CHAPTER XXVII.

MINERAL INDUSTRY.

§ 1. Introduction.

1. **Sources of Statistics.**—In the main, the data contained in this chapter consist of official statistics of the Mines Departments of the several States and of the Northern Territory Mines Branch. The particulars shown have been compiled as far as practicable on the standardized basis which has been used in Australia since 1950 and this presentation has involved some rearrangement of official statistics published by the Mines Departments in some States. These statistics have been supplemented, as necessary, by data obtained from the Statisticians of the several States, the Commonwealth Bureau of Mineral Resources, the Joint Coal Board, the Australian Mines and Metals Association (Inc.), the Mineral Resources Division of the United Kingdom Overseas Geological Surveys and from several other sources.

2. **Presentation of Mineral Statistics.**—(i) *Mineral Industry Data.* The mineral industry includes all mining and quarrying and the recovery of minerals from ore dumps, tailings, etc. Ore-dressing and elementary smelting of metallic minerals (e.g., in the case of gold) 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 mineral 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.

For mines and quarries which produce more than one product, it is not possible to apportion some particulars relating to the operations of the mine (employment, salaries and wages paid, and costs incurred in production) to the minerals produced. It is, therefore, the practice to record these data only as a total for each mine and then to classify each mine to the industry of the most important mineral produced. Thus a mine producing, say, both tin and tungsten minerals, would be classified as a tin mine if tin were the more important product by value, or vice versa if tungsten were the dominant product.

The mineral industries are classified into four major groups, namely, Metal Mining, Fuel Mining, Non-metal (excluding Fuel) Mining, and Construction Material Quarrying.

Mineral industry data are obtained annually from the Mining and Quarrying Census, which collection was first made in 1952. This census is carried out in collaboration with the several Mines Departments and involves the uniform collection of particulars from all establishments employing on the average four or more persons during the period worked by the mine. A representative specimen collection form is included in the Bulletin *Primary Industries, Part II.*, No. 52, 1957–58, pages 45 and 46. For smaller mines, either simplified Census returns covering number of persons employed and value of output are collected or these particulars are compiled from data made available by the Mines Departments.

Particulars of the uranium-mining industry are excluded, as are operations associated with the exploration for minerals, e.g. oil-search.

(ii) *Mineral Product Data.* In the preparation of Australian mineral production statistics, the quantities and values of individual minerals produced are reported in terms of the products in the form in which they are dispatched from the locality of each mine. 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 contents of metallic minerals and contents or average grade of selected non-metallic minerals are reported. Whenever 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. Other metallic contents which are not recovered are excluded.

Minerals are divided into four major groups, namely, Metals, Fuels, Non-metals (excluding Fuels) and Construction Materials. In this chapter, individual mineral products are arranged in these four groups.

Particulars relating to uranium-bearing minerals are excluded.

3. **Occurrences of Minerals.**—The greatest part of the area of outcropping rock on the Australian continent is Precambrian in age. These basement rocks form the western and central core of the continent and are flanked by younger Palaeozoic rocks which, along the eastern edge of the continent, form a belt several hundred miles wide extending from North Queensland to Tasmania. Smaller areas of Palaeozoic rocks occur in other States. Mesozoic sediments overlie large areas of the continent and reach their greatest development in central Queensland. Cainozoic rocks occur mainly in the southern parts of Victoria and South Australia and as residual basalt cappings over an extensive area of the Palaeozoic rocks of eastern Australia.

Minerals occur widely throughout the Precambrian and Palaeozoic rocks of the continent. Palaeozoic mineralization is perhaps more varied but the deposits now being worked are in general smaller than those found in Precambrian rocks. Most of the larger deposits of minerals now being mined in Australia are shown in the following table according to the geological era in which they were formed.

PRINCIPAL AUSTRALIAN MINERAL DEPOSITS.

Age of Geological Formation in which Located.	Metal or Mineral.	State or Territory.	Locality.
Precambrian (more than 520 million years old)	Copper ..	Queensland ..	Mt. Isa
		Northern Territory	Tennant Creek
	Gold	Western Australia	Kalgoorlie, and other localities
	Iron	South Australia ..	Middleback Ranges
		Western Australia	Yampi Sound
	Lead–Silver–Zinc	New South Wales	Broken Hill
		Queensland ..	Mt. Isa
	Uranium ..	Queensland ..	Mary Kathleen
		South Australia ..	Radium Hill
		Northern Territory	Rum Jungle and South Alligator River Area
Palaeozoic (between 200 and 520 million years old)	Black Coal ..	New South Wales	Hunter Valley, Lithgow, South Coast
		Queensland ..	Baralaba, Blair Athol, etc.
		Western Australia	Collie
	Copper–Gold ..	Queensland ..	Mt. Morgan
		Tasmania ..	Mt. Lyell
	Lead–Silver–Zinc	New South Wales	Captain's Flat
		Tasmania ..	Mt. Read and Rosebery
	Tin (lode) ..	Queensland ..	Herberton
		Tasmania ..	North-east of State
	Tungsten ..	Tasmania ..	King Island and North-east of State
Mesozoic (between 75 and 200 million years old)	Black Coal ..	Queensland ..	Ipswich
		South Australia ..	Leigh Creek
		Tasmania ..	St. Marys
	Mineral Sands(a)	New South Wales	North Coast
		Queensland ..	South Coast
Cainozoic (less than 75 million years old)	Brown Coal ..	Victoria ..	Gippsland
	Tin (alluvial) ..	New South Wales	Tingha
		Queensland ..	Herberton
		Tasmania ..	North-east of State

(a) The deposition of mineral sands, derived from Palaeozoic granites, continued throughout the Cainozoic Era.

The extensive bauxite (aluminium) deposits of Cape York Peninsula in Queensland are to be worked shortly. These were formed during the early part of the Cainozoic Era as a result of climatic conditions then prevailing.

Of the non-metallic minerals, many, such as clay, sand and silica, etc., are not restricted to the rocks of any particular era. However, Precambrian rocks do contain important deposits of asbestos in Western Australia, limestone and dolomite in South Australia, and mica in the Northern Territory. Crude salt is harvested in pans from which water has been evaporated.

4. **Mineral Concentrates.**—Concentration is a physical process involving the removal of mineral impurity from the ore. Most mines now dispatch ore in concentrate form as this considerably reduces the transport costs and produces a saleable product in the form required by smelters. Most concentrates are nearly pure mineral and the ore dressing processes (with the exception of that for uranium) involve no chemical change to the mineral being won. Various methods are used in concentration. Sulphide ores which now comprise the greatest tonnages treated are, in most instances, separated from the gangue by flotation. In this method of concentration, the ore is ground finely enough to liberate the individual mineral particles, aerated and agitated in tanks of water to which chemicals have been added. Under certain conditions, particles of one sulphide mineral adhere to the froth bubbles and are collected in the froth overflow, while gangue and even other sulphides are depressed. By treating the tailings of one flotation process with different chemicals and conditions it is often possible to separate a further concentrate, as is done at Broken Hill where the zinc sulphide is recovered from the tailings of the lead sulphide concentration process. Differential flotation is most extensively developed at Captain's Flat, in New South Wales, where successive concentrates of copper, lead, zinc and pyrite are obtained from a lead-silver-zinc-copper ore. Tailings from the lead flotation at Captain's Flat are passed over corduroy strakes to recover free gold in concentrate form.

Other methods of concentration used are gravity (alluvial tin, mineral sands, some lead–zinc ores), electromagnetic (wolfram, scheelite, glauconite and mineral sands) and electrostatic (mineral sands).

Particulars of an average Broken Hill ore mined during 1958, showing metal contents before and after differential flotation, are shown in the following table. It should be noted that in both the ore and the concentrate, lead and zinc are contained as the minerals lead sulphide and zinc sulphide respectively. Most of the silver is contained in minerals which are collected with the lead sulphide.

ORE TREATED AND CONCENTRATES PRODUCED BY DIFFERENTIAL FLOTATION AT BROKEN HILL (*a*): 1958.

Particulars.	Quantity.	Proportion of weight of ore mined.	Average Assays.			Proportion of Metal Distribution.		
			Lead.	Silver.	Zinc.	Lead.	Silver.	Zinc.
	tons.	%	%	f. oz.	%	%	%	%
Ore treated ..	1,895,566	100	12.7	4.7	11.5	100.0	100.0	100.0
Lead Concentrate	309,345	16.3	74.5	26.2	4.5	95.7	91.0	6.4
Zinc Concentrate	373,880	19.7	1.0	0.9	51.4	1.6	3.7	88.1
Residues(*b*) ..	1,212,341	64.0	0.5	0.4	1.0	2.7	5.3	5.5

(*a*) Average particulars for the five operating companies. (*b*) These are of no economic use at present and are either pumped as filling for underground workings or otherwise discarded.

§ 2. The Mineral Industry.

1. **Persons Engaged.**—In the following table, which shows particulars collected in the Population Censuses of Australia at 30th June, 1947 and 1954, the numbers of persons whose "industry" was stated to be "mining and quarrying" are shown together with the numbers engaged in all primary industries and the total work force.

PERSONS ENGAGED, AUSTRALIA.

Particulars.		At 30th June— 1947.	1954.
Persons Engaged in—			
Mining and Quarrying	No.	57,574	62,107
All Primary Industries	No.	563,697	560,100
Total Work force	No.	3,196,431	3,702,022
Persons Engaged in Mining and Quarrying as a proportion of—			
All Primary Industries	%	10.2	11.1
Total Work force	%	1.8	1.7

The number of persons engaged in the mining and quarrying industries represents approximately ten per cent. of the total number of persons engaged in all primary industries and less than two per cent. of the total workforce of Australia.

Particulars of the numbers of persons engaged in the various mining and quarrying industries, as collected in the Annual Mining and Quarrying Census, are included in paras. 4 (ii), page 1043, and 4 (iii), page 1044.

2. **Size Classification of Mines and Quarries.**—Most of the mines and quarries worked during 1958 employed less than four persons, including working proprietors. However, more than half of the persons engaged in mining and quarrying were in the 60 mines each employing two hundred persons or more. The following table shows the total number of mines grouped according to sizes in accordance with the average number of persons employed during the period worked by each mine in 1958. The details of persons employed are not directly comparable with the Population Census figures shown in the preceding table. For particulars of the method of compiling these industry statistics, *see* para. 2 (i), page 1037.

MINING AND QUARRYING: SIZE CLASSIFICATION OF ESTABLISHMENTS, 1958.

Mines and Quarries employing on the average(*a*)—	N.S.W.	Vic. (*b*)	Qld.	S.A.	W.A.	Tas.	N.T.	Aust. (*b*) (*c*)
Less than 4 persons—								
Establishments ..	513	72	243	290	215	63	35	1,431
Persons	759	129	436	478	549	117	84	2,552
From 4 to 20 persons—								
Establishments ..	164	106	92	105	66	28	7	571
Persons	1,283	956	916	807	534	250	77	4,844
From 21 to 200 persons—								
Establishments ..	93	34	74	15	22	15	4	258
Persons	6,667	1,618	(*d*)	(*d*)	1,485	800	356	15,040
More than 200 persons—								
Establishments ..	38	3	4	2	10	3	..	60
Persons	16,564	1,673	(*d*)	(*d*)	5,093	1,536	..	29,267
Total—								
Establishments ..	**808**	**215**	**413**	**412**	**313**	**109**	**46**	**2,320**
Persons	**25,273**	**4,376**	**8,563**	**2,565**	**7,661**	**2,703**	**517**	**51,703**

(*a*) Includes working proprietors. (*b*) Excludes 13 salt producers in Victoria, employment particulars for which are not available. (*c*) Includes Australian Capital Territory. (*d*) Not available for publication; included in totals.

3. **Value of Production.**—(i) *General.* In 1958, the local value of mining and quarrying in Australia (the value of output, or the selling value of mine and quarry products at the mine or quarry) was £155,955,000, or 11.7 per cent. of the production of all primary industries. The most important State was New South Wales with £71,414,000, followed by Queensland with £27,632,000 and Western Australia with £20,777,000.

(ii) *Local and Net Values of Production,* 1958. Local and net values of mining and quarrying production for each State are shown for 1958 in the following table. A more detailed reference to the value of production of mining and quarrying and other industries in Australia as well as a brief explanation of the terms used will be found in Chapter XXX.—Miscellaneous.

MINING AND QUARRYING: LOCAL AND NET VALUES OF PRODUCTION, 1958.

(£'000.)

State or Territory.	Local Value (Value of Output at Mine or Quarry.)	Costs of Power, Fuel and Light, and Materials and Stores Used.	Net Value. (*a*)
New South Wales	71,414	15,613	55,801
Victoria	13,694	2,707	10,987
Queensland	27,632	7,836	19,796
South Australia	12,308	2,309	9,999
Western Australia	20,777	6,323	14,454
Tasmania	7,358	2,190	5,168
Northern Territory	2,564	567	1,997
Australian Capital Territory ..	208	74	134
Australia	**155,955**	**37,619**	**118,336**

(*a*) Local value less costs of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted.

(iii) *Local Values,* 1954 *to* 1958. In the following table, the local values of mining and quarrying production are shown by States and Territories for the years 1954 to 1958:—

MINING AND QUARRYING: LOCAL VALUE OF PRODUCTION.(*a*)

(£'000.)

Year.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
1954 ..	78,202	10,080	21,602	8,580	20,736	8,955	1,145	103	149,403
1955 ..	84,244	10,917	26,892	10,512	19,746	10,744	1,691	125	164,871
1956 ..	88,790	11,891	30,204	11,910	20,230	10,555	2,594	146	176,320
1957 ..	83,170	12,728	25,576	11,872	20,979	8,421	2,195	170	165,111
1958 ..	71,414	13,694	27,632	12,308	20,777	7,358	2,564	208	155,955

(*a*) Value of output or selling value of products at the mine or quarry.

(iv) *Net Values of Production,* 1954 *to* 1958. In the following table, the net value of production of mining and quarrying products and the value per head of population are shown by States and Territories for the years 1954 to 1958.

MINING AND QUARRYING: NET VALUE OF PRODUCTION.(a)

Year.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
				NET VALUE OF PRODUCTION.(a) (£'000.)					
1954	63,965	8,146	15,934	7,101	14,776	7,057	1,028	80	118,087
1955	69,262	8,869	21,732	8,452	14,143	8,612	1,377	63	132,510
1956	72,053	9,457	24,148	9,487	14,350	8,298	2,084	105	139,982
1957	66,091	9,944	18,810	9,320	14,889	5,897	1,741	110	126,802
1958	55,801	10,987	19,796	9,999	14,454	5,168	1,997	134	118,336
				NET VALUE OF PRODUCTION(a) PER HEAD OF POPULATION. (£.)					
1954	18.5	3.3	12.0	8.8	22.8	22.6	62.2	2.6	13.0
1955	19.7	3.5	16.1	10.1	21.1	27.0	78.8	1.9	14.2
1956	20.1	3.6	17.5	11.0	21.0	25.4	113.6	2.9	14.7
1957	18.1	3.7	13.4	10.5	21.3	17.7	91.5	2.8	13.0
1958	15.0	3.9	13.9	11.0	20.3	15.1	101.5	3.2	11.9

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

4. **Statistics of the Principal Mining and Quarrying Industries.**—(i) *Summary*, 1958. In the next table, statistics of numbers of mines and quarries, persons employed, local and net value of production and other particulars are shown for the major industry groups for the year 1958. For particulars of the method of compiling these industry statistics, *see* para. 2 (i), page 1037.

MINING AND QUARRYING: SUMMARY OF INDUSTRY PARTICULARS, AUSTRALIA, 1958.

Industry Group.	Mines and Quarries.	Persons Employed. (a)	Salaries and Wages Paid. (b)(c)	Local Value of Production. (d)	Total Fuel, Materials, etc., Used.	Net Value of Production. (e)	Value of Additions and Replacements to Fixed Assets.(b)
	No.	No.	£'000.	£'000.	£'000.	£'000.	£'000.
Metal Mining ..	708	20,495	25,488	70,190	20,770	49,420	7,159
Fuel Mining ..	234	22,335	26,195	57,076	11,148	45,928	10,221
Non-metal (excluding Fuel) Mining(f) ..	645	2,728	2,384	10,160	2,389	7,771	1,283
Total Mining ..	*1,587*	*45,558*	*54,067*	*137,426*	*34,307*	*103,119*	*18,663*
Construction Material Quarrying(g) ..	746	4,581	3,241	18,529	3,312	15,217	825
Total All Mining and Quarrying	**2,333**	**50,139**	**57,308**	**155,955**	**37,619**	**118,336**	**19,488**

(a) Average number employed (including working proprietors) during whole year. (b) Excludes mines and quarries employing less than four persons. (c) Excludes drawings by working proprietors; the amounts are net after deducting value of explosives sold to employees. (d) Value of output or selling value of products at mine or quarry. (e) Local value less costs of power, fuel and light and other materials and stores used; depreciation and maintenance costs have not been deducted. (f) Incomplete for some industries outside the normal administrative control of State Mines Departments (e.g., clays and salt). (g) Incomplete owing to difficulties of coverage.

In the next table, statistics of numbers of mines and quarries, persons employed, local and net value of production are shown for each State, the Northern Territory and the Australian Capital Territory for the year 1958:—

MINING AND QUARRYING: SUMMARY OF OPERATIONS, 1958.

State or Territory.	Mines and Quarries.	Persons Employed. (a)	Salaries and Wages Paid. (b)(c)	Local Value of Production. (d)	Total Fuel, Materials, etc., Used.	Net Value of Production. (e)	Value of Additions and Replacements to Fixed Assets. (b)
	No.	No.	£'000.	£'000.	£'000.	£'000.	£'000.
New South Wales ..	808	24,984	28,903	71,414	15,613	55,801	8,772
Victoria	228	4,302	4,521	13,694	2,707	10,987	2,958
Queensland ..	413	8,276	9,632	27,632	7,836	19,796	3,568
South Australia ..	412	1,987	1,909	12,308	2,309	9,999	1,030
Western Australia ..	313	7,451	8,510	20,777	6,323	14,454	2,295
Tasmania	109	2,594	3,147	7,358	2,190	5,168	600
Northern Territory ..	46	507	634	2,564	567	1,997	258
Aust. Cap. Territory..	4	38	52	208	67	134	7
Australia ..	**2,333**	**50,139**	**57,308**	**155,955**	**37,619**	**118,336**	**19,488**

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

(ii) *Employment in Mining and Quarrying*, 1958. The following table shows the average numbers engaged in the various mining industries in each State in 1958.

MINING AND QUARRYING: EMPLOYMENT,(a) 1958.

