, the South Australian Government offers a bonus of £5,000 to the person or body corporate which first obtains from a local bore or well 100,000 gallons of crude petroleum containing not less than 90 per cent. of products obtainable by distillation. Geophysical surveys were undertaken by private interests during 1947, and continued into 1948, in the north-east corner of the State and extending over the border into New South Wales and Queensland, but with little success. Assistance given by the Commonwealth included equipment and a geophysical survey party.

Airborne geophysical surveys over the Eucla Basin in the south-western part of the State were made and extended into Western Australia.

6. **Western Australia.**—Systematic geological mapping and stratigraphic and structural studies have been continued in the Carnarvon area during 1955 by the Commonwealth Bureau of Mineral Resources, Geology and Geophysics. Western Australian Petroleum Pty. Ltd. (an exploration Company formed by Caltex in partnership with Ampol Petroleum Company) have proved commercial oil production at about 3,600 feet in one well on the Rough Range anticline at Exmouth Gulf. Subsequent wells drilled to exploit this reservoir showed that subsurface conditions did not reflect those shown at the surface, and further detailed geophysical work is in progress. One dry hole has been drilled on the Cape Range structure and a second well is now being drilled. Drilling has also been done at Giralda, Waroora and drilling for geological information was done at Grierson and Point Cuvier.

In the Fitzroy basin, South Kimberley area, geological surface and geophysical surveys have been continued by the Bureau of Mineral Resources, Geology and Geophysics. Associated Freney Oilfields N.L. drilled one well to 9,072 feet, which was abandoned after testing had shown that a number of oil shows were uneconomical. West Australian Petroleum Pty. Ltd. ceased drilling at Grant Range in October, 1955 and moved to a new site on the Fraser River.

7. **Papua.**—Australasian Petroleum Co. Pty. Ltd. and Island Exploration Company continued extensive geological and geophysical surveys over the western areas of Papua. During 1955, Island Exploration Co.'s Omati No. 2 was abandoned at 10,880 feet, and Aramia No. 1 was abandoned after having been drilled to 6,628 feet. The drilling rigs were then moved to Kuru and Barikewa.

8. **General.**—During 1939 efforts were made to secure greater uniformity in State legislation governing the search for oil. A draft Bill based on modern legislation in other countries was prepared by the Commonwealth and submitted to the State Governments. As a result, amending legislation was passed in Victoria, Queensland, South Australia and Western Australia. There was immediate response to this in Queensland, where an agreement has been reached between the State Government and one of the major oil companies, whereby the company has undertaken to spend up to £400,000 in the search for oil in that State.

Further details of action taken by the Commonwealth Government in connexion with the search for oil will be found in § 15. Government Aid to Mining, and Mineral Control (page 1023).

§ 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 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 will require 70,000 tons of pyrite concentrate from Nairne annually.

The following table shows for the years 1939 and 1950 to 1954, 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.	1939.	1950.	1951.	1952.	1953.	1954.
Sulphur contained in—						
Zinc concentrate ..	123,968	119,736	113,964	119,515	141,954	152,074
Pyrite ..	27,040	57,177	65,962	93,516	77,811	97,649
Spent Oxide Roasted (a)	(b)	2,930	3,200	4,211	5,432	4,680
Total Sulphur Content ..	151,008	179,843	183,126	217,242	225,197	254,403
Recoverable Sulphur (a)	129,709	156,095	159,050	189,436	195,471	221,265
Monohydrate Acid Produced	484,493	639,600	652,125	628,302	671,471	778,008
Quantity of Sulphur in Mono- hydrate Acid produced from—						
Sulphur (Elemental) (d) ..	a 114,500	134,000	135,683	112,225	123,469	154,337
Zinc concentrate ..	25,300	32,000	32,850	33,115	31,270	33,564
Pyrite ..	27,040	45,000	50,300	57,891	60,811	62,533
Spent Oxide ..	(b)	2,050	2,230	3,231	3,973	3,973
Total ..	166,840	213,050	221,063	206,462	219,523	254,407

(a) Estimated.