Industry.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal Mining—									
Gold Mining ..	74	268	153	2	5,189	..	215	..	5,901
Silver-Lead-Zinc Mining	6,221	..	(b)	(b)	41	(b)	..	..	9,461
Copper-Gold Mining ..	46	..	(b)	(b)	165	(b)	199	..	2,057
Tin Mining	135	..	328	..	36	434	11	..	944
Mineral Sands Mining	640	..	348	..	114	..	..	..	1,102
Other Metal Mining ..	59	13	12	(b)	295	(b)	22	..	1,030
Total, Metal Mining	*7,175*	*281*	(b)	(b)	*5,840*	*2,014*	*447*	..	*20,495*
Fuel Mining—									
Black Coal Mining—									
Underground ..	15,206	516	3,157	..	943	(c) 292	..	..	c 20,114
Open-cut	257	..	138	230	56	..	..	..	681
Total	*15,463*	*516*	*3,295*	*230*	*999*	*292*	..	..	*20,795*
Brown Coal Mining ..	..	1,540	..	..	..	..	..	..	1,540
Total, Fuel Mining	*15,463*	*2,056*	*3,295*	*230*	*999*	*292*	..	..	*22,335*
Non-metal (excluding Fuel) Mining(d)	1,062	273	(b)	(b)	390	165	27	(e)	2,728
Total, All Mining	*23,700*	*2,610*	*7,783*	*1,291*	*7,229*	*2,471*	*474*	(e)	*45,558*
Construction Material Quarrying(f) ..	1,284	1,692	493	696	222	123	33	38	4,581
Total, All Mining and Quarrying ..	**24,984**	**4,302**	**8,276**	**1,987**	**7,451**	**2,594**	**507**	**38**	**50,139**

(a) Average employment during whole year, including working proprietors. (b) Not available for publication. (c) Includes persons engaged by one mine which has both underground and opencut workings. (d) Incomplete for some industries outside the normal administrative control of State Mines Departments (e.g. clays and salt). (e) Not available for publication; included with "Construction Material Quarrying". (f) Incomplete owing to difficulties of coverage.

(iii) *Employment in Mining and Quarrying, 1954 to 1958.* The following table shows particulars of mining employment in Australia for the years 1954 to 1958. The figures show the average number of persons employed during the whole year.

MINING AND QUARRYING: EMPLOYMENT,(a) AUSTRALIA.

Industry.	1954.	1955.	1956.	1957.	1958.
Metal Mining—					
Gold Mining	7,192	6,753	6,488	6,205	5,901
Silver-Lead-Zinc Mining	9,397	10,076	10,627	10,354	9,461
Copper-Gold Mining	1,998	2,127	2,301	2,151	2,057
Tin Mining	969	937	938	856	944
Mineral Sands Mining	598	891	1,592	2,062	1,102
Other Metal Mining	1,253	1,273	1,407	1,300	1,030
Total, Metal Mining	*21,407*	*22,057*	*23,353*	*22,928*	*20,495*
Fuel Mining—					
Black Coal Mining	26,614	25,660	23,895	22,345	20,795
Brown Coal Mining	1,598	1,502	1,566	1,579	1,540
Total, Fuel Mining	*28,212*	*27,162*	*25,461*	*23,924*	*22,335*
Non-metal (excluding Fuel) Mining(b)	*2,722*	*2,678*	*2,708*	*2,749*	*2,728*
Total, All Mining	*52,341*	*51,897*	*51,522*	*49,601*	*45,558*
Construction Material Quarrying(b)	*4,121*	*4,197*	*4,329*	*4,640*	*4,581*
Total, All Mining and Quarrying	**56,462**	**56,094**	**55,851**	**54,241**	**50,139**

(a) Average employment during whole year, including working proprietors. (b) Incomplete.

(iv) *Salaries and Wages Paid in Mining, 1954 to 1958.* Salaries and wages paid in the mining and quarrying industries in Australia during each year 1954 to 1958 are shown in the following table. Information regarding rates of wages paid in the mining industry is shown in Chapter XII.—Labour, Wages and Prices (p. 419) and also in the *Labour Report.*

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

Industry.	1954.	1955.	1956.	1957.	1958.
Metal Mining—					
Gold Mining	6,450	6,344	6,551	6,422	6,492
Silver-Lead-Zinc Mining	12,761	15,154	17,299	16,241	13,462
Copper-Gold Mining	1,786	1,867	2,114	2,289	2,362
Tin Mining	704	734	733	753	737
Mineral Sands Mining	512	819	1,644	2,177	1,327
Other Metal Mining	1,095	1,328	1,504	1,402	1,108
Total, Metal Mining	*23,308*	*26,246*	*29,845*	*29,284*	*25,488*
Fuel Mining—					
Black Coal Mining	25,988	26,065	25,862	25,105	24,501
Brown Coal Mining	1,557	1,761	1,649	1,640	1,694
Total, Fuel Mining	*27,545*	*27,826*	*27,511*	*26,745*	*26,195*
Non-metal (excluding Fuel) Mining(b)	*1,620*	*2,105*	*2,300*	*2,400*	*2,384*
Total, All Mining	*52,473*	*56,177*	*60,216*	*58,429*	*54,067*
Construction Material Quarrying(b)	*2,045*	*2,439*	*2,738*	*3,219*	*3,241*
Total, All Mining and Quarrying	**54,518**	**58,616**	**62,394**	**61,648**	**57,308**

(a) Excludes mines and quarries employing less than four persons. (b) Incomplete.

(v) *Accidents in Mining.* Particulars of numbers of persons killed and injured in accidents in mines and associated treatment plants are recorded by State Mines Departments. Numbers injured are not reported on a uniform basis in all States as varying criteria are used in determining what constitutes injury for the purpose of these records. In 1958, 44 persons were recorded as having been killed and 1,553 as having been injured in mining (excluding quarrying) accidents. Of the total of 44 persons killed, 13 were in black coal mines, 12 in gold mines and 8 in silver-lead-zinc mines. Reported injuries were highest in black coal mines (442), gold mines (392), and silver-lead-zinc mines (411).

(vi) *Local and Net Values of Mining and Quarrying Production,* 1958. The following two tables show particulars of the local and net value of production of individual mining and quarrying industries and for all mining and quarrying for the year 1958. It should be noted that these statistics are on an industry basis and not by product. For particulars of the method of compiling these industry statistics *see* para. 2 (i), page 1037.

MINING AND QUARRYING: LOCAL VALUE OF PRODUCTION,(*a*) 1958.

(£'000.)

Industry.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal Mining—									
Gold Mining	102	694	274	1	14,330	..	900	..	16,301
Silver-Lead-Zinc Mining	19,093	..	(*b*)	(*b*)	125	(*b*)	..	..	33,414
Copper-Gold Mining ..	15	..	(*b*)	(*b*)	163	(*b*)	1,281	..	6,704
Tin Mining	190	..	756	..	75	766	1	..	1,788
Mineral Sands Mining ..	2,738	..	2,306	..	296	..	..	..	5,340
Other Metal Mining ..	128	19	99	(*b*)	1,160	(*b*)	73	..	6,643
Total, Metal Mining	*22,266*	*713*	*18,368*	*4,340*	*16,149*	*6,099*	*2,255*	..	*70,190*
Fuel Mining—									
Black Coal Mining ..	39,979	528	7,231	1,017	2,281	622	..	..	51,658
Brown Coal Mining ..	..	5,418	..	..	..	..	..	..	5,418
Total, Fuel Mining ..	*39,979*	*5,946*	*7,231*	*1,017*	*2,281*	*622*	..	..	*57,076*
Non-metal (excluding Fuel) Mining—									
Clays(*c*)	871	1,049	112	287	(*b*)	(*b*)	..	(*d*)	2,629
Gypsum	171	61	..	384	40	..	..	..	656
Limestone	1,131	615	(*b*)	1,056	(*b*)	281	..	..	3,673
Salt	..	100	(*b*)	672	(*b*)	..	12	..	878
Other Non-metal (excluding Fuel) Mining	565	7	33	444	(*b*)	(*b*)	47	..	2,324
Total, Non-metal (excluding Fuel) Mining ..	*2,738*	*1,832*	*696*	*2,843*	*1,626*	*366*	*59*	(*d*)	*10,160*
Total, All Mining ..	*64,983*	*8,491*	*26,295*	*8,200*	*20,056*	*7,087*	*2,314*	(*d*)	*137,426*
Construction Material Quarrying(*c*)	*6,431*	*5,203*	*1,337*	*4,108*	*721*	*271*	*250*	*208*	*18,529*
Total, All Mining and Quarrying ..	**71,414**	**13,694**	**27,632**	**12,308**	**20,777**	**7,358**	**2,564**	**208**	**155,955**

(*a*) Value of output or selling value of products at the mine or quarry. (*b*) Not available for publication. (*c*) Incomplete. (*d*) Not available for publication; included with "Construction Material Quarrying".

MINING AND QUARRYING: NET VALUE OF PRODUCTION,(a) 1958.
(£'000.)

Industry.	N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal Mining—									
Gold Mining	69	547	214	1	9,704	..	796	..	11,331
Silver-Lead-Zinc Mining	13,288	..	(b)	(b)	100	(b)	..	..	23,389
Copper-Gold Mining ..	(c) −24	..	(b)	(b)	79	(b)	915	..	3,735
Tin Mining	156	..	480	..	23	607	1	..	1,267
Mineral Sands Mining ..	2,168	..	1,661	..	230	..	..	..	4,059
Other Metal Mining ..	108	19	93	(b)	881	(b)	62	..	5,639
Total, Metal Mining	*15,765*	*566*	(b)	(b)	*11,017*	*4,182*	*1,774*	..	*49,420*
Fuel Mining—									
Black Coal Mining ..	31,558	376	6,100	841	1,753	494	..	..	41,122
Brown Coal Mining ..	..	4,806	..	..	..	..	..	..	4,806
Total, Fuel Mining ..	*31,558*	*5,182*	*6,100*	*841*	*1,753*	*494*	..	..	*45,928*
Non-metal (excluding Fuel) Mining—									
Clay(d)	715	1,009	96	261	(b)	(b)	..	(e)	2,382
Gypsum	122	45	..	275	34	..	..	..	476
Limestone	752	264	(b)	896	(b)	205	..	..	2,482
Salt	..	(f) 100	(b)	544	(b)	..	12	..	(g) 720
Other Non-metal (excluding Fuel) Mining	458	7	32	(b)	(b)	(b)	44	..	1,711
Total, Non-metal (excluding Fuel) Mining	*2,047*	*1,425*	(b)	(b)	*1,134*	*280*	*56*	(e)	*7,771*
Total, All Mining ..	*49,370*	*7,173*	*18,908*	*6,978*	*13,904*	*4,956*	*1,830*	(e)	*103,119*
Construction Material Quarrying(d)	*(f)6,431*	*3,814*	*888*	*3,021*	*550*	*212*	*167*	*134*	*g 15,217*
Total, All Mining and Quarrying ..	55,801	10,987	19,796	9,999	14,454	5,168	1,997	134	118,336

(a) Local value (i.e., value of output at mine) less costs of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted. (b) Not available for publication. (c) Costs of materials used, etc., exceed value of output. (d) Incomplete. (e) Not available for publication; included with "Construction Material Quarrying". (f) No allowance has been made for costs of power, fuel, light and other materials and stores used, particulars for which are not available. (g) *See* footnote (f).

§ 3. Mineral Production.

1. **Quantities of Principal Minerals Produced in 1958.**—In the following table, particulars of the quantities of the principal minerals produced during 1958 are shown for each State and the Northern Territory:—

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, 1958.

Mineral.	Unit.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	Aust. (a)
METALLIC MINERALS.									
Antimony Ore and Concentrate	ton	1,114	2	..	..	..	..	..	1,116
Bauxite	„	1,664	4,054	1,191	..	..	..	..	6,909
Beryllium Ore	„	10	..	11	56	170	..	..	247
Chromite	„	39	..	737	..	..	..	..	776
Copper Ore	„	21	..	50,307	52	7,719	..	10	58,109
Copper Concentrate ..	„	5,204	..	197,377	..	1,727	45,057	30,611	279,976
Copper Precipitate ..	„	99	..	..	..	..	153	1,284	1,536
Gold Concentrate ..	„	110	1,739	..	..	..	..	6	1,855
Gold—Other Forms(b) ..	oz.	5,436	47,916	(c)	(c)	(c)	(c)	(c)	(c)
Ilmenite Concentrate ..	ton	131	..	..	..	69,817	..	..	69,948
Iron Ore(d)	'000 tons	..	..	..	3,353	573	..	..	3,926
Lead-Silver Ore ..	ton	4,231	..	17,371	72	121	..	..	21,795
Lead Concentrate ..	„	327,098	..	148,811	..	2,313	14,686	..	492,908
Lead-Copper Concentrate	„	..	..	..	..	..	7,630	..	7,630
Manganese Ore ..	„	1,858	..	7,068	..	47,584	..	3,173	59,683
Pyrite Concentrate ..	„	36,730	..	7,890	66,935	49,389	65,800	..	226,744
Rutile Concentrate ..	„	46,491	..	36,540	..	297	..	..	83,328
Tantalite-Columbite Concentrate	lb.	..	..	..	..	13,507	..	..	13,507
Tin Concentrate ..	ton	334	..	1,424	..	138	1,229	3	3,128
Tungsten Concentrates—									
Scheelite Concentrate ..	„	2	..	..	..	..	731	..	733
Wolfram Concentrates	„	..	..	8	..	..	495	14	517
Zinc Concentrate ..	„	408,169	..	33,239	226	..	62,118	..	503,752
Zircon Concentrate ..	„	32,542	..	26,621	..	106	..	..	59,269

NOTE.—*See* next page for footnotes.

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, 1958—*continued.*

Mineral.	Unit.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	Aust. (a)
FUEL MINERALS.									
Coal, Black—									
Semi-anthracite ..	'000 tons	..	..	55	..	..	2	..	57
Bituminous	"	15,841	108	2,393	..	..	274	..	18,616
Sub-bituminous ..	"	10	..	133	755	871	..	..	1,769
Total	"	*15,851*	*108*	*2,581*	*755*	*871*	*276*	..	*20,442*
Coal, Brown (Lignite) ..	"	..	11,644	..	..	..	..	..	11,644
NON-METALLIC (EXCLUDING FUEL) MINERALS.									
Asbestos	short ton	712	..	..	..	14,856	..	..	15,568
Barite	ton	3,991	..	..	2,811	..	..	..	6,802
Clays—									
Brick Clay and Shale..	'000 tons	1,663	(e)1,031	223	373	(e) 394	145	..	3,829
Other(f)	"	474	170	7	63	34	27	..	775
Diatomite	ton	3,100	1,111	29	..	..	..	..	4,240
Dolomite	"	3,957	..	2,779	148,631	196	2,585	..	158,148
Felspar	"	5,302	..	..	1,033	681	..	..	7,016
Gypsum	"	90,664	72,010	..	306,749	35,515	..	..	504,938
Limestone	'000 tons	2,061	859	(g)	1,386	(g)	235	..	5,490
Magnesite	ton	69,030	..	20	341	..	..	..	69,391
Mica-Muscovite, trimmed	lb.	..	..	..	..	..	..	31,391	31,391
Salt, Crude	ton	..	70,572	(g)	336,241	(g)	..	1,500	429,534
Silica (Glass, Chemical, etc.)(f)	"	120,502	..	4,280	7,552	6,510	6,639	..	145,483
Talc	"	998	..	..	11,894	2,501	..	..	15,393
CONSTRUCTION MATERIALS.(h)									
Sand	'000 tons	1,790	1,146	(i)	1,176	(i)	(i	6	4,118
River Gravel and Gravel Boulders	"	1,580	112	(i)	558	(i)	(i)	15	2,265
Dimension Stone ..	"	147	5	6	38	76	(i)	(i)	272
Crushed and Broken Stone	"	2,107	5,546	2,175	4,573	599	435	108	15,543
Other (Decomposed Rock, etc.)	"	12,173	549	(i)	(i)	(i)	(i)	(i)	12,722

(a) Excludes Australian Capital Territory where production is confined to brick clay mining and construction material quarrying. (b) Bullion, alluvial, retorted gold, etc. (c) Gross weight not available. (d) Ore for metal extraction and fluxing only. (e) Estimated. (f) Incomplete; figures relate only to production reported by Mines Departments. (g) Not available for publication. (h) Incomplete owing to difficulties of coverage. (i) Not available.

NOTE.—Particulars of uranium concentrate produced are not available for publication and have been excluded from the above table.

2. Quantities of Principal Minerals Produced, Australia.—The following table shows the quantities of the principal minerals produced in Australia during the years 1954 to 1958.

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, AUSTRALIA.(*a*)

Mineral.	Unit.	1954.	1955.	1956.	1957.	1958.
METALLIC MINERALS.						
Antimony Ore and Concentrate	ton	222	650	547	852	1,116
Bauxite	,,	5,487	7,563	10,329	7,707	6,909
Beryllium Ore	,,	149	206	318	395	247
Chromite	,,	4,943	..	6,096	3,049	776
Copper Ore	,,	24,813	47,381	47,209	56,447	58,109
Copper Concentrate	,,	184,122	192,770	205,304	222,168	279,976
Copper Precipitate	,,	165	182	134	557	1,536
Gold Ore and Concentrate	,,	102	171	107	959	1,855
Gold—Other Forms(*b*)	oz.	(*c*)	(*c*)	(*c*)	(*c*)	(*c*)
Ilmenite Concentrate	ton	469	535	4,274	71,155	69,948
Iron Ore(*d*)	'000 tons	3,519	3,573	3,924	3,805	3,926
Lead-Silver Ore	ton	1,905	23,483	20,121	20,758	21,795
Lead Concentrate	,,	452,447	484,941	475,731	497,404	492,908
Lead-Copper Concentrate	,,	6,833	5,878	6,315	7,366	7,630
Manganese Ore	,,	28,202	47,356	59,384	77,010	59,683
Pyrite Concentrate	,,	192,530	217,621	171,859	229,125	226,744
Rutile Concentrate	,,	44,659	59,613	96,816	128 903	83,328
Tantalite-Columbite Concentrate	lb.	117,767	27,139	159,655	50,038	13,507
Tin Concentrate	ton	2,974	2,890	2,926	2,867	3,128
Tungsten Concentrates—						
Scheelite Concentrate	,,	1,331	1,449	1,495	1,449	733
Wolfram Concentrates	,,	722	788	877	656	517
Zinc Concentrate	,,	483,744	492,549	530,777	556,763	503,752
Zircon Concentrate	,,	41,453	48,673	72,458	88,561	59,269
FUEL MINERALS.						
Coal, Black—						
Semi-anthracite	'000 tons	74	82	81	71	57
Bituminous	,,	17,848	17,610	17,681	18,229	18,616
Sub-bituminous	,,	1,841	1,583	1,512	1,619	1,769
Total	,,	*19,763*	*19,275*	*19,274*	*19,919*	*20,442*
Coal, Brown (Lignite)	,,	9,331	10,112	10,560	10,741	11,644
NON-METALLIC (EXCLUDING FUEL) MINERALS.						
Asbestos	short ton	5,278	5,994	9,709	14,670	15,568
Barite	ton	6,872	6,264	6,009	9,778	6,802
Clays—						
Brick Clay and Shale	'000 tons	3,519	3,556	3,426	3,531	3,829
Other(*e*)	,,	716	778	717	748	775
Diatomite	ton	5,439	5,042	5,789	6,221	4,240
Dolomite	,,	127,994	111,417	115,564	192,103	158,148
Felspar	,,	16,384	20,833	18,629	8,819	7,016
Gypsum	,,	439,716	470,014	463,355	478,436	504,938
Limestone	'000 tons	3,459	3,998	4,264	4,572	5,490
Magnesite	ton	43,152	57,674	64,685	83,473	69,391
Mica-Muscovite, trimmed	lb.	84,619	56,649	28,837	36,713	31,391
Salt, Crude	ton	379,143	369,323	408,689	427,600	429,534
Silica (Glass, Chemical, etc.)(*e*)	,,	133,958	121,268	142,485	149,339	145,483
Talc	,,	12,940	12,691	13,160	14,441	15,393

NOTE.—*See* next page for footnotes.

QUANTITIES OF PRINCIPAL MINERALS PRODUCED, AUSTRALIA(a)—*continued.*

Mineral.	Unit.	1954.	1955.	1956.	1957.	1958.
CONSTRUCTION MATERIALS.(f)						
Sand	'000 tons	3,633	3,732	4,314	4,126	4,118
River Gravel and Gravel Boulders	,,	2,310	1,743	2,116	1,764	2,265
Dimension Stone	,,	291	274	231	230	272
Crushed and Broken Stone ..	,,	9,633	13,367	14,817	15,601	15,543
Other (Decomposed Rock, etc.)	,,	10,480	10,758	11,113	12,546	12,722

(a) Excludes Australian Capital Territory where production is confined to brick clay mining and construction material quarrying. (b) Bullion, alluvial, retorted gold, etc. (c) Gross weight not available. (d) Ore for metal extraction and fluxing only. (e) Incomplete; figures relate only to production reported by Mines Departments. (f) Incomplete owing to difficulties of coverage.

NOTE.—Particulars of uranium concentrate produced are not available for publication and have been excluded from the above table.

3. **Contents of Metallic Minerals Produced in 1958.**—The following table shows the contents of metallic minerals produced in 1958 which were "pay metals" or which were recovered as "refiners' prizes". Further particulars for earlier years are shown in the following paragraph and in the sections later in this chapter covering principal contents.

CONTENTS OF METALLIC MINERALS PRODUCED, 1958.

Content of Metallic Minerals Produced.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Alumina (Al_2O_3)	ton	633	2,304	(a) 596	..	..	..	..	3,533
Antimony ..	,,	1,355	1	..	..	..	..	..	1,356
Beryllium Oxide (BeO) ..	unit (b)	120	..	(a) 120	(a) 654	2,006	..	..	2,900
Bismuth ..	lb.	..	..	..	..	2,328	..	..	2,328
Cadmium ..	ton	812	..	..	..	..	60	..	872
Chromic Oxide (Cr_2O_3) ..	,,	17	..	(a) 369	..	..	..	..	(c) 386
Cobalt ..	,,	70	..	..	..	..	1	..	71
Copper ..	,,	4,023	..	50,511	1	1,107	11,413	8,660	75,715
Gold	fine oz.	18,709	41,476	74,568	48	874,819	21,744	72,616	1,103,980
Iron(d) ..	'000 tons	..	..	..	(a)2,179	365	..	..	(c) 2,544
Lead	ton	246,896	..	65,799	13	1,854	13,785	..	328,347
Manganese(e) ..	,,	516	..	(a)3,181	..	21,926	..	..	25,623
Manganese Dioxide (MnO_2)(f)	,,	511	..	..	..	195	..	2,113	2,819
Molybdenum Disulphide (MoS_2)	lb.	..	..	(a)8,568	..	..	..	..	(a)8,568
Monazite ..	ton	210	..	109	..	(a) 104	..	..	423
Osmiridium ..	oz.	1	..	..	..	..	42	..	43
Platinum ..	,,	22	..	..	..	..	..	..	22
Silver	'000 fine oz.	8,992	3	5,675	1	189	1,395	50	16,305
Sulphur(g) ..	ton	197,736	..	c 14,647	a 32,129	22,635	54,404	..	321,551
Tantalite-Columbite ($Ta_2O_5+Nb_2O_5$) ..	lb.	..	..	..	..	6,736	..	..	6,736
Tin	ton	239	..	1,019	..	94	883	2	2,237
Titanium Oxide (TiO_2) ..	,,	44,974	..	35,755	..	38,504	..	..	119,233
Tungstic Oxide (WO_3) ..	,,	1	..	5	..	..	837	7	850
Zinc	,,	211,667	..	17,484	113	20	33,760	..	263,044
Zircon ..	,,	32,230	..	26,412	..	103	..	..	58,745

(a) Estimated. (b) Unit of 22.4 lb. (c) Partly estimated. (d) Excludes iron content of iron oxide not intended for metal extraction or fluxing. (e) Content of metallurgical grade ore. (f) Content of manganese ore other than of metallurgical grade ore. (g) Sulphur content of pyrite and other minerals from which sulphur is extracted.

NOTE.—Particulars of production of uranium oxide (U_3O_8) are not available for publication and have been excluded from the above table.

4. Contents of Metallic Minerals Produced in Australia, 1954 to 1958.—Particulars of the contents of metallic minerals produced in Australia in the years 1954 to 1958 are shown in the following table. Graphs showing details of the mine production of principal metals and coal from 1930 to 1959 may be found on pages 1055 and 1056.

CONTENTS OF METALLIC MINERALS PRODUCED, AUSTRALIA.

Content of Metallic Minerals Produced.	Unit.	1954.	1955.	1956.	1957.	1958.
Alumina (Al_2O_3) ..	ton	(a) 2,440	3,406	4,618	3,758	3,533
Antimony ..	,,	731	922	903	1,209	1,356
Beryllium Oxide (BeO)	unit(b)	1,723	2,428	3,768	4,570	2,900
Bismuth	lb.	1,393	2,800	5,120	1,344	2,328
Cadmium ..	ton	914	844	922	979	872
Chromic Oxide (Cr_2O_3) ..	,,	2,094	..	2,624	(a) 1,420	(c) 386
Cobalt	,,	69	61	59	68	71
Copper	,,	41,891	47,312	54,547	59,255	75,715
Gold	fine oz.	1,117,742	1,049,039	1,029,821	1,083,941	1,103,980
Iron(d)	'000 tons	2,274	2,304	2,543	2,466	2,544
Lead	ton	284,862	295,944	299,485	333,753	328,347
Manganese(e) ..	,,	12,718	20,462	25,856	34,904	25,623
Manganese Dioxide (MnO_2)(f) ..	,,	644	1,378	1,464	1,239	2,819
Molybdenum Disulphide(MoS_2) (c)	lb.	1,620	5,381	190	5,236	8,568
Monazite ..	ton	71	149	93	132	423
Osmiridium ..	oz.	18	21	27	69	43
Platinum ..	,,	23	7	18	17	22
Silver	'000 fine oz.	13,831	14,572	14,610	15,789	16,305
Sulphur(g) ..	ton	249,664	263,560	305,188	341,443	321,551
Tantalite-Columbite ($Ta_2O_5+Nb_2O_5$)	lb.	60,348	15,454	85,690	23,499	6,736
Tin	ton	2,075	2,017	2,078	1,952	2,237
Titanium Dioxide (TiO_2)	,,	43,241	57,505	95,502	163,751	119,233
Tungstic Oxide (WO_3)	,,	1,372	1,482	1,582	1,409	850
Zinc	,,	252,659	256,564	278,082	291,582	263,044
Zircon	,,	40,920	48,210	71,769	87,703	58,745

(a) Partly estimated. (b) Unit of 22.4 lb. (c) Estimated. (d) Excludes iron content of iron oxide not intended for metal extraction or fluxing. Partly estimated. (e) Content of metallurgical grade ore. (f) Content of manganese ore other than of metallurgical grade. (g) Sulphur content of pyrite and other minerals from which sulphur is extracted.

NOTE.—Particulars of production of uranium oxide (U_3O_8) are not available for publication and have been excluded from the above table.

5. Local Value of Minerals Produced 1954 to 1958.—Particulars of the estimated values of minerals (mine and quarry products) produced during the years 1954 to 1958 are shown in the following table. The values represent the estimated selling value at the mine or quarry of minerals produced during the years concerned.

LOCAL VALUE OF MINERALS PRODUCED, AUSTRALIA.
(£'000.)

Mineral.	1954.	1955.	1956.	1957.	1958.
METALLIC MINERALS.					
Copper Ore, Concentrate, etc.	9,912	15,018	18,182	12,345	14,770
Gold Ore, Concentrate, Other forms, etc.	15,810	15,536	15,509	16,090	16,251
Iron Ore	3,923	4,004	4,449	4,295	4,393
Lead and Lead-Silver Ore and Concentrate, Lead-Copper Concentrate, etc.(a)	27,560	32,308	34,552	28,810	22,493
Manganese Ore	366	192	337	589	460
Pyritic Ore and Concentrate	897	1,091	1,023	1,166	1,112
Rutile Concentrate	1,597	2,995	6,430	8,577	4,524
Tin Concentrate	1,606	1,554	1,599	1,612	1,739
Tungsten Concentrates	2,347	3,375	3,332	2,167	871
Zinc Ore and Concentrate	6,531	7,879	8,215	3,655	2,565
Zircon Concentrate	324	392	604	854	487
Other Metallic Minerals	253	179	415	602	525
Total Metallic Minerals (b)	*71,126*	*84,523*	*94,647*	*80,762*	*70,190*
FUEL MINERALS.					
Coal, Black	54,884	53,737	52,439	52,279	51,658
Coal, Brown	3,945	4,382	4,644	5,228	5,418
Total Fuel Minerals	*58,829*	*58,119*	*57,083*	*57,507*	*57,076*
NON-METALLIC (EXCLUDING FUEL) MINERALS.(b)					
Total Non-metallic (excluding Fuel) Minerals	*7,102*	*7,405*	*8,146*	*9,002*	*10,192*
CONSTRUCTION MATERIALS.(c)					
Total Construction Materials	*12,346*	*14,824*	*16,444*	*17,840*	*18,497*
TOTAL.					
Total, All Minerals and Construction Materials (c)	149,403	164,871	176,320	165,111	155,955

(a) Prior to 1958, the value of lead-copper concentrate was included with "Copper Ore, Concentrate, etc." (b) Excludes Australian Capital Territory, details of which are included with construction materials. (c) Incomplete owing to difficulties of coverage.

NOTE.—Particulars of the value of uranium concentrate produced are not available for publication and have been excluded from the above table.

6. **Local and Net Value of Mining and Quarrying Production by Industry, 1958.**—Particulars of the local value (or value of output) and net value (or value of production) of production of the principal Mining and Quarrying industries for the year 1958 are shown in para. 4 (*vi.*), page 1045. Owing to the necessity of classifying individual mines according to the principal mineral produced, the values in the tables on pp. 1045-6 and for mining industry groups differ slightly in some cases from totals of the corresponding groups of mine products shown in the table in para. 5 above.

§ 4. Gold.

1. **Historical.**—The earliest definite record of the discovery of gold in Australia was made on 15th February, 1823, by James McBrien, a surveyor, whilst surveying the Fish River between Rydal and Bathurst, New South Wales, and there are records of gold having been identified in several places during the next 27 years. It is believed that the first authentic

discovery of gold from which actual mining operations resulted was made in January, 1846, about 10 miles east of Adelaide, South Australia. However, credit for the first discovery of payable gold is generally given to E. H. Hargraves, who notified the Government of New South Wales on 3rd April, 1851, of his find, located at the junction of the Summerhill and Lewis Pond Creeks in the Bathurst (N.S.W.) district. This caused a gold rush, and prospecting started in many localities.

The Colony of Victoria was separated from New South Wales on 1st July, 1851, and within a few days of its inception, the new government was notified of the discovery of gold in several places. It would appear that the Hon. W. Campbell discovered gold near Clunes (Victoria) in March, 1850, but temporarily concealed the fact, and his discovery was not disclosed until 8th July, 1851. The discovery of gold at Ballarat and Bendigo followed soon afterwards.

The early discoveries were of alluvial gold, and only crude equipment was required to work them. As a consequence, cities and towns were depleted of their population as large numbers rushed to the diggings. The Australian population growth from 438,000 at the end of 1851 to 1,168,000 at the end of 1861 can be said to be largely due to the discoveries of gold.

Discoveries continued to be made, including such important fields as Canoona (Queensland) in 1858, Forbes (New South Wales) in 1862, Gympie (Queensland) in 1868, and Charters Towers and Mount Morgan (both in Queensland) in 1882. With the discovery at Mt. Lyell (Tasmania) in 1886, the major discoveries in the Eastern States ceased.

Western Australia did not enter the field for a considerable time after gold mining had become well established in most of the other States. Although some specimens had been found between 1850 and 1870, it was not until 1886 that the Kimberley field was discovered, followed by Yilgarn in 1887. In 1892, Bayley and Ford discovered Coolgardie, and in May of the following year Hannan and Flannigan found Kalgoorlie. In the years since, there have been no further discoveries of major goldfields although many profitable deposits in other localities have been found and worked.

The amount of gold won in Australia in any one year attained its maximum in 1903, the year in which Western Australian production reached its highest level. For the other States, the years in which the greatest yields were obtained were as follows:—New South Wales, 1852; Victoria, 1856; Queensland, 1900; South Australia, 1904; and Tasmania, 1899. In recent years, output from the Northern Territory has expanded considerably and the highest annual production was recorded as recently as 1956.

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.

2. **Present Methods of Mining and Treatment.**—Gold ores can be divided into two types, namely, free-milling and refractory. Free-milling ores are those that, when finely ground, will yield their gold content to amalgamation and/or cyanidation and these are found in most of the gold deposits of Australia.

Some refractory ores, which are not amenable to amalgamation, allow their gold to be dissolved by cyanidation, from which solution the gold is then precipitated. However, on the Coolgardie field, where gold bearing sulphide and telluride minerals occur, it is necessary first to recover these from gangue by flotation. This concentrate is then roasted and the resulting calcine, an impure oxide containing free gold, is cyanided to yield gold. This is usually smelted as bullion, in which form it leaves the vicinity of the mine.

3. **Mine Production.**—The table hereunder shows the mine production of gold (gold content of minerals produced) during 1958 according to the mineral in which it was contained and the State or Territory of origin. It should be noted that the minerals shown below contain, in addition to gold, certain other metals.

GOLD : MINE PRODUCTION, 1958.

(Fine oz.)

Mineral in which contained.	N.S.W.	Vic.	Qld.	S.A.	W.A.	Tas.	N.T.	Aust.
Copper Ore, Concentrate, etc. ..	3,197	..	57,675	..	834	6,015	10,132	77,853
Gold Ore, Concentrate, etc. ..	4,997	41,476	16,893	48	*a* 873,985	151	62,484	1,000,034
Lead-Silver Ore ..	15	..	..	..	..	..	..	15
Lead Concentrate ..	8,571	..	..	..	..	3,019	..	11,590
Lead-Copper Concentrate ..	..	..	..	..	..	10,001	..	10,001
Zinc Concentrate ..	1,929	..	..	..	..	2,558	..	4,487
Total Gold ..	**18,709**	**41,476**	**74,568**	**48**	**874,819**	**21,744**	**72,616**	**1,103,980**

(*a*) Includes a small quantity of gold recovered from pyrite concentrate which was dispatched from Kalgoorlie for sulphuric acid manufacture.

The principal sources of production during 1958 were as follows:—

(i) *New South Wales.* There are now no mines employing four or more hands engaged solely in gold mining in New South Wales. Most of the gold produced during 1958 was contained in lead and zinc concentrates produced at Broken Hill and lead, zinc and copper concentrates milled at Captain's Flat.

(ii) *Victoria.* At Chewton, near Castlemaine, the Wattle Gully mine produced more than half of the State's production. Most of the remaining production was won from small gold mines in the north-east portion of the State.

(iii) *Queensland.* The copper concentrate produced at Mt. Morgan contained more than two-thirds of the State's output of gold. Nearly all of the remaining production was from the Golden Plateau N.L. mine at Cracow.

(iv) *South Australia.* The only gold produced was won by prospectors.

(v) *Western Australia.* More than half of the total production came from the Coolgardie goldfields, while most of the remaining production came from the Dundas, Murchison and Yilgarn goldfields. The Lake View and Star mine at Fimiston maintained its position as the largest gold producer in Australia, mining 170,888 fine oz. during 1958, and three other mines each produced over 100,000 fine oz. in the same period.

(vi) *Tasmania.* Copper concentrate produced at Mt. Lyell contained most of the gold produced in Tasmania during 1958, while most of the remaining production was included in lead and zinc concentrates milled at Rosebery. A small quantity of gold was recovered from alluvial tin-mining operations.

(vii) *Northern Territory.* Gold production in the Northern Territory is centred around Tennant Creek. At this centre, the main producer was the Nobles Nob mine, and the next largest producer was the Peko mine where gold was produced in copper concentrate.

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 1958. Owing to defective information in the earlier years, it is likely that the recorded production falls considerably short of the actual totals.

GOLD : MINE PRODUCTION.(a)

('000 fine oz.)

Period.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
1851–60	2,714	21,973	3	..	..	1	..	24,691
1861–70	3,220	15,327	489	..	..	3	..	19,039
1871–80	2,019	9,564	2,527	136	..	165	19	14,430
1881–90	1,014	6,689	3,259	58	42	357	168	11,587
1891–1900	2,432	7,040	5,648	52	5,252	550	214	21,188
1901–10	2,253	7,095	5,512	73	17,784	604	111	33,432
1911–20	1,145	3,067	2,263	55	10,671	202	23	17,426
1921–30	204	593	434	10	4,557	43	2	5,843
1931–40	569	1,052	1,021	53	8,474	130	84	11,383
1941–50	572	800	750	13	6,683	157	148	9,123
1951	49	66	79	(b)	648	15	39	896
1952	39	68	85	(b)	727	16	45	980
1953	26	64	92	(b)	823	17	53	1,075
1954	32	53	98	(b)	862	19	54	1,118
1955	30	38	64	(b)	835	17	65	1,049
1956	29	39	56	(b)	814	17	75	1,030
1957	31	46	63	(b)	850	20	74	1,084
1958	19	41	75	(b)	875	22	72	1,104
Total, 1851-1958 ..	16,397	73,615	22,518	450	59,897	2,355	1,246	176,478

(a) Gold content of minerals produced. (b) Less than 500 fine oz.

4. **Refinery Production.**—Amalgam and gold slimes from cyanide extraction are treated at the mines to produce gold bullion, which at some mines may be partly refined before dispatch to the Royal Mints, located in Melbourne and Perth. By-product gold from lead smelting is refined at Port Pirie in South Australia while the gold contained in copper refinery sludges, resulting from electrolytic copper refining at Mount Lyell and Port Kembla, is recovered at Port Kembla. Gold bullion and other gold-bearing materials are also refined in Sydney.