(b) Not available.

(c) Year ended 30th June, 1939.

(d) 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 of asbestos in Australia in recent years has been of two types, chrysotile and crocidolite, the former being the most important type economically, but deposits of chrysotile in Australia 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 1950 to 1954 is shown in the following table:—

PRODUCTION OF ASBESTOS : STATES.
(Tons.)

Year.	Chrysotile.			Crocidolite.		
	New South Wales.	Western Australia.	Australia.	South Australia.	Western Australia.	Australia.
1950 ..	374	211	585	13	1,018	1,031
1951 ..	432	727	1,159	6	1,393	1,399
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

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 1954.

PRODUCTION OF CLAYS : STATES, 1954.
(Tons.)

Type.	New South Wales.	Victoria.	Queensland	South Australia.	Western Australia.	Tasmania.	Total.
Bentonite ..	63	..	126	..	1,122	..	1,311
Brick Clay and Shale ..	1,604,409	(a) 845,000	277,468	302,942	(a) 420,000	(a) 69,000	3,518,819
Cement Clay and Shale ..	114,254	..	..	20,548	11,901	..	146,703
Damourite ..	..	..	..	514	..	..	514
Fireclay ..	60,038	27,035	8,459	24,861	6,738	..	127,131
Fuller's Earth ..	73	..	..	..	..	..	73
Knolin ..	23,159	2,575	226	3,325	4,020	7,948	41,253
Stoneware Clay ..	109,974	..	878	..	..	..	110,852
Tile Clay ..	150,184	..	..	..	..	..	150,184
Other Clays ..	10,047	(a) 85,854	..	42,190	..	..	138,091

(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) 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 about two-thirds of the total Australian production of gypsum to 1954 have come from this area, 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, principally in the manufacture of plaster and 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 1950 to 1954 compared with the year 1939.

PRODUCTION OF GYPSUM : STATES.

(Tons.)

Year.	New South Wales.	Victoria.	South Australia.	Western Australia.	Australia.
1939	7,032	11,777	144,940	14,340	178,089
1950	102,910	39,945	156,031	36,598	335,484
1951	104,697	41,126	147,701	70,823	364,347
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

4. Limestone.—Limestone is quarried in all States, but statistics of limestone production are incomplete, none being collected in Western Australia, and in 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 1954 are shown in the following table :—

PRODUCTION OF LIMESTONE (a) : STATES, 1954.

(Tons.)

New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Northern Territory.	Total.
1,544,217	694,684	(b)73,701	950,202	(c)	196,485	65	(b)3,459,354

(a) Includes shell and coral.

(b) Incomplete.

(c) Not available.

5. Magnesite.—The major sources of magnesite at present are deposits at Fifield and Thuddunga in central New South Wales. Most of the output of magnesite in Australia is used for refractory purposes, particularly in the steel industry, and small amounts are used in chemical, paper, glass, rubber, and ceramic industries. Particulars of the production of magnesite in each State for the years 1939, and 1950 to 1954, are set out in the table below.

PRODUCTION OF MAGNESITE : STATES.

(Tons.)

Year.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Australia.
1939.. ..	25,189	118	..	376	..	25,683
1950.. ..	32,386	..	..	1,177	1,829	35,392
1951.. ..	35,963	398	13	998	762	38,134
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

6. Mica.—Almost all Australian production of muscovite mica has come 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 1025—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 1950 to 1954.

MUSCOVITE MICA PRODUCTION.

(lbs.)

Particulars.	1950.	1951.	1952.	1953.	1954.
New South Wales—					
Scrap .. ..	..	..	..	..	15,680
Northern Territory—					
Trimmed	67,769	48,034	71,929	70,684	84,619
Crude and Film .. ..	..	2,034		1,542	..
Scrap	51,184	82,880		..	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 1939 and 1950 to 1954. Available estimates of total Australian production are also shown.

SALT PRODUCTION.

('000 Tons.)