Details of the refinery production of gold in Australia and the value of refined newly-won gold of Australian origin are shown in the following table for each of the years 1954 to 1958. The value of the refined newly-won gold is based on the price fixed by the Commonwealth Bank, but allowance is made for premiums on sales of gold overseas and for industrial purposes in Australia.

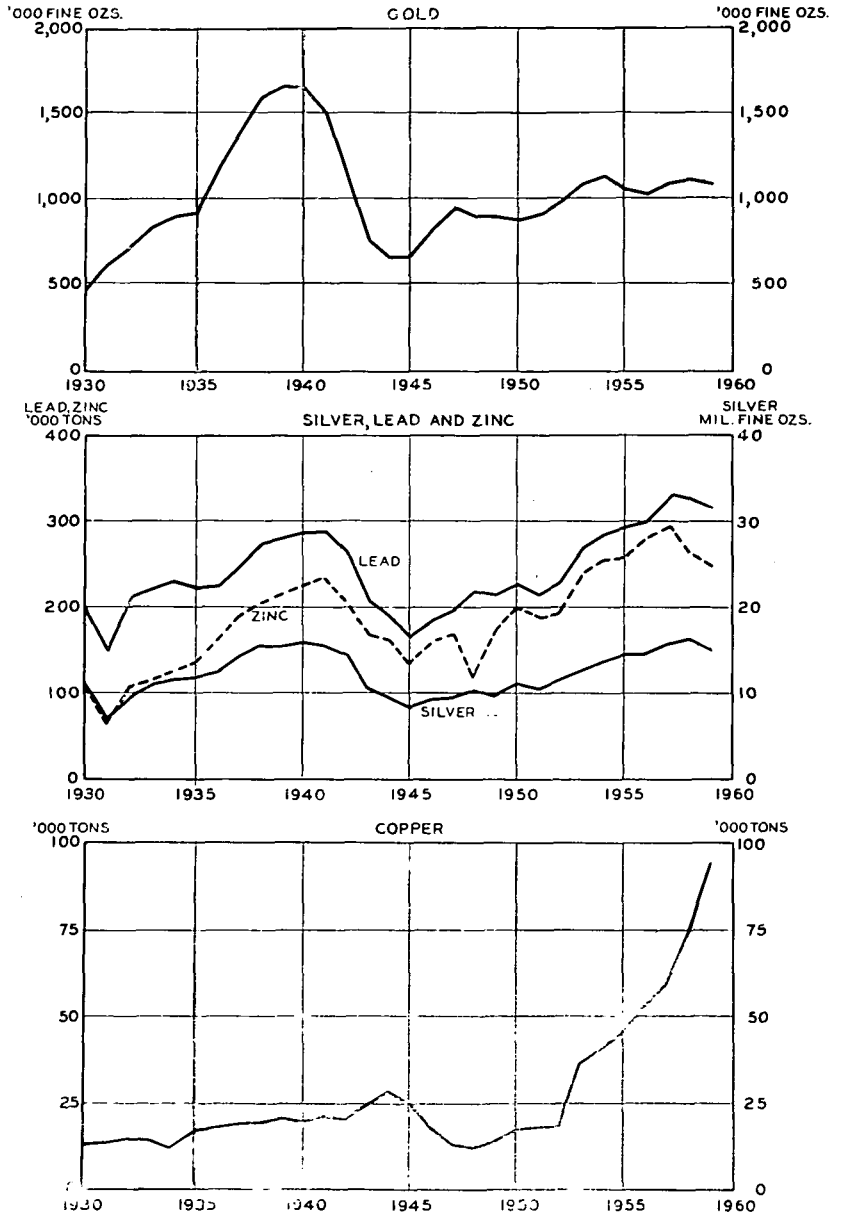
PRODUCTION OF REFINED GOLD IN AUSTRALIA.

Particulars.	1954.	1955.	1956.	1957.	1958.
QUANTITY (FINE OUNCES).					
Australian Origin—					
Newly-won Gold	1,063,457	1,054,714	1,044,164	1,078,419	1,069,774
From Scrap	20,728	20,130	20,106	21,480	17,350
Oversea Origin—					
Newly-won Gold	189,913	167,547	161,065	171,970	136,998
From Scrap	828	454	708	1,248	888
Total	**1,274,926**	**1,242,845**	**1,226,043**	**1,273,117**	**1,225,010**
VALUE (£.).					
Newly-won Gold of Australian Origin	16,589,114	16,503,403	16,345,912	16,872,458	16,720,490

MINE PRODUCTION OF PRINCIPAL METALS

(METALLIC CONTENT OF MINERALS)

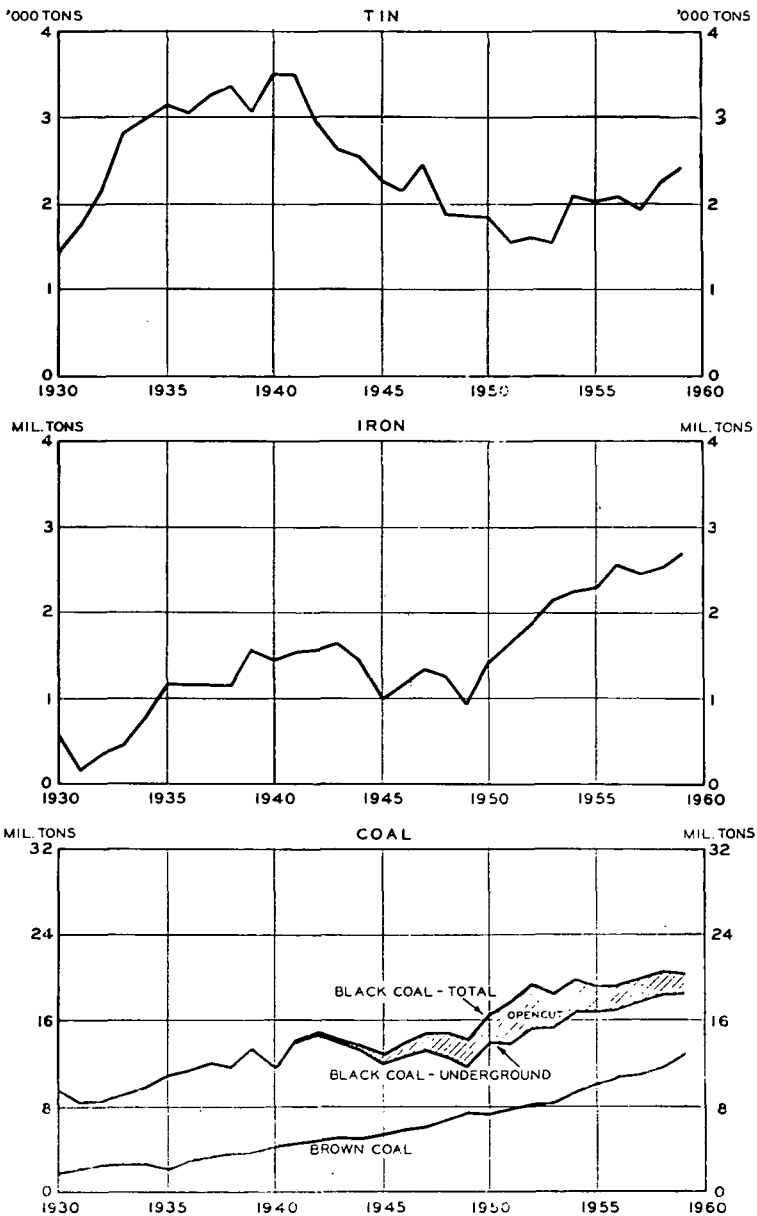
AUSTRALIA, 1930 TO 1959



MINE PRODUCTION OF PRINCIPAL METALS AND PRODUCTION OF COAL

(METALLIC CONTENT OF MINERALS)

AUSTRALIA, 1930 TO 1959



5. **Changes in Stocks of Gold held in Australia.**—The following table shows particulars of production, imports and exports of gold and changes in stocks of gold held in Australia for each of the years 1954 to 1958.

CHANGES IN STOCKS OF GOLD HELD IN AUSTRALIA.

(Fine oz.)

Particulars.	1954.	1955.	1956.	1957.	1958.
Mine Production of Gold(*a*) ..	1,117,742	1,049,039	1,029,821	1,083,941	1,103,980
Imports of Gold(*b*)(*c*) ..	211,018	150,606	201,883	159,998	160,232
Total	*1,328,760*	*1,199,645*	*1,231,704*	*1,243,939*	*1,264,212*
Exports of Gold(*b*).. ..	568,732	1,136,575	531,010	783,814	128,550
Gold Content of Ores and Concentrates Exported ..	10,231	15,244	18,177	19,561	22,453
Net Industrial Absorption of Gold	52,346	35,953	37,052	42,887	37,568
Total	*631,309*	*1,187,772*	*586,239*	*846,262*	*188,571*
Changes in Stocks of Gold held in Australia(*d*)	+ 697,451	+ 11,873	+ 645,465	+ 397,677	+1,075,641

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

6. **Production in Principal Countries.**—The quantities of gold produced in the principal producing countries and the estimated world total production in each of the years 1954 to 1958, according to data published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys, are shown in the table hereunder.

GOLD: PRODUCTION IN PRINCIPAL COUNTRIES.

('000 fine oz.)

Country.	1954.	1955.	1956.	1957.	1958.
Union of South Africa ..	13,237	14,601	15,897	17,031	17,656
Canada	4,366	4,542	4,384	4,434	4,535
United States of America ..	1,837	1,880	1,832	1,794	1,739
Australia	**1,118**	**1,049**	**1,030**	**1,084**	**1,104**
Ghana	787	687	638	790	853
Rhodesia and Nyasaland ..	538	527	540	540	559
Philippines	416	419	406	380	423
Colombia	377	381	438	325	372
Belgian Congo	365	370	374	374	356
Mexico	387	383	350	346	332
Estimated World Total(a) ..	*25,700*	*26,900*	*28,000*	*29,000*	*30,000*

(*a*) Excludes U.S.S.R. The United States Bureau of Mines has estimated U.S.S.R. production at 9–10 million ounces per annum in recent years.

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

Average prices of gold per fine oz. in Australia and in London, for the years 1954 to 1958, are shown in the following table. The London gold market was re-opened on 22nd March, 1954, and the prices quoted on this market have been used from that date. Previously the Bank of England official price was used.

PRICES OF GOLD: AUSTRALIA AND LONDON.

(per fine oz.)

Place of Sale.	1954.	1955.	1956.	1957.	1958.
At Mints in Australia £A. *s. d.*	15 11 7	15 12 6	15 12 6	15 12 6	15 12 6
London .. £stg. *s. d.*	12 9 4	12 10 11	12 10 2	12 10 3	12 9 9

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

The following table shows the quantity and value of gold sold on oversea premium markets and the average price realized for these sales during the years 1954 to 1958.

GOLD SOLD ON OVERSEA PREMIUM MARKETS.

Particulars.	Unit.	1954.	1955.	1956.	1957.	1958.
Quantity ..	fine oz...	602,767	981,980	505,262	687,115	189,537
Value	£A. *f.o.b.*	9,390,028	15,370,834	7,919,646	10,760,214	2,964,638
Average Price ..	£A. *s. d.*	15 11 7	15 13 1	15 13 6	15 13 2	15 12 10

9. **Assistance to the Gold-Mining Industry.**—After the collapse of high premium prices late in 1953, conditions in the gold-mining industry again became acute and many producers were faced with the prospect of closing down. To meet this situation, the Gold-Mining Industry Assistance Act was assented to on 18th November, 1954. The purpose of this Act was to assist the gold-mining industry by the payment of subsidy subject to certain conditions on the production and sales of gold. The subsidies paid under the original Act were increased under amendments enacted on 22nd October, 1957, and 22nd May, 1959. Under the Act as it now stands, the subsidy payable to small producers whose annual output does not exceed 500 fine oz. is £2 8s. 0d. per fine oz., irrespective of cost of production. For large producers, subsidy is paid at the rate of three quarters of the excess of the average cost of production over £13 10s. 0d. per fine oz. with a maximum amount of subsidy of £3 5s. 0d. per

fine oz. Where a producer receives an amount in excess of the official price of £15 12s. 6d. per fine oz. as a result of sales on oversea premium markets or otherwise, the subsidy payable shall be reduced by the amount of the excess. The subsidy is also limited to the extent that the annual net profit of a producer will not, with the addition of the subsidy, exceed 10 per cent. of the capital investment in the company. The maximum expenditure on development allowable in determining costs is £5 5s. 0d. per fine oz. A further condition of the Act is that the recovery rate of the mine shall be maintained at the level of the year previous to the Act. Payments under the Act are to continue until 30th June, 1962.

Payments under the Act commenced in March, 1955, and the amounts paid to gold producers in the various States and Territories of Australia in each of the years 1955 to 1959 are shown in the following table.

NET SUBSIDY PAYMENTS TO GOLD PRODUCERS.
(£.)

Year.	New South Wales.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor. Terr.	Papua and New Guinea.	Total.
1955	225	29,657	966	..	199,051	..	441	6,606	236,946
1956	17	31,478	2,848	..	496,819	..	1,020	63,979	596,161
1957	34	56,044	620	..	512,708	..	8,345	10,761	588,512
1958	26,951	38,380	3,958	..	623,394	..	16,360	44,485	753,528
1959	107	41,500	2,937	55	652,266	..	39,181	52,449	788,495

10. **Employment in Gold Mining.**—Particulars of the numbers of persons employed in gold mining are shown in paras. 4 (ii), page 1043 and 4 (iii), page 1044.

§ 5. Lead, Silver and Zinc.

1. **Historical.**—Prior to the discovery of the great Broken Hill lead-silver-zinc lode in 1883 by Charles Rasp, a boundary rider, the mining of lead-silver-zinc ores at other localities in New South Wales had been intermittent and only small quantities were produced. The Broken Hill lode has proved to be one of the biggest in the world and to date over 80 million tons of ore have been raised. The Broken Hill Proprietary Co. Ltd., now engaged in steel manufacture, was the company first formed to operate at Broken Hill and continued operations there until 1939 when the ore in its leases became exhausted. The first ores mined at Broken Hill were oxidized and required only simple smelting to produce a lead-silver bullion. No initial attempt was made to recover zinc and it was not until 1897 that the first commercial zinc concentrate was produced. The exhaustion of the oxidized ore early this century led to the mining of the deeper sulphide ores. The need to produce separate lead and zinc concentrates for smelting purposes, with economic metal recoveries, resulted in the perfection at Broken Hill of the differential ore flotation process. The preparation of sulphide concentrates by flotation methods is now used throughout the world. Mining operations at Broken Hill are now mainly carried on to the north and south of the original leases. In 1939, Lake George Mines Ltd. at Captain's Flat, near Queanbeyan, commenced large-scale mining of a lead-zinc-copper ore body which had been first worked in 1882.

Lead-silver-zinc ores have been mined in Queensland since 1870 but it was not until 1923 that the largest ore-body, at Mt. Isa, was discovered by John Miles. Mt. Isa Mines Ltd. commenced mining operations at this centre in 1931. Mt. Isa is now the second largest centre in Australia producing lead-silver-zinc ores and the largest producer of copper. During the 1939–45 War, mining of lead-silver-zinc ores at Mt. Isa was suspended in favour of copper production.

Lead-silver ores were first discovered in Western Australia in the Northampton District in 1848 and most of the subsequent production in that State has been from that District.

The first recorded production of lead in Tasmania was in 1888, and of zinc, in 1919. Production has been restricted to the West Coast.

2. **Present Methods of Mining and Treatment.**—Nearly all ores now mined are composed of deep-lying sulphide minerals and it is therefore necessary to mine these ores by underground methods. At all large mines, it is the practice to produce separate lead and zinc concentrates,

with the lead concentrate containing most of the silver. These concentrates are prepared by differential flotation except in cases where a satisfactory concentrate can be obtained by gravity methods. In flotation plants, the ore is finely ground and by differential flotation a lead concentrate is first produced, with the zinc concentrate subsequently separated from the tailings. At Captain's Flat, differential flotation methods are used to produce successive concentrates of copper, lead, zinc and pyrite.

Particulars of representative Broken Hill lead and zinc concentrates are shown in para. 4, page 1039.

3. **Mine Production.**—The following table shows for 1958 the mine production (metal content of ores and concentrates produced) of silver, lead and zinc in Australia, and the respective minerals in which these metals were contained.

LEAD, SILVER AND ZINC: CONTENT OF ORES AND CONCENTRATES PRODUCED, 1958.

Mineral in which contained.	N.S.W.	Vic.	Q'land.	S.A.	W.Aust.	Tas.	N.T.	Aust.
LEAD (tons).								
Lead-Silver Ore ..	729	..	1,449	13	92	..	..	2,283
Lead-Silver-Zinc Ore	..	..	..	..	18	..	..	18
Lead Concentrate ..	241,521	..	63,715	..	1,744	9,068	..	316,048
Lead-Copper Concentrate ..	..	..	..	..	..	2,843	..	2,843
Zinc Concentrate ..	4,646	..	635	..	..	1,874	..	7,155
Total Lead ..	**246,896**	..	**65,799**	**13**	**1,854**	**13,785**	..	**328,347**
SILVER (fine oz.).								
Copper Ore, Concentrate, etc. ..	64,736	..	260,327	..	3,475	34,392	49,449	412,379
Gold Concentrate, etc.	592	3,018	9,363	..	184,082	..	215	197,270
Lead-Silver Ore ..	58,653	..	34,600	613	891	..	..	94,757
Lead Concentrate ..	8,509,147	..	5,262,594	..	927	427,462	..	14,200,130
Lead-Copper Concentrate ..	..	..	..	..	..	761,360	..	761,360
Zinc Concentrate ..	359,165	..	107,905	..	..	171,604	..	638,674
Total Silver ..	**8,992,293**	**3,018**	**5,674,789**	**613**	**189,375**	**1,394,818**	**49,664**	**16,304,570**
ZINC (tons).								
Silver-Lead-Zinc Ore	..	..	..	..	20	..	..	20
Zinc Concentrate ..	211,667	..	17,484	113	..	33,760	..	263,024
Total Zinc ..	**211,667**	..	**17,484**	**113**	**20**	**33,760**	..	**263,044**

The principal sources of production of lead, silver and zinc during 1958 were as follows:—

(i) *New South Wales.* Lead and zinc concentrates, produced only at Broken Hill and Captain's Flat, contained nearly all of the New South Wales production of lead and silver and all of the zinc. The five present Broken Hill mines listed in decreasing order of tonnage mined, are:—Zinc Corporation Ltd., New Broken Hill Consolidated Ltd., North Broken Hill Ltd., Broken Hill South Ltd., and Barrier Central Pty. Ltd. The mines operating at Broken Hill, during 1958, produced (in terms of the contents of all ores and concentrates produced) over 70 per cent. of Australia's lead and zinc and more than one half of the silver. Small quantities of lead-silver ore were produced, mainly in the Broken Hill district. In addition, the copper concentrate produced at Captain's Flat contained silver as did small quantities of copper ore produced in other parts of the State and gold bullion produced from gold mining operations.

(ii) *Victoria.* All of the silver produced was obtained from gold mining operations. No zinc bearing minerals are mined in Victoria and lead was last mined in 1957.

(iii) *Queensland.* Mt. Isa Mines Ltd. was the only producer of lead and zinc concentrates in Queensland and these contained most of the State's production of lead and silver and all of the zinc. Small quantities of silver-lead ore were mined mainly at Mt. Isa and

in the surrounding district. Copper concentrates containing silver were produced at Mount Morgan while some silver is also contained in gold bullion derived from gold ores, mainly at Cracow.

(iv) *South Australia.* Very small quantities of lead, silver and zinc ore were mined in South Australia during 1958.

(v) *Western Australia.* Most of the silver produced in Western Australia was obtained from gold bullion produced by the gold-mining industry. Lead-silver ores, mined chiefly in the Northampton mineral field, near Geraldton, contained lead and silver. The zinc production recorded for 1958 refers to dispatches from the Pilbara goldfield.

(vi) *Tasmania.* All of the lead, silver and zinc was produced from mines at Rosebery and Mt. Read on the West Coast. Ores from both mines were concentrated at the Rosebery mine and separate lead, zinc, and lead-copper concentrates were produced. Silver was also contained in copper concentrates milled at Mt. Lyell. A lead concentrate was milled from ore mined at Zeehan during 1958.

(vii) *Northern Territory.* No ores containing lead or zinc were mined during 1958. However, silver was produced in copper concentrates from the Peko mine at Tennant Creek and Rum Jungle and in small quantities of copper ore mined at various localities. Gold bullion produced, mainly at Tennant Creek, also contained silver.

The table hereunder shows the quantities of silver, lead and zinc contained in minerals won in the several States and the Northern Territory during the years 1954 to 1958:—

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

State or Territory.	1954.	1955.	1956.	1957.	1958.
	LEAD (tons).				
New South Wales	230,392	234,854	238,319	266,928	246,896
Victoria	..	..	..	4	..
Queensland	41,424	48,814	43,104	51,269	65,799
South Australia	14	2	17	20	13
Western Australia	1,497	1,007	5,828	3,087	1,854
Tasmania	11,533	11,267	12,217	12,445	13,785
Northern Territory ..	2	..	..	..	..
Australia	**284,862**	**295,944**	**299,485**	**333,753**	**328,347**
	SILVER (fine oz.).				
New South Wales	8,680,114	8,823,211	9,289,583	9,969,102	8,992,293
Victoria	3,443	1,633	2,255	3,157	3,018
Queensland	3,583,776	4,363,371	3,724,596	4,283,388	5,674,789
South Australia	625	142	653	975	613
Western Australia	237,639	200,748	192,589	187,530	189,375
Tasmania	1,321,385	1,166,307	1,372,881	1,299,062	1,394,818
Northern Territory ..	3,542	16,621	27,365	45,417	49,664
Australia	**13,830,524**	**14,572,033**	**14,609,922**	**15,788,631**	**16,304,570**
	ZINC (tons).				
New South Wales	202,646	211,478	229,126	241,509	211,667
Queensland	19,615	17,138	16,231	19,536	17,484
South Australia	..	..	7	97	113
Western Australia	74	..	..	..	20
Tasmania	30,324	27,948	32,718	30,440	33,760
Australia	**252,659**	**256,564**	**278,082**	**291,582**	**263,044**

4. **Smelter and Refinery Production.**—(i) *Lead Concentrate.* Lead concentrate produced at Broken Hill is railed to Port Pirie, in South Australia, for smelting and refining. Lead-silver bullion is produced from initial smelting, and lead, silver and gold are then refined. Cadmium is obtained from smelter fumes and refined to produce rods of metal. The sulphur dioxide gas formed during pre-smelter sintering operations is used to manufacture sulphuric acid. The antimony contained in the concentrate is alloyed with lead to form marketable antimonial lead while the copper is processed to the matte and speiss stage and sent to copper refineries for copper extraction. Lead concentrates produced at Broken Hill are now in excess of Port Pirie smelter and refinery capacity and part of the Broken Hill production is exported.

Lead ore and concentrate produced at Mount Isa is smelted at the mine to derive a lead bullion which is rich in silver. All of this bullion is exported to the United Kingdom for refining. A lead-copper dross is produced as a by-product of lead smelting and this is also exported.

Lead and lead-copper concentrate produced in Tasmania, and lead concentrate produced at Captain's Flat in New South Wales and in Western Australia, are exported.

(ii) *Zinc concentrate.* About half of the zinc concentrate produced at Broken Hill is exported overseas, and the remainder is shipped from Port Pirie to Risdon, near Hobart, for refining. At Risdon, the Broken Hill concentrate, together with all zinc concentrate produced in Tasmania, is roasted to form zinc oxide, or calcine. Sulphur dioxide formed during this roasting process is used for the manufacture of sulphuric acid. The calcine is leached with a weak solution of sulphuric acid to form a zinc sulphate solution which, after purification, is electrolysed. Zinc of high purity is deposited on the cathodes and this zinc is melted and cast into ingots. Cadmium metal and cobalt oxide are also recovered. Lead-silver residues are recovered and forwarded to Port Pirie for smelting with lead concentrates. Copper residues are sent to Port Kembla for treatment.

Zinc concentrates produced at Mount Isa and Captain's Flat, and small quantities of lead-silver-zinc ore produced at various localities in Western Australia, are exported.

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

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

Particulars.	1954.	1955.	1956.	1957.	1958.
SILVER ('000 fine oz.).					
Production(*a*)	8,474	7,818	8,232	8,011	9,101
Sold to Australian consumers(*b*)	1,977	1,928	1,893	4,410	4,184
Sold for export(*b*)	6,989	5,793	6,214	3,397	5,074
LEAD (tons).					
Refined Lead—					
Production(*a*)	200,409	187,134	194,506	192,161	191,474
Sold to Australian consumers(*b*) ..	42,088	45,851	38,616	37,291	39,928
Sold for export(*b*)	153,847	148,189	151,628	152,432	158,075
Lead-Silver Bullion—					
Produced for export (lead content)(*a*) ..	38,146	37,392	41,658	46,891	57,171
ZINC (tons).					
Production(*a*)	104,523	101,090	104,993	110,348	114,773
Sold to Australian consumers(*b*) ..	61,478	71,355	69,760	78,874	72,844
Sold for export(*b*)	36,130	34,049	32,718	37,316	37,989

(*a*) Source: Bureau of Mineral Resources. (*b*) Source: Australian Mines and Metals Association.

5. **Production in Principal Countries and World Total.**—The following table shows, for the years 1956 to 1958, particulars of silver, lead and zinc production (mine basis) in principal producing countries, together with the estimated world total, according to data published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys.

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

Country.	1956.	1957.	1958.
LEAD (tons).			
U.S.S.R.	(a) 305,000	(a) 320,000	(a) 335,000
Australia	**299,485**	**333,753**	**328,347**
United States of America	315,023	301,979	238,729
Mexico	196,457	211,482	197,859
Canada	168,620	162,039	165,866
Peru	127,036	134,986	132,043
Estimated World Total	*2,300,000*	*2,400,000*	*2,300,000*
SILVER (fine oz.).			
Mexico	43,078,040	47,149,514	47,592,360
United States of America	38,948,121	38,164,915	34,111,027
Canada	28,431,847	28,823,298	31,311,378
Peru	22,972,766	24,845,258	25,918,353
U.S.S.R.	(b) 25,000,000	(b) 25,000,000	(b) 25,000,000
Australia	**14,609,922**	**15,788,631**	**16,304,570**
Japan	6,166,963	6,543,673	6,513,900
Bolivia	7,543,304	5,375,090	6,051,284
Germany, Eastern	(a) 4,500,000	(a) 4,500,000	(a) 4,500,000
Belgian Congo	3,794,000	3,044,900	3,794,000
Estimated World Total	*226,000,000*	*230,000,000*	*235,000,000*
ZINC (tons).			
Canada	377,350	369,411	382,712
United States of America	484,232	474,763	367,862
U.S.S.R.	(a) 270,000	(a) 300,000	(a) 325,000
Australia	**278,082**	**291,582**	**263,044**
Mexico	244,956	237,221	220,566
Poland	150,900	156,261	160,047
Japan	121,058	133,858	139,505
Peru	172,354	152,017	133,120
Estimated World Total	*2,990,000*	*3,050,000*	*2,990,000*

(a) Estimated smelter production. (b) Estimated.

6. **Prices of Silver, Lead and Zinc.**—The following table shows average prices in Australia and on the London Metal Exchange during the years 1954 to 1958. 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. In Australia, minimum prices for sales of zinc and lead were fixed on 1st January, 1958, and 22nd December, 1958, respectively. Silver prices have not been controlled in Australia or the United Kingdom.

PRICES OF SILVER, LEAD AND ZINC.

Particulars.	1954.	1955.	1956.	1957.	1958.
Australian Prices, in Australian currency—					
	s. d.	s. d.	s. d.	s. d.	s. d.
Silver, per fine oz. (*a*) ..	7 8	8 1	8 3	8 3	8 0
	£	£	£	£	£
Lead, per ton	114	127	140	117	(*b*) 87
Zinc, per ton	101	114	122	104	(*c*) 91
London Metal Exchange Prices, in sterling—					
	s. d.	s. d.	s. d.	s. d.	s. d.
Silver, per fine oz. ..	6 2	6 4	6 7	6 7	6 5
	£	£	£	£	£
Lead, per ton	96	106	116	97	73
Zinc, per ton	78	91	98	82	65

(*a*) Silver prices shown represent export parity calculated from London Metal Exchange prices. (*b*) Average market price was used for the periods shown prior to 23rd December, 1958, on which day the minimum price was fixed at £100 per ton. (*c*) Prior to 1st January, 1958, the prices shown were average market prices. On 1st January, 1958, a minimum price was fixed at £90 and this minimum was later raised to £100 on 22nd December, 1958.

7. **Employment in Silver, Lead and Zinc Mining.**—Particulars of the number of persons employed in mining for these metals are shown in paras. 4 (ii), page 1043 and 4 (iii), page 1044.

§ 6. Copper.

1. **Historical.**—Copper was first discovered in Australia in 1842, at Kapunda in South Australia and in the Northampton district of Western Australia. The subsequent large scale mining of the South Australian deposits contributed significantly to that State's development, but now only very small quantities are mined in South Australia.

The mining of copper commenced in New South Wales in 1847, near Rockley. Copper was first recognized in the Cobar district in 1869, and large scale mining continued at Cobar until 1952. Other fields were opened at Mt. Hope in 1878, Nymagee in 1880 and Captain's Flat in 1882 but of these, only Captain's Flat is still producing.

The first important discovery of copper in Queensland was made in 1862, when a rich lode was found near Clermont. Copper was discovered in the Herberton mineral field in 1879 and at Mt. Morgan in 1882. The copper ore body at Mt. Isa was not recognized as an outcrop when the lead-zinc ore body was discovered in 1923, and was discovered as a result of underground development.

Copper mining was first undertaken at Mt. Isa during the 1939-45 War, but it was not until the erection of a copper smelter at that centre that large scale production commenced. The Mt. Isa mine is today Australia's largest producer of copper.

In Tasmania, the Mt. Lyell deposit was discovered in 1886.

2. **Methods of Mining and Treatment.**—Most of the large copper ore bodies contain the mineral chalcopyrite, an iron-copper sulphide. Copper ore is mined by opencut methods at Mt. Morgan and Mt. Lyell and by underground methods at Mt. Isa, Captain's Flat and Ravensthorpe (Western Australia). Oxidized copper ore is mined at Mt. Isa and at numerous other localities, mainly in Western Australia.

It is the practice for the sulphide ore to be finely ground and for the chalcopyrite to be recovered by flotation. At Mt. Lyell and Mt. Morgan, the tailings from the copper flotation are subjected to a further flotation and a pyrite concentrate is produced. The oxidised ore mined at Mt. Isa is not concentrated and is fed direct to the smelters.

3. **Mine Production.**—The following table shows for 1958 the copper content of all minerals produced in the several States and the Northern Territory:—

COPPER: CONTENT OF ORES AND CONCENTRATES PRODUCED: 1958
(Tons.)

Mineral in which Contained.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Copper Ore, Concentrate, etc...	1,054	..	49,748	1	1,107	10,544	8,660	71,114
Gold Ore, Concentrate, etc...	(a)	..	..	..	..	..	..	(a)
Lead Concentrate ..	2,507	..	763	..	..	..	..	3,270
Lead-Copper Concentrate	..	..	..	..	..	666	..	666
Zinc Concentrate ..	462	..	..	..	..	203	..	665
Total	**4,023**	..	**50,511**	**1**	**1,107**	**11,413**	**8,660**	**75,715**

(a) Less than half a ton.

The following were the principal sources of copper during 1958:—

(i) *New South Wales.* Most of the copper produced in this State was contained in lead concentrate milled at Broken Hill. At Captain's Flat, copper was contained in both copper and lead concentrates. Small quantities of copper were precipitated from water pumped from old mine workings, mainly at Cobar.

(ii) *Victoria.* No copper is produced in Victoria.

(iii) *Queensland.* Mt. Isa Mines Ltd. was the most important producer in Queensland, with its output of copper concentrate contained in copper sulphide concentrate, oxidized copper ore and lead concentrate. Copper concentrate containing appreciable gold and silver, was also produced at Mt. Morgan.

(iv) *South Australia.* Only a negligible quantity of copper was produced from areas which in the past were important for copper.

(v) *Western Australia.* A copper concentrate was produced by Ravensthorpe Copper Mines N.L. However, oxidized ore, which is used for fertilizer manufacture, was mined at various other localities.

(vi) *Tasmania.* Copper concentrate was produced at Mt. Lyell. Lead-copper concentrate and zinc concentrate milled at Rosebery made up the remainder of Tasmania's production. At Mt. Lyell, small amounts of copper were precipitated from water pumped from old mine workings in the vicinity.

(vii) *Northern Territory.* Copper concentrates were produced at Tennant Creek by Peko Mines Ltd. At Rum Jungle, Territory Enterprises Pty. Ltd. produced a copper concentrate and a copper precipitate in association with uranium mining. Small quantities of ore were mined at other localities.

The table hereunder shows the quantities of copper contained in minerals produced in the several States and the Northern Territory during the years 1954 to 1958:—

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

State or Territory.	1954.	1955.	1956.	1957.	1958.
New South Wales	3,182	3,492	4,289	4,382	4,023
Queensland	27,857	31,858	35,708	35,786	50,511
South Australia	(a)	..	1	2	1
Western Australia	380	699	740	788	1,107
Tasmania	9,880	8,394	8,807	10,984	11,413
Northern Territory ..	592	2,869	5,002	7,313	8,660
Australia	**41,891**	**47,312**	**54,547**	**59,255**	**75,715**

(a) Less than half a ton.

4. **Smelter and Refinery Production of Copper.**—Most of the copper concentrate milled in Australia is smelted locally, blister copper being produced at Mt. Isa, Mt. Morgan, Mt. Lyell and Port Kembla. Port Kembla smelts all of the concentrate from Captain's Flat and some from Tennant Creek.

Blister copper smelted at Mt. Isa is railed to Townsville for electrolytic refining at the refinery which commenced production there in 1959. Mt. Lyell blister copper is electrolytically refined at Mt. Lyell and the bulk is remelted and cast into primary shapes at Port Kembla. Mt. Morgan blister copper is shipped to Port Kembla, where together with blister produced at Port Kembla, it is refined. Most Port Kembla copper is electrolytically refined, although fire refining, which is a cheaper process and undertaken when there are no other metals to be recovered, is used to a lesser extent. Copper from some copper drosses and speisses, by-products of lead refining operations at Port Pirie, is also extracted at Port Kembla.

At Port Kembla, gold and silver contained in electrolytic refining tank house slimes from Mt. Lyell and from Port Kembla, are recovered.

In the following table, details are given of the production of blister copper, and the production and sales of refined copper for the years 1954 to 1958:—

METALLIC COPPER: PRODUCTION AND SALES, AUSTRALIA.

(Tons.)

Particulars.	1954.	1955.	1956.	1957.	1958.
Blister Copper—					
Production (*a*) (*b*) ..	38,047	37,439	49,030	50,403	64,608
Refined Copper (*c*)—					
Production (*a*)	29,287	28,148	29,307	32,880	43,276
Sold to Australian Consumers (*d*)	29,361	27,366	29,038	34,114	43,035
Sold for Export (*d*) ..	..	..	650	..	..

(*a*) Source: Bureau of Mineral Resources. (*b*) Production for refining in Australia or overseas.
(*c*) Refined from domestic primary copper. (*d*) Source: Australian Mines and Metals Association.

5. **Production in Principal Countries and World Total.**—The following table shows the mine production of copper during 1956, 1957 and 1958 in the principal producing countries, as published by the Minerals Resources Division of the United Kingdom Overseas Geological Surveys and their estimate of total world production in those years.

COPPER: MINE PRODUCTION IN PRINCIPAL COUNTRIES.

(Tons.)

Country.	1956.	1957.	1958.
United States of America	985,854	970,410	874,401
Chile	482,004	477,952	475,350
U.S.S.R.	(*a*) 425,000	(*a*) 465,000	(*a*) 475,000
Rhodesia and Nyasaland	399,461	431,732	401,341
Canada	316,839	320,633	312,022
Belgian Congo(*b*)	246,016	238,418	229,610
Japan	77,230	80,417	79,827
Australia	**54,547**	**59,255**	**75,715**
Mexico	53,998	59,643	63,937
Peru	45,506	56,271	52,772
Union of South Africa	45,762	44,811	48,763
Estimated World Total	*3,440,000*	*3,500,000*	*3,400,000*

(*a*) Estimated. (*b*) Smelter production.

6. **Prices.**—From the outbreak of war in 1939 to August, 1953, in the United Kingdom and to 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 market price for the years shown are given in terms of Australian currency and sterling in the following table:—

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

(£ per ton.)

Country.	1954.	1955.	1956.	1957.	1958.
Australia — in Australian currency(*a*)	310	437	435	341	284
United Kingdom—in sterling	249	352	304	220	193

(*a*) *Ex* works Port Kembla.

7. **Employment in Copper Mining.**—Particulars of the numbers of persons engaged in the mining of copper and copper-gold ores are shown in paras. 4 (ii), page 1043 and 4 (iii), page 1044.