Particulars.	1939.	1950.	1951.	1952.	1953.	1954.
South Australia	79	191	219	203	239	304
Estimated Australian Total ..	(a)	273	300	277	310	380

(a) Not available.

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 Oraparinna in the north Flinders Range in South Australia where the deposits are of first-grade quality. The production of barite in Australia during 1954 was 6,872 tons, of which 3,828 tons came from South Australia.

(iii) *Cupreous Ore and Concentrate.* Cupreous ore is mined in Western Australia for mixing with superphosphate fertilizer. The quantity produced in 1954 was 4,748 tons and 18 tons were also produced in the Northern Territory giving a total of 4,766 tons production for Australia.

(iv) *Diatomite.* Production of diatomite is carried on mainly in the eastern States of Australia, only a small quantity coming from Western Australia. In 1954, 5,439 tons were produced in Australia, and of this total, New South Wales produced 3,708 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 over 90 per cent. of total output. In 1954 New South Wales produced 3,855 tons; Queensland, 2,680 tons; South Australia, 118,612 tons; and Tasmania, 2,847 tons, making an Australian total of 127,994 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 9,538 tons of the Australian total of 16,384 tons in 1954.

(vii) *Gemstones.* (a) *Diamonds.* Gem quality diamonds are not produced in Australia, but 1,564 carats of industrial diamonds worth £12,673 were recovered in 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 Peedy and Andamooka fields in South Australia which produced opals worth £44,815 in 1954 compared with £76,460 in 1953. Other production in 1954 was from the Quilpie district in Queensland valued at £950, and £661 from Lightning Ridge in New South Wales.

(c) *Sapphires*. The Anakie field in Central Queensland is the only Australian producer of sapphires. Output in 1954 was valued at £636.

(d) *Other Gemstones*. The only other recorded production of gemstones in Australia during 1954 was in Western Australia, where emeralds valued at £3·3 were won.

(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 siliceous abrasives, was 102,044 tons in New South Wales; 17,942 tons in South Australia; 7,803 tons in Western Australia; and 6,169 tons in Tasmania, giving a total of 133,958 tons for those States during 1954.

(ix) *Sillimanite*. In 1954, 2,337 tons of sillimanite were produced in Australia. New South Wales contributed 1,370 tons and the remaining 967 tons came from South Australia.

(x) *Talc*. The Australian output of talc (including steatite), 12,940 tons, in 1954 was the highest yet recorded, New South Wales produced 932 tons, South Australia 9,088 tons and Western Australia 2,920 tons.

(xi) *Other*. Other non-metallic minerals produced in Australia in small quantities during 1954 were fluorite, graphite, glauconite, mineral pigments, pebbles for grinding, phosphate rock, pyrophyllite, petalite, serpentine and slate.

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

1. *Total Employment in Mining*.—The number of persons engaged in the mining industry in Australia fluctuates according to economic conditions generally, the price of industrial metals, the state of the labour market, and according to the permanence of new finds and the development of the established mines. The following table shows the numbers engaged in the various mining industries in each State and Australia as a whole in 1953. Attention is drawn to § 1, para. 3, Standardization of Mineral Statistics, (pp. 983-4) which outlines the nature of changes adopted in 1950 and 1952 in the reporting of mineral statistics.

EMPLOYMENT IN MINING, 1953. (a)