8. **Assistance to the Copper-mining Industry.**—Following a Tariff Board inquiry which recommended that the industry should be assisted by stabilizing the price of copper at £330 a ton, the Government decided in 1958 to provide this assistance partly by duty and partly by bounty. The bounty is payable on copper sold on the Australian market, with a maximum of £45 a ton, or such lesser bounty as will give a return of 10 per cent. on assessed capital employed in the production of copper. The bounty reduced the net effective price of copper to Australian consumers from £330 to £285. A duty is imposed on imported copper when the Australian equivalent of the London Metal Exchange price falls below £275 (£Stg.220), increasing by £1 for each £1 that the Australian equivalent falls below £275. Including freight and other charges, the landed cost is thus expected to be maintained at about £285 so long as the Australian equivalent of the London Metal Exchange price is not in excess of £275.

§ 7. Tin.

1. **Historical.**—Although specimens of tin had been found in New South Wales as early as 1851 it was not until tin stone was discovered near Inverell in 1872 that mining operations commenced. The New England area is still the most important producing area in New South Wales.

The first notable discovery of tin in Queensland occurred in 1872, when rich deposits of stream tin were found in the country to the south of Warwick but these alluvial deposits soon became exhausted. In 1879, important discoveries were made in the Herbert River district and rich fields, including that at Herberton, were opened up.

Tin was first discovered in Western Australia in 1888, and since then has been found in several widely separated localities in the State. More than half of the production to date has come from the Greenbushes Mineral Field, and most of the remainder from the Pilbara goldfield.

Tin mining in Tasmania dates from the year 1871, when the Mount Bischoff mine was discovered. Soon after, rich deposits were located in the north-east of the State and near St. Helens. In 1875, tin was discovered at Mt. Heemskirk.

2. **Present Methods of Mining and Treatment.**—All tin produced in Australia is contained in tin concentrate, which is usually of the mineral cassiterite (tin oxide). The greater proportion of the production is obtained from alluvial workings as a gravity concentrate. In the lode deposits, tin is usually not associated with other recoverable minerals. However, at two mines in Tasmania tin is associated with wolfram and other sulphide minerals. At these mines, a gravity concentrate of tin, wolfram and sulphide minerals is obtained and from this the wolfram is separated by electromagnetic means. The tin and sulphide minerals are separated by flotation, the sulphides being floated off and the tin remaining as tailings.

3. **Mine Production.**—The following table sets out the tin content of tin concentrate produced in Australia during the years 1954 to 1958. No tin is included in minerals other than tin concentrate.

TIN: CONTENT OF TIN CONCENTRATES PRODUCED: STATES.

(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
New South Wales	272	270	269	211	239
Victoria	26	2	..	(*a*)	..
Queensland	730	770	630	772	1,019
Western Australia	80	119	240	182	94
Tasmania	947	853	938	777	883
Northern Territory ..	20	3	1	10	2
Australia	**2,075**	**2,017**	**2,078**	**1,952**	**2,237**

(*a*) Less than half a ton.

The following were the principal sources of production in 1958:—

(i) *New South Wales.* Virtually the whole of the State's production was from alluvial deposits. The New England region mainly around Tingha produced two-thirds of the total production.

(ii) *Victoria.* No tin was produced in Victoria in 1958.

(iii) *Queensland.* Most of the tin concentrate produced in Queensland was from the Herberton field, where the main producers were Tableland Tin N.L. and Ravenshoe Tin Dredging Ltd. Both of these operators produced alluvial tin concentrate. Tin concentrate was also produced in the Chillagoe, Kangaroo Hills and Cooktown districts.

(iv) *South Australia.* No tin was produced in South Australia.

(v) *Western Australia.* In 1958, nearly all of the tin concentrate produced in Western Australia was lode tin won from the Pilbara field.

(vi) *Tasmania.* Most of the tin concentrate produced in Tasmania is won in the north-east part of the State, from both lode and alluvial deposits. The Aberfoyle Tin N.L., operating a lode deposit in north-east Tasmania, was the largest producer of tin concentrate in Australia during 1958 and this mine, together with Storey's Creek Tin Mining Co. N.L., produced wolfram concentrate, as well as tin concentrate.

(vii) *Northern Territory.* In 1958, small quantities were won at various localities.

4. **Smelting and Refining.**—Except for occasional small parcels of concentrate shipped to oversea smelters, all local production is treated by the two tin smelters located in Sydney. The combined capacity of the two smelters is well in excess of the domestic supply of concentrates and there seems little prospect of this capacity being fully utilized in the foreseeable future unless concentrates could be economically imported and smelted.

The production of refined tin in Australia from locally produced tin concentrate during recent years, as recorded by the Bureau of Mineral Resources, was as follows:—1954, 2,063 tons; 1955, 2,004 tons; 1956, 1,850 tons; 1957, 1,806 tons and 1958, 2,121 tons.

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

The production of tin ore (metal content) as published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys, for the principal producing countries in 1957 and 1958 was as follows.

TIN : PRODUCTION IN PRINCIPAL COUNTRIES.

(Tons.)

Country.	Production.		Country.	Production.	
	1957.	1958.		1957.	1958.
Malaya, Federation of	59,293	38,458	**Australia** ..	**1,952**	**2,237**
Indonesia	27,721	23,200	Union of South Africa	1,463	1,416
China(*a*)	16,000	18,000	Portugal	1,127	1,249
Bolivia	27,796	17,731	Burma	694	(*b*) 1,200
Belgian Congo ..	14,281	11,214	United Kingdom ..	1,080	1,116
Thailand	13,528	7,726	*Estimated World*		
Nigeria	7,534	6,154	*Total*(*c*) ..	*180,000*	*134,000*

(*a*) Estimated smelter production. (*b*) Estimated. (*c*) Excludes U.S.S.R.

6. **Prices.**—At the outbreak of war in September, 1939, the price of tin in Australia and in London was fixed by regulation. London control of tin prices ceased on 14th November, 1949, while the Australian price was decontrolled on 21st April, 1953. Details of the movement in average market prices for the years 1954 to 1958 are given in terms of Australian currency and sterling in the following table.

AVERAGE PRICE OF TIN IN AUSTRALIA AND THE UNITED KINGDOM.

(£ per ton.)

Country.	1954.	1955.	1956.	1957.	1958.
Australia — in Australian currency	911	947	1,014	992	995
United Kingdom—in sterling	720	741	788	755	735

7. **Employment in Tin Mining.**—The number of persons employed in tin mining is shown in paras. 4 (ii), page 1043 and 4 (iii), page 1044.

§ 8. Iron.

1. **Historical.**—Iron ore was first mined in New South Wales to supply raw material for the ironworks that were established near Mittagong in 1852. Iron ore for the ironworks established later at Lithgow was drawn from Carcoar, near Bathurst.

In South Australia, the iron ore deposits of the Middleback Ranges, near Whyalla, were first mined by the Broken Hill Proprietary Co. Ltd. in 1900 to provide a flux for lead smelting operations at Port Pirie. When that Company opened its Newcastle steelworks in 1915, it greatly expanded ore production from the Middleback Ranges and most of the Australian steel industry's requirements of iron ore still come from this source.

Regular shipments of iron ore from Yampi Sound, north of Derby in Western Australia, to the steel works at Port Kembla commenced in 1951. Iron ore for the iron smelter at Wundowie which commenced operations in 1948, has in recent years been provided entirely from the deposits at Koolyanobbing, near Southern Cross.

Besides the large quantities of iron ore that are mined for metal extraction purposes, smaller quantities of iron oxide are mined for other purposes, such as gas purification, cement manufacture, coal washing and fluxing.

2. **Methods of Mining and Treatment.**—All iron ore and iron oxide is won by opencut mining. The ore is selectively mined and crushed and screened to provide a standard assay and size for blast furnace use. No concentration is carried out. However, the iron ore from Yampi Sound is powdery and friable and it has to be sintered, or agglomerated, before making up the furnace charge.

3. **Mine Production of Iron Ore.**—Iron oxide deposits exist in all States and in the Northern Territory but at present iron oxide for metal extraction purposes, termed iron ore in this chapter, is produced in two States only. The following table shows the estimated iron content of iron ore produced during the years 1954 to 1958.

IRON : ESTIMATED IRON CONTENT OF IRON ORE PRODUCED.

(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
South Australia	1,863,589	1,978,586	2,331,611	2,203,004	2,179,187
Western Australia	410,741	325,579	211,215	262,519	365,275
Australia	**2,274,330**	**2,304,165**	**2,542,826**	**2,465,523**	**2,544,462**

The producing centres during 1958 were as follows:—

(i) *South Australia.* During 1958, 3,352,600 tons of iron ore were drawn from the Iron Monarch and Iron Baron deposits in the Middleback Ranges. Selected foundry grade ore was diverted as required to the Whyalla blast furnace, but the greater part was shipped to Newcastle and Port Kembla for smelting. A small quantity was dispatched to Port Pirie for use as a flux in lead smelting operations.

(ii) *Western Australia.* During the year, 536,713 tons of ore were shipped from Yampi Sound, north of Derby, to New South Wales for sintering and smelting. A quantity of 36,215 tons was mined at Koolyanobbing, near Southern Cross, for pig iron production at Wundowie.

4. **Mine Production of Iron Oxide.**—Production of iron oxide, excluding that used for metal extraction (iron ore) and mineral pigments, in the several States during 1958, according to end use, is shown in the following table. Small quantities of iron ore mined in the Middleback Ranges are used for fluxing purposes, mainly at Port Pirie, but this production is included with " iron ore " in para. 3 above. Only total quantities of iron oxide produced are recorded; particulars of metallic content are not available.

IRON OXIDE PRODUCTION, 1958.

(Tons.)

Use.	New South Wales.	Victoria.	Queensland.	Tasmania.	Australia.
For gas purification ..	2,106	758	..	..	2,864
For cement manufacture ..	831	..	996	4,266	6,093
For coal washing	25	..	..	..	25
Total(*a*)	**2,962**	**758**	**996**	**4,266**	**8,982**

(*a*) Excludes iron oxide for fluxing which is included with iron ore in para. 3 above.

The principal sources of iron oxide production during 1958 were as follows:—

(i) *New South Wales.* Quantities of iron oxide for gas purification were obtained from deposits near Port Macquarie, while that used for cement manufacture was mined from the Mudgee and Rylstone mining divisions. Magnetite, used in coal washing, was produced from beach sand deposits near Murwillumbah.

(ii) *Victoria.* Limonite ore used for gas purification was mined at Buchan.

(iii) *Queensland.* Iron oxide produced for cement manufacture was mined near Townsville.

(iv) *Tasmania.* Iron oxide for cement manufacture was mined in the vicinity of Penguin.

Particulars of Australian production of iron oxide for the years 1954 to 1958, according to end use, are shown in the following table.

IRON OXIDE PRODUCTION: AUSTRALIA.

(Tons.)

Use.	1954.	1955.	1956.	1957.	1958.
For gas purification ..	3,515	5,328	6,479	5,338	2,864
For cement manufacture ..	6,453	7,400	9,126	9,759	6,093
For coal washing	1,795	183	..	4	25
Total(*a*)	**11,763**	**12,911**	**15,605**	**15,101**	**8,982**

(*a*) Excludes iron oxide for fluxing which is included with iron ore in para. 3 above.

5. **Iron and Steel Production.**—(i) *Australia.* The production of pig-iron and steel ingots in Australia, of which New South Wales is the main producing State, is shown in the following table for each of the years ended 31st May, 1950 to 1959.

PIG-IRON AND INGOT STEEL: PRODUCTION(*a*), AUSTRALIA.

(Tons.)

Year Ended 31st May.	Pig-iron. (*b*)	Steel Ingots.	Year Ended 31st May.	Pig-iron. (*b*)	Steel Ingots.
1950	1,097,635	1,217,971	1955	1,868,841	2,208,708
1951	1,313,332	1,443,831	1956	1,910,521	2,320,289
1952	1,430,027	1,521,386	1957	2,098,352	2,773,995
1953	1,691,693	1,801,028	1958	2,283,925	3,037,705
1954	1,826,711	2,116,813	1959	2,293,709	3,203,584

(*a*) Includes recovery from scrap. (*b*) Includes pig-iron for castings; excludes ferro-alloys.

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

(ii) *New South Wales.* The principal producers in Australia, both in New South Wales, are the Broken Hill Proprietary Co. Ltd. at Newcastle and Port Kembla, and its subsidiary, Australian Iron and Steel Ltd. at Port Kembla.

(iii) *South Australia.* At Whyalla in South Australia, the Broken Hill Proprietary Co. Ltd. produces pig iron using locally produced raw materials together with metallurgical coke from New South Wales. A small quantity of steel ingots is produced from an electric furnace.

(iv) *Western Australia.* In Western Australia, the State-owned Wundowie Wood-distillation, Charcoal Iron and Steel Industry produces pig iron using charcoal for smelting. This high grade iron is used in the manufacture of spheroidal graphite cast iron, and considerable quantities are exported. At Kwinana, The Broken Hill Proprietary Co. Ltd. produces steel products from billets imported from New South Wales.

6. **Production of Iron and Steel in Principal Countries.**—Particulars of the production in the principal countries and the estimated world total production during the years 1957 and 1958 according to figures published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys, are shown in the next table.

IRON AND STEEL: PRODUCTION IN PRINCIPAL COUNTRIES.

('000 Tons.)

Country.	Pig-iron and Ferro-alloys.		Steel Ingots and Castings.	
	1957.	1958.	1957.	1958.
United States of America ..	72,141	52,507	100,638	76,120
U.S.S.R.	36,400	39,000	50,200	54,000
Germany, Federal Republic ..	18,068	16,396	24,120	22,425
United Kingdom	14,283	12,975	21,699	19,566
France	11,727	11,778	13,873	14,385
Japan	7,075	7,588	12,372	11,927
China(*a*)	5,400	9,300	5,300	11,000
Italy	2,170	2,133	6,680	6,172
Belgium	5,493	5,432	6,135	5,911
Poland	3,624	3,803	5,220	5,542
Czechoslovakia	3,507	3,714	5,084	5,423
Canada	3,503	2,832	4,525	3,880
Saar	3,116	3,054	3,384	3,406
Luxemburg	3,315	3,233	3,438	3,325
Australia	**2,208**	**2,276**	**3,020**	**3,156**
Germany, Eastern	1,636	1,747	2,849	2,995
Sweden	1,519	(*b*) 1,279	2,443	2,360
Austria	1,929	1,789	2,469	2,355
India	1,911	2,102	1,710	1,813
Estimated World Total ..	*207,700*	*193,000*	*287,500*	*269,000*

(*a*) Estimated. (*b*) Excludes ferro-alloys.

§ 9. Mineral Sands.

1. **Historical.**—In recent years, the growing world demand for titanium metal has brought about a rapid expansion of Australian mineral sands mining. Australia is the largest producer of rutile and zircon in the world and nearly all of this production comes from the mineral sands deposits along the beaches of the east coast. The ilmenite produced on the east coast has proved unsuitable for titanium oxide pigment manufacture and most of the production is discarded. However, ilmenite produced from mineral sands mined in Western Australia since 1956 has a much lower chromic oxide content than east coast ilmenite and is therefore suitable for paint manufacture.

The first commercial development of the mineral sands deposits commenced at Byron Bay in New South Wales in 1934, when a mixed zircon-rutile-ilmenite concentrate was prepared. Large scale production of zircon-rutile concentrate commenced in Queensland in 1941 when electromagnetic separators were installed to separate the ilmenite. In 1943, after the installation of electrostatic separators, a rutile concentrate was produced. The Commonwealth Government banned the export of mixed concentrates in 1944, and all producers now turn out separate concentrates of rutile, zircon, ilmenite and monazite.

Production of rutile and zircon in 1958 was considerably lower than that of the previous year, mainly because of reduced prices offering on world markets. Virtually all rutile and zircon concentrates are exported overseas.

2. **Present Methods of Mining and Treatment.**—Mineral bearing sands are usually recovered from sand dunes but deposits occurring below sea level are recovered by suction dredges. The mineral sands and beach sand (quartz) are gravity concentrated, either by shaking tables or by spiral concentrators, resulting in the complete elimination of quartz and leaving a mixed concentrate of heavy minerals. Magnetic ilmenite and monazite are separated by electromagnetic methods and are then separately recovered using increasing magnetic intensities. The remaining zircon and rutile are separated using electrostatic separators. The above method is employed at nearly all plants, but Zircon Rutile Ltd., at Byron Bay, recovers a zircon concentrate from the raw sand using froth flotation.

3. **Mine Production.**—(i) *Titanium Dioxide.* The following table shows the quantities of titanium dioxide contained in rutile and ilmenite concentrates produced during the years 1954 to 1958.

TITANIUM DIOXIDE: CONTENT OF CONCENTRATES PRODUCED.

(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
CONTAINED IN RUTILE CONCENTRATE.					
New South Wales	21,872	33,045	62,470	83,363	44,915
Queensland	21,139	24,198	30,772	41,500	35,755
Western Australia	..	..	..	..	285
Australia	**43,011**	**57,243**	**93,242**	**124,863**	**80,955**
CONTAINED IN ILMENITE CONCENTRATE.					
New South Wales	228	230	481	485	59
Queensland	2	32	..	78	..
Western Australia	..	..	1,779	38,325	38,219
Australia	**230**	**262**	**2,260**	**38,888**	**38,278**

(ii) *Zircon.* The quantities of zircon mineral contained in zircon concentrate produced during the years 1954 to 1958 are shown in the table below.

ZIRCON: CONTENT OF ZIRCON CONCENTRATE PRODUCED.

(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
New South Wales	27,037	32,465	50,135	58,747	32,230
Queensland	13,883	15,745	21,634	28,956	26,412
Western Australia	..	..	..	..	103
Australia	**40,920**	**48,210**	**71,769**	**87,703**	**58,745**

(iii) *Other Products.* Small quantities of monazite concentrate, tin concentrate, magnetite and garnet concentrate were also recovered from mineral sands.

(iv) *Sources of Production.* The principal sources of mineral sands treated during 1958 were:—

(*a*) *New South Wales and Queensland.* The main deposits of mineral sands occur along 300 to 400 miles of the eastern Australian coast from Swansea, New South Wales to Curtis Island, Queensland. At present, the principal mining operations are located within a 90 mile stretch of coast extending from Byron Bay, New South Wales to North Stradbroke Island, Queensland.

(*b*) *Western Australia.* Deposits of mineral sands occur on the south-west coast of Western Australia, in the Bunbury and Albany districts.

4. **Employment in Mineral Sands Mining.**—Particulars of the number of persons employed in mineral sands mining are shown in paras. 4 (ii), page 1043 and 4 (iii), page 1044.

§ 10. Aluminium.

1. **Mine Production.**—The source of aluminium is the ore bauxite, which is produced in small quantities in New South Wales, Victoria and Queensland. Australian production is used for the manufacture of refractories, all bauxite used for metal extraction during 1958 being imported from Indonesia. Large deposits of bauxite outcrop exist on the Cape York Peninsula in North Queensland and it is expected that this raw material will be refined in Australia when mining commences. The alumina content of bauxite produced in Australia during the years 1954 to 1958 is shown in the following table:—

ALUMINA : CONTENT OF BAUXITE PRODUCED.