Industry.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N. Terr.	Aust.
Metal Mining—								
Gold Mining ..	125	549	166	22	6,049	..	139	7,050
Silver-Lead-Zinc Mining ..	6,932	..	1,450	2	128	746	..	9,258
Copper-Gold Mining ..	25	..	1,138	2	10	(b)	(b)	2,025
Tin Mining ..	195	..	267	..	69	502	30	1,063
Other Metal Mining ..	459	20	481	311	383	(b)	(b)	2,198
Total, Metal Mining	7,736	569	3,502	337	6,639	2,401	41	21,594
Fuel Mining—								
Black Coal Mining—								
Underground ..	19,084	900	3,301	..	1,189	344	..	24,818
Open-cut ..	877	..	372	250	289	..	..	1,788
Total Black Coal Mining ..	19,061	900	3,673	250	1,478	344	..	26,606
Brown Coal Mining ..	..	1,598	..	..	..	..	..	1,598
Other Fuel Mining ..	..	..	(c)	..	..	..	..	(c)
Total, Fuel Mining	19,061	2,498	(d) 3,673	250	1,478	344	..	(d) 28,204
Non-metal (excluding Fuel) Mining ..	1,077	256	(d)(e) 284	778	(d) 370	160	6	(e) 3,016
Total, All Mining ..	28,774	3,323	(d) 7,459	1,365	(d) 8,437	2,914	472	(f) 53,744
Construction Material								
Quarrying ..	1,024	(f) 1,403	(d) 180	700	(g) 285	70	..	(h) 3,803
Total, All Mining and Quarrying ..	29,798	4,816	(d) 7,638	2,065	(d) 8,722	2,984	472	(h) 56,547

(a) Average employment during whole year. (b) Not available for publication. (c) Not available for publication; included with 'Non-metal (excluding Fuel) Mining'. (d) Incomplete. (e) Includes particulars of "Other Fuel Mining". (f) Year ended 30th June, 1953. (g) Year ended 30th June, 1954. (h) Includes 42 for the Australian Capital Territory.

The particulars in the foregoing table exclude the following estimated numbers of fossickers :—Gold mining, 222 ; Tin mining, 409 ; Other mining, 1,633.

The following table shows particulars of mining employment in Australia for the years 1938 and 1949 to 1953. Complete particulars of employment in construction material quarrying are not available prior to 1952. The details for 1951 and earlier years include estimates by State Mines Departments of numbers of fossickers which are excluded for 1952 and 1953. Changes in the bases of collecting and compiling the statistics introduced in 1950, 1951 and 1952 have resulted in some lack of comparability of the data in other respects, particularly in the case of metal mining. The employment figures for 1952 are for the period worked by individual mines or quarries, and for 1953 the figures show the average number employed during the whole year.

EMPLOYMENT IN MINING : AUSTRALIA.

Industry.	1939.	1949.	1950.	1951.	1952.	1953.
Metal Mining—						
Gold Mining ..	28,840	10,395	9,478	8,647	6,583	7,050
Silver-Lead-Zinc Mining ..	6,095	8,126	8,807	9,536	9,497	9,258
Copper-Gold Mining ..	1,291	999	2,184	2,047	2,112	2,025
Tin Mining ..	4,113	1,745	1,644	1,577	990	1,063
Other Metal Mining ..	(a) 353	(a) 368	1,279	2,028	2,220	2,198
Total, Metal Mining ..	40,692	21,633	23,392	23,835	21,411	21,594
Fuel Mining—						
Black Coal Mining ..	21,562	24,269	24,451	24,861	26,612	26,606
Brown Coal Mining (b) ..	449	811	889	898	1,691	1,598
Other Fuel Mining ..	71	(c)	183	147	112	(c)
Total, Fuel Mining ..	22,082	25,080	25,523	25,906	28,415	28,304
Non-metal (excluding Fuel)						
Mining ..	(d) 3,015	d e 3,825	3,117	3,035	3,070	(e) 2,946
Total, All Mining ..	65,789	50,538	52,032	52,776	52,806	51,744
Construction Material Quarrying ..	(f)	(f)	(f)	(f)	4,167	3,803
Total, All Mining and Quarrying ..	(f)	(f)	(f)	(f)	57,058	56,547

(a) Incomplete ; some metal mining included with " Total Non-metal (excluding Fuel) Mining ".
 (b) Prior to 1952, persons engaged in removing overburden were not included. (c) Not available separately ; included with " Non-metal (excluding Fuel) Mining ". (d) Includes some Metal Mining.
 (e) Includes " Other Fuel Mining ". (f) Not available.

2. **Wages Paid in Mining.**—Information regarding rates of wages paid in the mining industry is shown in the *Labour Report* issued by this Bureau and in Chapter VI.—Labour, Wages and Prices (page 168).

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 from State to State as varying criteria are used in determining what constitutes injury for the purpose of these records. In 1953, 58 persons were recorded as having been killed and 1,546 as having been injured in mining accidents (excluding accidents in construction material quarrying). Of the total of 58 persons killed, 23 were in black coal mines, 12 in gold mines and 23 in other mines. Reported injuries were highest in gold mines (493), black coal mines (463) and silver-lead-zinc mines (332).

§ 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 1952–53, 1953–54 and 1954–55. In addition to the unfabricated metals shown, considerable quantities of partly fabricated metals (bars, rods, wire, etc.) enter into Australia's overseas trade.

IMPORTS AND EXPORTS OF PRINCIPAL MINERALS AND METALS: AUSTRALIA.

Item.	Unit of Quantity.	1952-53.		1953-54.		1954-55.	
		Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
IMPORTS.							
Minerals—			£A. f.o.b.		£A. f.o.b.		£A. f.o.b.
Antimony ore and concentrate	cwt.	5,401	39,763	13,119	69,419	27,091	142,821
Asbestos	"	575,757	1,888,651	528,899	1,988,691	853,811	3,246,480
Chromium ore and concentrate	"	125,273	89,856	83,517	67,419	99,242	59,296
Coal	ton	145,634	483,093	2,051	9,816	4,991	26,185
Coke	"	685	8,363	10,981	144,566	5,900	71,114
Diatomite	cwt.	30,541	43,467	38,413	54,628	78,873	123,182
Industrial Diamonds ..	carat	249,556	395,275	102,577	325,015	265,144	471,681
Mica	lb.	117,917	19,564	377,277	64,800	1,029,900	93,528
Sulphur	cwt.	2,644,058	2,550,325	3,836,254	2,644,015	3,851,674	2,720,089
Metals—							
Aluminium (pigs, ingots, etc.)	"	135,919	1,384,631	241,980	1,900,542	255,250	2,748,466
Copper—							
Blister	"	(a)	(a)	2,000	30,086	19,000	150,597
Pigs, ingots, etc. ..	"	357,205	4,733,878	57,791	897,133	561,382	9,521,463
Gold bullion (ingots, bar, etc.)	fine oz.	228,387	3,595,656	180,628	2,955,517	175,166	2,720,834
Iron and Steel—							
Bar and Rod	cwt.	457,665	2,703,401	133,198	1,166,863	1,198,833	3,935,534
Ingots, blooms, slabs, etc.	"	18,691	99,096	4,405	35,609	10,319	56,140
Nickel (pigs, ingots, etc.) ..	"	11,659	316,817	11,705	359,970	10,197	312,899
Tin (ingots)	"	3,659	205,904	14,868	608,500	7,682	341,786
EXPORTS.							
Minerals—							
Asbestos	cwt.	32,694	277,677	46,743	376,315	66,013	380,483
Coal	ton	255,837	1,178,466	385,812	1,528,788	391,226	1,147,441
Coke	"	17,069	145,616	28,223	240,138	21,885	180,321
Copper—							
Ore and concentrate ..	cwt.	313	2,900	2,530	5,911	110,924	352,068
Copper-lead dross, etc. ..	"	(a)	(a)	65,088	290,049	163,349	902,594
Rutile and Zircon concentrates	"	1,369,519	2,269,576	1,195,236	1,644,989	2,055,471	2,895,624
Silver-lead and Zinc Ores and concentrates—							
Silver-lead ore and concentrate	"	824,429	2,722,707	1,447,803	4,086,927	1,181,261	3,840,616
Zinc concentrate	"	4,896,311	11,054,881	5,327,894	3,337,401	4,013,406	2,686,832
Other	"	3,133	12,597	90,995	256,580	99,031	244,104
Tungsten (scheelite and wolfram concentrates) ..	"	44,101	3,444,003	43,524	2,952,684	41,776	3,168,416
Metals—							
Copper, blister	"	(a)	(a)	253,290	3,537,583	102,463	1,513,844
Gold bullion (ingot, bar, dust, sheet, etc.) ..	fine oz.	1,250,162	20,397,933	873,321	13,769,222	864,391	13,716,622
Iron and Steel—							
Bar and rod	cwt.	289,691	576,501	507,333	906,930	266,182	567,727
Ingots, blooms, slabs, etc.	"	1,568,914	2,393,406	2,121,216	2,099,038	156,131	228,149
Pig iron	"	3,236,626	3,210,414	2,326,220	2,053,886	1,205,561	1,021,107
Lead—							
Pig	"	2,810,756	17,171,800	3,104,226	18,550,238	2,805,126	17,182,339
Bullion	"	977,767	7,955,453	682,485	4,392,514	816,369	6,133,236
Zinc, ingots	"	899,293	6,086,392	749,966	3,504,174	654,180	3,408,244