(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
New South Wales	710	902	1,578	1,354	633
Victoria	1,320	1,644	2,600	1,910	2,304
Queensland(*a*)	410	860	440	494	596
Australia	**2,440**	**3,406**	**4,618**	**3,758**	**3,533**

(*a*) Estimated.

2. **Refinery Production.**—A refinery for the production of alumina and refined aluminium was constructed at Bell Bay on the Tamar River, in Northern Tasmania. The location of this refinery was determined by the availability of large supplies of hydro-electric power. Production of alumina commenced in February, 1955, and of refined aluminium in September, 1955. The following table shows the production of alumina and refined aluminium in Australia during the years 1955 to 1958:—

ALUMINA AND REFINED ALUMINIUM : PRODUCTION, AUSTRALIA.

(Tons.)

Refinery Product.	1955.	1956.	1957.	1958.
Alumina	(*a*) 4,134	16,863	20,116	22,490
Refined Aluminium	(*b*) 1,248	9,143	10,624	10,869

(*a*) Production commenced February. (*b*) Production commenced September.

Source: Bureau of Mineral Resources.

§ 11. Uranium.

Uranium concentrate has been produced in Australia since 1954 but particulars of the quantity of U_3O_8 concentrate produced and its value are not available for publication. All U_3O_8 concentrate is exported overseas. During 1958, the principal producing centres were as follows:—

(i) *Queensland.* Uranium ore was mined by opencut methods at Mary Kathleen, 33 miles east of Mt. Isa, by Mary Kathleen Uranium Ltd. A treatment plant producing U_3O_8 concentrate commenced operating at this site in June, 1958.

(ii) *South Australia.* The South Australian Department of Mines mined uranium ore by underground methods at Radium Hill, 289 miles north-east of Adelaide. A concentrate of heavy minerals is produced at the mine and this is railed to a treatment plant at Port Pirie for the chemical extraction of U_3O_8 concentrate.

(iii) *Northern Territory.* At Rum Jungle, Territory Enterprises Pty. Ltd., acting on behalf of the Australian Atomic Energy Commission, mined and treated uranium-copper and copper ores to produce U_3O_8 concentrate, copper concentrate and copper precipitate. Mining operations ceased at Rum Jungle in November, 1958, but sufficient ore was stockpiled to permit the continuation of full scale production of uranium concentrate for some years.

During 1958, ore was mined in the South Alligator River area. Two companies, the United Uranium N.L. and the South Alligator Uranium N.L. opened treatment plants in 1959.

§ 12. Other Metallic Minerals.

1. **Tungsten.**—In recent years, Tasmania has been the principal State producing tungsten ores, scheelite being mined on King Island in Bass Strait and wolfram being mined in association with tin ores in the north-east part of the State. Because of low world prices, scheelite production on King Island ceased in August, 1958, but the operator, King Island Scheelite (1947) Ltd., recommenced production on a limited scale in 1960.

Particulars of the production of tungstic oxide contained in scheelite and wolfram concentrates produced during the years 1954 to 1958 are shown in the following table.

TUNGSTIC OXIDE (WO_3): CONTENT OF CONCENTRATES PRODUCED.
(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
CONTAINED IN SCHEELITE CONCENTRATE.					
New South Wales	6	7	2	1	1
Queensland	(a)	(a)	3	1	..
Western Australia	3	5	..	..	..
Tasmania	852	948	985	948	477
Australia	**861**	**960**	**990**	**950**	**478**
CONTAINED IN WOLFRAM CONCENTRATE.					
New South Wales	2	1	2	(a)	..
Queensland	38	51	46	19	5
Tasmania	420	389	443	391	360
Northern Territory ..	51	81	101	49	7
Australia	**511**	**522**	**592**	**459**	**372**

(a) Less than half a ton.

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

The following table shows the manganese content of metallurgical grade and the manganese dioxide content of battery and other grades of manganese ore produced during the years 1954 to 1958:—

MANGANESE : CONTENT OF MANGANESE ORE PRODUCED.
(Tons.)

Year.	Metallurgical Grade. In terms of Manganese (Mn) Content.				Battery and Other Grades. In terms of Manganese Dioxide (MnO_2) Content.			
	N.S.W.	Q'land. (a)	W. Aust.	Australia.	N.S.W.	W. Aust.	N. Terr.	Australia.
1954 ..	322	60	12,336	12,718	644	..	..	644
1955 ..	443	35	19,984	20,462	403	..	975	1,378
1956 ..	436	140	25,280	25,856	371	179	914	1,464
1957 ..	391	557	33,956	34,904	385	186	668	1,239
1958 ..	516	3,181	21,926	25,623	511	195	2,113	2,819

(a) Estimated.

Zinc concentrates produced at Broken Hill and Rosebery, in Tasmania, contain manganese. However, in 1958, only 306 tons of manganese dioxide, recovered as a by-product of zinc refining at Risdon, near Hobart, were utilized.

3. **Other.**—The production, in 1958 (1957 shown in parentheses) of other metallic minerals worthy of note, was as follows:—

Antimony. The antimony content of antimony-bearing minerals produced was 1,356 tons (1,209 tons). Of this amount, 664 tons (724 tons) were in lead concentrate and 692 tons (485 tons) in 1,116 tons (852 tons) of antimony ore and concentrate.

Beryllium. Production of beryllium ore was 247 tons (395 tons) which came mainly from Western Australia where the Pilbara gold field was the main producing area. The beryllium oxide content of the ore was 2,900 units of 22.4 lb. (4,570 units).

Chromite. Production of chromite was 776 tons (3,049 tons) with chromic oxide content of 386 tons (1,420 tons). This production came from Rockhampton in Queensland and Gundagai in New South Wales.

Tantalite-Columbite. The production of tantalite-columbite concentrate was 13,507 lb. (50,038 lb.) and the whole of this output came from Western Australia. The tantalum pentoxide and columbium pentoxide content of the concentrates was 6,736 lb. (23,499 lb.).

Other. Other metallic minerals produced in Australia in small quantities during 1958 were molybdenite concentrate, native osmiridium, and platinum concentrate.

§ 13. Coal.

1. **Historical.**—Coal was probably the first of Australia's mineral products to be discovered, being reported from the neighbourhood of Newcastle in 1796. In the following year, outcrop coal was discovered at Coalcliff, 40 miles south of Sydney, and at the entrance to the Hunter River in the Newcastle district. By 1799, outcrop coal was being exported overseas from the latter field. All production was from the Newcastle district until 1857 when the first coal was produced from the southern field. The estimated production in 1830 was 4,000 tons and this increased to 30,000 tons in 1840, 70,000 tons in 1850 and 370,000 tons in 1860. In 1864, the first coal was discovered in the Greta-Cessnock-Maitland field which has since become the principal Australian source of gas coal.

The discovery of coal in Victoria dates from the year 1825, when the mineral was reported to have been found at Cape Paterson, but only a small quantity of coal was mined in Victoria prior to the opening of the State-owned mine at Wonthaggi in 1909. Present day Victorian production is obtained almost exclusively from this mine. In Victoria, brown coal was discovered at Lal Lal in 1857 and in the Latrobe Valley in 1874. Mining operations were first undertaken in 1889 but it was not until after the 1914–18 War that large scale mining began.

In Queensland, coal was first discovered near Ipswich in 1827 and the first colliery was established there in 1846. At Blair Athol, 240 miles west of Rockhampton, coal was discovered in 1864. This field is unique in that the field's total reserves of 200 million tons are available for opencut mining in a seam attaining a thickness of over 90 feet, the greatest thickness of black coal yet found in Australia.

The deposits of black coal at Leigh Creek, 377 miles north of Adelaide, were discovered in 1888 during dam-sinking operations. Small quantities of coal were mined in 1907 and 1917 but it was not until 1944 that extensive opencut mining operations began.

In Western Australia, coal was first discovered on the Irwin River in 1846 but the discovery of the Collie field in 1883 proved to be of far greater importance. This field is located 120 miles south of Perth and commercial mining began there in 1898.

There appear to be no reliable records of the earliest discoveries of coal in Tasmania. Coal was mined on the Tasman Peninsula to provide fuel for penal settlements in the vicinity and for Hobart, and mining continued there until about 1877. In 1824, coal was discovered at South Cape Bay near the most southerly part of the island. The most important deposit is the Mt. Nicholas-Fingal-Dalmayne (St. Marys) field in the north-east part of the State.

The mining of black coal on a large scale by opencut methods first began in Australia at Blair Athol in Queensland, where in 1937, the first year of production, 18,494 tons were produced. Opencut mining of black coal was introduced in New South Wales in 1940, in Western Australia in 1943, in South Australia in 1944, and in Tasmania in 1950. The output from opencuts rose slowly up to 1943 when 119,406 tons were produced, increasing rapidly from 1944 and reaching an output of over four million tons in 1952. Since then however, the output from opencut mining has declined and in 1958 it was only 2,065,331 tons. This decline has been mainly due to the closing down of large opencuts in New South Wales, as over-production of coal began to occur late in 1952.

2. **Mine Production of Black Coal.**—Production of black coal according to rank in the several States during the years 1954 to 1958 is set out in the following table. The tonnages produced by underground mining and opencut mining are also shown.

BLACK COAL : PRODUCTION.
(Tons.)

Particulars.	1954.	1955.	1956.	1957.	1958.
NEW SOUTH WALES.					
Bituminous	15,065,979	14,720,084	14,792,853	15,376,240	15,840,550
Sub-bituminous ..	17,281	16,313	17,312	13,996	10,398
Total	**15,083,260**	**14,736,397**	**14,810,165**	**15,390,236**	**15,850,948**
Underground mines ..	13,703,289	13,834,824	13,999,615	14,662,155	15,130,633
Opencut mines ..	1,379,971	901,573	810,550	728,081	720,315
VICTORIA.					
Total(*a*) ..	**141,318**	**132,888**	**118,827**	**111,569**	**108,359**

BLACK COAL: PRODUCTION—*continued.*
(Tons.)

Particulars.	1954.	1955.	1956.	1957.	1958.
QUEENSLAND.					
Semi-anthracite ..	72,459	80,442	79,316	68,873	55,190
Bituminous	2,377,883	2,459,727	2,472,692	2,475,079	2,392,435
Sub-bituminous ..	310,468	206,996	182,651	157,625	132,748
Total	**2,760,810**	**2,747,165**	**2,734,659**	**2,701,577**	**2,580,373**
Underground mines ..	2,066,788	2,108,065	2,103,641	2,170,979	2,098,030
Opencut mines ..	694,022	639,100	631,018	530,598	482,343
SOUTH AUSTRALIA.					
Total(*b*) ..	**495,106**	**455,287**	**481,463**	**608,913**	**755,022**
WESTERN AUSTRALIA.					
Total(*c*) ..	**1,018,343**	**903,792**	**830,007**	**838,661**	**870,882**
Underground mines ..	607,727	599,662	621,467	689,882	779,394
Opencut mines ..	410,616	304,130	208,540	148,779	91,488
TASMANIA.					
Semi-anthracite ..	1,162	1,764	1,827	1,847	2,006
Bituminous	263,040	297,457	296,886	266,293	274,262
Total	**264,202**	**299,221**	**298,713**	**268,140**	**276,268**
Underground mines ..	254,122	283,743	280,332	253,108	260,100
Opencut mines ..	10,080	15,478	18,381	15,032	16,168
AUSTRALIA.					
Semi-anthracite ..	73,621	82,206	81,143	70,720	57,196
Bituminous	17,848,220	17,610,156	17,681,258	18,229,181	18,615,606
Sub-bituminous ..	1,841,198	1,582,388	1,511,433	1,619,195	1,769,050
Total	**19,763,039**	**19,274,750**	**19,273,834**	**19,919,096**	**20,441,852**
Underground mines ..	16,773,244	16,959,182	17,123,882	17,887,693	18,376,516
Opencut mines ..	2,989,795	2,315,568	2,149,952	2,031,403	2,065,336

(*a*) Bituminous coal from underground mines. (*b*) Sub-bituminous coal from an opencut mine.
(*c*) Sub-bituminous coal.

The principal producing centres during 1958 were as follows:—

(i) *New South Wales.* The principal deposits worked were in the vicinity of Newcastle, Cessnock and Singleton (northern field), Lithgow (western field) and Wollongong (southern field). Tonnages mined in 1958 were: northern field, 9,583,595 tons; southern field, 4,693,170 tons and western field, 1,574,183 tons. All open-cut coal was from the northern field.

The coal fields of New South Wales, predominately bituminous, are the most important in Australia, in respect of the magnitude, quality and accessibility of reserves and the extent to which the deposits are being worked. Coal from the various seams differs in properties, coal from the Greta seam worked in the vicinity of Cessnock being particularly suitable for gas making, while coal from the Victoria tunnel, Dudley, Young Wallsend and Borehole seams, all of which are mined near Newcastle, have coking properties and are used in the steel works. Coking coal is also obtained from the Bulli seam which is mined near Wollongong and in the Burragorang Valley. A multi-purpose coal is available in the Singleton area and steaming coals are mined around Newcastle, Lithgow, Cessnock and Wollongong.

(ii) *Victoria.* 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.

(iii) *Queensland.* The principal producing centres were Ipswich, 1,490,735 tons; Collinsville, 431,482 tons; Blair Athol, 190,285 tons and Callide, 131,916 tons. Open-cut coal was mined at Blair Athol, Callide and Collinsville and the total coal won by this means was 19 per cent. of total production.

(iv) *South Australia.* Coal was mined only at Leigh Creek, 377 miles north of Adelaide.

(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 and all production during 1958 was from this source.

(vi) *Tasmania.* Of the total production, 267,491 tons were produced from the Avoca and Mt. Nicholas-Fingal-Dalmayne fields in the north-east of the State. Of the remainder, 2,006 tons of semi-anthracite were produced at the Sandfly mine, near Hobart.

3. **Mine Production of Brown Coal.**—Brown coal is mined only in Victoria and production in recent years has been as follows:—1954, 9,331,255 tons; 1955, 10,112,206 tons; 1956, 10,559,801 tons; 1957, 10,740,989 tons and 1958, 11,643,629 tons. In the past ten years, the output of brown coal has nearly doubled.

4. **Australia's Coal Reserves.**—The latest available estimate of the measured and indicated coal reserves of Australia is that prepared by the Coal and Lignites Panel of the Power Survey Sectional Committee of the Standards Association of Australia, and is shown in the following table. It should be noted that reserves can only be included in the "measured and indicated" categories when sufficient exploratory and testing work has been completed.

COAL RESERVES OF AUSTRALIA.

(Million Tons.)

State.	Bituminous Coal.(a)	Sub-bituminous Coal.	Brown Coal. (Lignite).
New South Wales	8,650	800	..
Victoria	12	..	56,100
Queensland	749	..	..
South Australia	..	144	230
Western Australia	..	274	..
Tasmania	240	..	..
Australia	**9,651**	**1,218**	**56,330**

(a) Includes reserves of a small quantity of semi-anthracitic coal.

5. **Production in Principal Countries.**—The following table shows the production of the principal countries in 1957 and 1958 as published by the Mineral Resources Division of the United Kingdom Overseas Geological Surveys.

COAL: PRODUCTION IN PRINCIPAL COUNTRIES.
('000 Tons.)

Country.	Black Coal.		Brown Coal and Lignite.	
	1957.	1958.	1957.	1958.
United States of America ..	460,210	383,205	2,328	2,167
U.S.S.R.	322,000	347,000	134,000	141,000
China(*a*)	125,000	270,000	..	..
United Kingdom	223,631	215,825	..	..
Germany, Federal Republic ..	134,043	133,221	95,350	92,046
Poland	92,610	93,481	5,862	7,422
France	55,899	56,808	2,258	2,279
Japan	50,914	48,884	1,636	1,557
India	43,449	45,340	..	..
Union of South Africa ..	34,219	36,499	..	..
Belgium	28,627	26,635	..	..
Czechoslovakia	23,799	25,404	50,211	55,940
Australia	**19,919**	**20,442**	**10,741**	**11,644**
Saar	16,195	16,164	..	..
Spain	13,711	14,196	2,479	2,610
Netherlands	11,196	11,692	283	251
Canada	9,768	8,423	2,008	2,012
Germany, Eastern	2,710	2,857	209,237	211,575
Hungary	2,241	2,585	18,720	21,273
Yugoslavia	1,207	1,188	16,435	17,598
Estimated World Total ..	*1,698,000*	*1,800,000*	*582,000*	*600,000*

(*a*) Estimated.

6. **Consumption of Coal in Australia.**—(i) *Black Coal.* Details of the production of black coal in Australia and its disposal are shown in the following table for the years 1953–54 to 1957–58.

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

Particulars.	1953–54.	1954–55.	1955–56.	1956–57.	1957–58.
Production(*a*)	19,424	19,352	19,033	19,711	20,362
Imports	2	5	4	6	9
Total	**19,426**	**19,357**	**19,037**	**19,717**	**20,371**
Consumption as Fuel—					
Electricity Generation ..	5,590	5,916	5,922	6,363	6,941
Factories	3,367	3,329	3,101	2,977	2,991
Railway Locomotives(*b*) ..	3,208	3,112	2,963	2,690	2,217
Bunker Coal—					
Oversea Vessels ..	32	25	39	9	12
Interstate Vessels ..	228	218	198	181	171
Total	*12,425*	*12,600*	*12,223*	*12,220*	*12,332*
Consumption as raw material—					
Gas works	2,047	2,063	2,031	1,946	1,779
Coke works	3,252	3,314	3,258	3,665	3,841
Total	*5,299*	*5,377*	*5,289*	*5,611*	*5,620*
Exports (Oversea)	386	291	194	545	836
Balance—Unrecorded consumption, other purposes(*c*)	1,316	1,089	1,331	1,341	1,583
Grand Total	**19,426**	**19,357**	**19,037**	**19,717**	**20,371**

(*a*) Includes miners' and colliery coal. (*b*) Government railways only. (*c*) 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 1958–59, exports of black coal were 645,249 tons and imports were 7,526 tons.

(ii) *Brown Coal.* The table following shows the production and distribution of brown coal and the production of briquettes in Victoria for the years 1953–54 to 1957–58.

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

Year.	Production.	Consumption as Fuel.			Consumption as Raw Material in Briquette Manufacture.	Briquettes Manufactured.
		Electricity Generation.	Briquette Factory.	Other Factories. (a)		
1953–54	8,731	5,307	780	920	1,560	587
1954–55	9,668	5,899	842	1,088	1,684	631
1955–56	10,383	6,517	843	1,191	1,686	634
1956–57	10,772	6,943	806	1,309	1,613	618
1957–58	10,869	7,020	810	1,297	1,619	626

(a) Recorded consumption.

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 671,779 tons in 1959. Approximately two and a half tons of brown coal are required to make one ton of briquettes. In December, 1956, the Lurgi high pressure brown coal gasification plant at Morwell was opened. This plant is operated by the Gas and Fuel Corporation of Victoria and produces town gas which is sent to Melbourne through 103 miles of pipeline.