(a) Not available.

§ 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, a large producer may receive a subsidy of up to three-quarters of that portion of the cost of production in excess of £13 10s. od. per fine oz.; the subsidy will not exceed £2 os. od. per fine oz. A person producing less than 500 fine oz. per year receives a flat rate

subsidy of £1 10s. od. per fine oz. regardless of the cost of production. The Act will remain in force for two years from 1st July, 1954. The operation of the Act has since been extended for a further three years.

(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 conducts all surveys required in Commonwealth Territories, 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. The Bureau has carried out extensive scout boring in New South Wales to prove deposits of coal suitable for working by open-cut methods.

(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. Some of the drills are available for hire to private companies.

(e) *Search for Oil.* No variation has been made in the policy described in Official Year Book No. 37, page 850, regarding the search for petroleum throughout Australia and its Territories. In addition to its activities set out in that Year Book, the Bureau of Mineral Resources, Geology and Geophysics furnishes field laboratories and trained personnel to assist small companies in recording scientific information obtained while drilling for oil.

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. 1016). A considerable amount of geological and geophysical work and test drilling has been conducted under the provisions of the Petroleum Oil Search Act 1936.

(f) *Survey of North Australia.* Reference to this survey which was completed at the end of 1940 appears in Official Year Book No. 35, page 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 conjointly with appropriate State institutions, the three laboratory centres being the School of Mines, Kalgoorlie, the School of Mines and Industries, Adelaide, and the University of Melbourne.

Since 1947, funds for these investigations have been included in the investigational vote approved annually for the Commonwealth Scientific and Industrial Research Organization; in 1955 the Commonwealth Government expended approximately £18,000 on ore-dressing and £10,500 on mineragraphic investigations.

(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 early in 1954. 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 consisted 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 made to assist prospecting and development or the purchase of machinery. The Mines Department has 28 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.

(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.* During 1940 the Premier announced that assistance would be given to copper-mining in the form of financial help towards such development work as was absolutely necessary for a mine to enter upon reasonably continuous production. The State maintains batteries and cyanide works at Mount Torrens, Peterborough, Mongolata, Tarcoola and Glenloth and assays for public purposes are made at the School of Mines.

(f) *Western Australia.* The Mines Department has about twenty batteries throughout the mining fields where prospectors and others can have their ore treated.

(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 operates Government batteries at Tennant Creek, Hatches Creek, and Maranboy for the treatment of miners' ores. The crushing charges are subsidized by Government grants. In addition, the Administration provides cartage subsidies and financial advances to encourage miners to carry out development work. Roads and water supply services are provided and maintained for all 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 to conserve 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 has approved the granting of monetary rewards for such discoveries.

Up to the end of 1949 important deposits had been found only in the northern 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, together with other deposits which are known to occur, but which have not yet been adequately investigated, 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 scintillometer. 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 Bureau of Mineral Resources is carrying out further airborne scintillometer 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 contains 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 XXVII.—Defence.