7. **Exports.**—The quantities and values of the oversea exports of Australian coal and of bunker coal for oversea vessels for the five years 1954–55 to 1958–59 are shown in the following table. These shipments were made mainly from New South Wales.

COAL: OVERSEA EXPORTS AND BUNKER, AUSTRALIA.

Year.	Oversea Exports.(a)		Bunker Coal for Oversea Vessels.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£A f.o.b.	Tons.	£A f.o.b.
1954–55	291,226	1,147,441	25,363	111,625
1955–56	193,813	780,284	38,749	165,224
1956–57	545,101	2,196,044	9,065	44,116
1957–58	836,336	3,390,628	11,608	50,656
1958–59	645,249	2,676,042	8,187	37,808

(a) Excludes bunker coal.

New South Wales in addition to meeting requirements within that State supplies considerable quantities of coal to other States and for export overseas. Of the total of 15,762,000 tons produced in 1958–59, 1,859,000 tons (12 per cent.) were exported interstate and 645,000 tons (4.1 per cent.) were exported overseas. The demand for bunker coal continues to decline and in 1957–58 a total of 182,000 tons (1 per cent.) of New South Wales production was supplied for interstate and oversea vessels.

8. **Value at the Mine in New South Wales.**—Particulars of the average values at the mine (or at screens or mine washeries where these are at a distance from the mine) of saleable coal for each district and for New South Wales as a whole are shown in the following table for the years 1954 to 1958. Saleable coal excludes miners' coal, coal consumed at the mines and refuse, etc., removed by the use of hand picking belts or at mine washeries. In calculating these values, coal won by producer consumers is also excluded and in respect of stocks of coal held at grass by the Commonwealth Government only actual sales have been taken into account. No deduction has been made in respect of excise duty operative from 1st November, 1949.

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

(s. d.)

Year.	Northern District.	Southern District.	Western District.	Average for State.
1954..	60 3	59 0	57 3	59 7
1955..	59 11	58 10	55 9	59 2
1956..	59 3	58 1	55 1	58 6
1957..	58 3	55 7	50 7	56 9
1958..	56 1	55 0	47 5	54 10

9. **Values in New South Wales, United Kingdom and the United States of America.**—The following table shows, for the years 1954 to 1958, average values of coal produced in New South Wales, Great Britain and the United States of America. The figures give an indication of changes in average value or price within each country but they do not necessarily show the relative levels as between the countries concerned.

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

Country.	1954.	1955.	1956.	1957.	1958.
	s. d.	s. d.	s. d.	s. d.	s. d.
New South Wales—Bituminous(a)	59 7	59 2	58 6	56 9	54 10
United Kingdom—Deep mined(b)	63 6	68 0½	77 0	82 1	85 7
United States of America—	$	$	$	$	$
Bituminous and lignite(c) ..	4.51	4.50	4.82	5.08	4.86

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

10. **Employment in Coal-mines.**—The number of persons employed, both above and below ground, in coal-mines in each State for each of the years 1954 to 1958 is shown in the following table.

COAL-MINES: PERSONS EMPLOYED.(a)

Year.	New South Wales.	Victoria.		Queensland.	South Australia.	Western Australia.	Tasmania.	Australia.
		Black.	Brown.					
1954	19,979	786	1,598	3,638	270	1,583	358	28,212
1955	19,260	687	1,502	3,634	280	1,432	367	27,162
1956	17,918	610	1,566	3,568	260	1,190	349	25,461
1957	16,622	561	1,579	3,493	223	1,145	301	23,924
1958	15,463	516	1,540	3,295	230	999	292	22,335

(a) Average number of persons employed (including working proprietors) during whole year.

The year of maximum employment was 1926 when 31,774 persons were engaged in the coal-mines of Australia. Shortly after that year, the industrial depression and a prolonged stoppage of work on one of the principal fields of New South Wales during 1929 and 1930 seriously affected the figures of employment. After 1933, there was a gradual increase up to a level of about 23,000 which was maintained during the war years. There was a further increase after the war to 28,303 in 1952, but since then the number in employment has fallen again. In 1958, it was 22,335. In New South Wales, during 1958, 12,354,000 tons of coal or 81.6 per cent. of the total output of underground coal, were loaded by machinery as compared with 1,101,000 tons or 9.8 per cent. in 1939 and 3,089,000 tons (32.9 per cent.) in 1949. Similar details for other States are not available but machinery is used to a considerable extent in Western Australian mines and to a lesser extent in Queensland.

11. **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 1954 to 1958. These estimates have been calculated by the Joint Coal Board from data collected fortnightly in respect of coal production and the number of man-shifts actually worked. In South Australia, black coal is won only by open-cut mining.

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

(Tons.)

Year.	N.S.W.	Vic.	Q'land.	W. Aust.	Tas.	Australia.
PRODUCTION PER MAN-SHIFT WORKED AT COAL FACE.						
1954	10.16	2.03	6.54	4.82	5.95	8.81
1955	10.76	2.13	6.61	4.74	6.54	9.24
1956	11.43	2.05	6.79	5.14	7.04	9.77
1957	13.19	2.01	7.13	5.88	7.60	11.02
1958	14.48	2.04	7.28	6.67	8.01	11.96
PRODUCTION PER MAN-SHIFT WORKED BY ALL EMPLOYEES.						
1954	3.25	0.82	2.61	1.91	3.07	3.00
1955	3.29	0.86	2.66	2.06	3.08	3.14
1956	3.55	0.83	2.65	2.35	3.41	3.28
1957	3.99	0.85	2.82	2.77	3.76	3.65
1958	4.35	0.89	2.90	3.02	3.91	3.95

(ii) *Opencut Mines.* In the next table, the Joint Coal Board's estimates of production of black coal per man-shift worked by all employees in opencut mines are shown for the years 1954 to 1958. There are no opencuts producing black coal in Victoria.

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

(Tons.)

Year.	N.S.W.	Q'land.	S. Aust.	W. Aust.	Tas.	Australia.
1954	8.97	12.27	4.52	4.71	7.91	7.31
1955	9.18	11.42	6.02	5.77	7.78	8.11
1956	10.36	13.06	6.72	6.37	8.56	9.19
1957	11.11	12.17	9.89	6.04	7.68	10.25
1958	11.31	13.63	11.46	6.78	10.42	11.47

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

§ 14. 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 1957–58 it reached the record level of 2,295,737 tons. Imports exceeded exports prior to 1952–53 but in 1952–53 and later years there has been a net export surplus. In 1958–59, exports amounted to 8,823 tons while imports were 6,845 tons. Most of the tonnage imported is petroleum coke for use in the production of aluminium.

In addition to metallurgical coke referred to above (which is produced by specialized coke works), considerable quantities of coke are produced in gas works as a by-product of the manufacture of gas. Production in gas works in 1958–59 was 815,464 tons. To date, there has been no production of petroleum coke at Australian oil refineries.

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

In the following table, particulars of the production of coke in coke works and gas works in Australia are shown for the years 1954–55 to 1958–59. The figures exclude output of coke breeze, which amounted to 328,586 tons in 1957–58 and 435,450 tons in 1958–59.

COKE PRODUCTION: AUSTRALIA.

(Tons.)

Industry.	1954–55.	1955–56.	1956–57.	1957–58.	1958–59.
Coke Works	2,046,790	2,058,426	2,234,458	2,295,737	2,210,621
Gas Works	1,099,859	1,031,135	954,756	831,615	815,464
Total	**3,146,649**	**3,089,561**	**3,189,214**	**3,127,352**	**3,026,085**

2. **Other By-products from Coal.**—In addition to coke, other products are obtained from the treatment of coal by coke and gas works. Some of the main items produced, principally in coke and gas works, during 1958–59 (1957–58 in parentheses) were: crude tar, 49,708,000 gallons (50,429,000 gallons); refined tar 28,696,000 gallons (28,277,000 gallons); and ammonium sulphate 117,489 tons (118,732 tons).

§ 15. Mineral Oils.

In 1959, the search for oil continued throughout the Australian mainland and in Papua-New Guinea. While petroleum in commercial quantities has not yet been discovered, several interesting shows of gas and/or oil have been found.

In Papua, oil, gas and condensate were discovered in Puri No. 1. Subsequent tests indicated that no commercial production was obtainable. At Port Campbell in Victoria gas was discovered in a well drilled by Frome-Broken Hill Co. Pty. Ltd. and further testing is in progress to determine the potential of this discovery.

The Petroleum Search Subsidy Act 1957–58 continued to attract applications for subsidy of the drilling of stratigraphic test wells in areas not previously investigated. On 4th December, 1959, the Petroleum Search Subsidy Act 1959 received the Royal Assent. This

Act widens the scope of the original Act to include the grant of subsidy on approved geophysical and bore-hole surveys and off-structure drilling. The response to this new Act indicates a continued upward trend in exploration.

Drilling programmes are being carried out in all States and Territories with the exception of Tasmania. The year 1959 saw the commencement of the first stratigraphic test well in the Northern Territory at Spirit Hill.

In the following table, details are given of the footage drilled in the search for oil in the Commonwealth of Australia and the Territory of Papua and New Guinea during the years 1955 to 1959.

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

State or Territory.	1955.	1956.	1957.	1958.	1959.
	feet.	feet.	feet.	feet.	feet.
New South Wales	9,338	4,608	8,729	16,357	17,422
Victoria	10,738	22,660	12,244	2,439	8,395
Queensland	58,668	92	15,343	5,081	30,328
South Australia	661	16,966	13,995	6,239	12,637
Western Australia	77,824	61,271	26,961	30,383	36,020
Northern Territory ..	..	..	..	..	2,458
Australia	**157,229**	**105,597**	**77,272**	**60,499**	**107,260**
Territories of Papua and New Guinea	10,205	17,500	25,636	29,350	13,389

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

§ 16. Sulphur.

1. **Mine Production of Sulphur.**—There is no production of elemental sulphur (brimstone) in Australia but, although sulphur is itself non-metallic, considerable quantities are contained in certain metallic minerals produced.

It should be noted that large quantities of the lead and zinc concentrates produced are exported and the sulphur they contain is not available for utilization in Australia.

The following table shows the sulphur content of the metallic minerals produced during 1958 from which sulphur was subsequently recovered.

SULPHUR: CONTENT OF METALLIC MINERALS PRODUCED, 1958.
(Tons.)

Mineral in which contained.	N.S.W.	Q'land.	S. Aust.	W. Aust.	Tas.	Australia.
Lead concentrate..	49,559	..	..	324	2,056	51,939
Pyrite Concentrate	17,715	4,011	(a) 32,129	22,311	32,470	108,636
Zinc concentrate	130,462	(a) 10,636	..	..	19,878	160,976
Total ..	**197,736**	(b) **14,647**	(a) **32,129**	**22,635**	**54,404**	**321,551**

(a) Estimated. (b) Partly estimated.

The principal producing centres during 1958 were—

(i) *New South Wales.* All of the sulphur produced in New South Wales was contained in lead and zinc concentrates produced at Broken Hill and in lead, zinc and pyrite concentrates produced at Captain's Flat.

(ii) *Queensland.* In Queensland, sulphur was contained in zinc concentrate milled at Mt. Isa and in pyrite concentrate produced at Mt. Morgan. No sulphur was recovered in Australia from zinc concentrate produced in Queensland.

(iii) *South Australia.* A pyrite concentrate containing sulphur was produced from ore mined at Nairne, 22 miles east of Adelaide.

(iv) *Western Australia.* Marketable pyrite concentrates were produced at Norseman and at Kalgoorlie. Although both of these concentrates are auriferous, the gold was recovered only from that produced at Kalgoorlie. A small quantity of sulphur was contained in lead concentrates produced in the Northampton Mineral Field.

(v) *Tasmania.* A pyrite concentrate was recovered at Mt. Lyell after the prior separation of the copper sulphide mineral. Recoverable sulphur was also contained in lead and zinc concentrates milled at Rosebery, but only that contained in zinc concentrate was recovered in Australia.

The following table shows for the years 1954 to 1958 the sulphur content of minerals from which sulphur was subsequently recovered.

SULPHUR: CONTENT OF METALLIC MINERALS PRODUCED.

(Tons.)

State.	1954.	1955.	1956.	1957.	1958.
New South Wales	127,648	140,120	187,087	207,604	197,736
Queensland (*a*)	53,309	47,515	15,103	24,544	14,647
South Australia (*b*) ..	..	13,790	31,248	32,721	32,129
Western Australia	24,458	23,892	25,295	25,420	22,635
Tasmania	44,249	38,243	46,455	51,154	54,404
Australia ..	**249,664**	**263,560**	**305,188**	**341,443**	**321,551**

(*a*) Partly estimated. (*b*) Estimated.

2. **Production of Sulphuric Acid.** The principal use of sulphur is in the manufacture of sulphuric acid which is produced in all States and in the Northern Territory. Most of this is used for fertilizer manufacture although small quantities are used in the rubber and chemical industries and in the preparation of uranium concentrates. Sulphur contained in lead concentrate is used for acid manufacture at Port Pirie and sulphur in zinc concentrates is used at Risdon. Pyrite concentrate is used as a source of sulphur for acid manufacture at Cockle Creek, near Newcastle, and at Port Kembla in New South Wales, and at Melbourne, Brisbane, Adelaide, Perth and Fremantle. However, half of the sulphuric acid produced in Australia is made from imported elemental sulphur. The next table shows the Australian production of sulphuric acid and the quantity of sulphur in the acid produced from various sources.

SULPHUR USED IN SULPHURIC ACID PRODUCTION: AUSTRALIA.

(Tons.)

Item.	1954.	1955.	1956.	1957.	1958.
Production of Sulphuric Acid (Mono.)	*778,008*	*895,765*	*841,225*	*971,976*	*1,009,064*
Sulphur in Sulphuric Acid (Mono.) produced from— ..					
Sulphur (Elemental)(*a*)	154,337	187,015	146,816	156,413	162,881
Zinc concentrate ..	33,564	30,412	29,061	35,025	38,524
Lead concentrate ..	..	..	16,090	18,272	21,339
Pyrite	62,533	71,179	76,780	100,111	99,216
Spent Oxide	3,973	4,295	4,643	4,744	4,301
Other Materials ..	..	..	1,694	3,271	3,702
Total Sulphur Content ..	*254,407*	*292,901*	*275,084*	*317,836*	*329,963*

(*a*) All imported.

§ 17. Non-metallic Minerals.

1. **Asbestos.**—The production of asbestos in Australia at present is only sufficient to meet about one-sixth of domestic requirements. Production in recent years has been of two types, chrysotile (white) and crocidolite (blue). The deposits of chrysotile, however, are relatively small and widely scattered, and during 1958, it was produced mainly at Nunyerry and Lionel in Western Australia and at Baryulgil in New South Wales. Production of crocidolite, which is confined to the Hammersley Ranges in Western Australia, about 200 miles south-east of Roebourne, has expanded greatly in recent years. Large scale operaitons were commenced there in 1943 at Wittenoom Gorge by Australian Blue Asbestos Ltd., and reserves in seams over which the company holds leases are estimated at two million tons.

The production of chrysotile and crocidolite in Australia during the five years 1954 to 1958 is shown in the following table:—

PRODUCTION OF ASBESTOS : STATES.
(Short Tons of 2,000 lb.)

Year.	Chrysotile.			Crocidolite.	
	New South Wales.	Western Australia.	Australia.	Western Australia.	Australia.
1954	690	339	1,029	4,249	4,249
1955	661	308	969	5,025	5,025
1956	697	852	1,549	8,160	8,160
1957	676	1,556	2,232	12,438	12,438
1958	712	1,543	2,255	13,313	13,313

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 addition, the statistics are somewhat incomplete as some clays are outside the normal administrative control of some State Mines Departments. In the following table, the recorded production of the main types of clays produced in each State of Australia is shown for the year 1958.

PRODUCTION OF CLAYS : STATES, 1958.
(Tons.)

Type.	New South Wales.	Victoria.	Queensland	South Australia.	Western Australia.	Tasmania.	Australia.
Bentonite and Bentonitic Clay ..	30	..	86	..	37	..	153
Brick Clay and Shale	1,662,832	a1,030,771	223,738	373,094	(a)394,010	144,818	3,829,263
Cement Clay and Shale	126,668	..	..	9,571	13,506	14,063	163,808
Damouritic Clay ..	..	..	..	482	..	..	482
Fireclay, n.e.i. ..	87,763	28,205	7,161	16,967	20,212	..	160,308
Fuller's Earth ..	120	..	..	..	..	..	120
Kaolin	23,216	5,631	68	4,803	79	3,302	37,099
Stoneware Clay ..	87,975	..	91	31,614	..	..	119,680
Tile Clay.. ..	137,679	(b)	(b)	(b)	(b)	6,101	(c) 143,780
Other Clays ..	10,072	136,125	(b)	(b)	(b)	3,254	(c) 149,451

(a) Estimated. (b) Not available. (c) Incomplete.

3. **Gypsum.**—There are very extensive deposits of gypsum in Australia, but only the more accessible and easily worked deposits have been exploited. These deposits lie in four main regions, (*a*) in New South Wales stretching from around Griffith to near Broken Hill, (*b*) in the north-west corner of Victoria, the south-west corner of New South Wales and adjoining parts of South Australia, (*c*) in South Australia on both sides of St. Vincent Gulf and extending to Lake MacDonnell in the west, and (*d*) between Perth and Kalgoorlie in Western Australia. The South Australian deposits are the most important and more than half of the total Australian production of gypsum in 1958 came from that State, where the main centres of production are Stenhouse Bay on Yorke Peninsula and Lake MacDonnell.

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

The production of gypsum in Australia is set out in the following table for the five years 1954 to 1958.

PRODUCTION OF GYPSUM : STATES.

(Tons.)

Year.	New South Wales.	Victoria.	South Australia.	Western Australia.	Australia.
1954	128,790	75,012	194,772	41,142	439,716
1955	136,356	89,190	204,522	39,946	470,014
1956	94,203	78,895	263,136	27,121	463,355
1957	101,491	68,647	274,945	33,353	478,436
1958	90,664	72,010	306,749	35,515	504,938

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

The recorded statistics of limestone production in each State of Australia for the years 1955 to 1958 are shown in the following table. Details of limestone produced for use as building or road material are not included.

PRODUCTION OF LIMESTONE(*a*) : STATES.

('000 Tons.)

Year.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.	Australia.
1955 ..	1,690	714	(*b*)	987	(*b*)	206	3,998
1956 ..	1,700	814	(*b*)	1,076	(*b*)	179	4,264
1957 ..	1,897	846	(*b*)	1,135	(*b*)	205	4,572
1958 ..	2,061	859	(*b*)	1,386	(*b*)	235	5,490

(*a*) Includes shell and coral. (*b*) Not available for publication, included in total for Australia.

5. **Magnesite.**—The major sources of magnesite at present are deposits at Fifield and Thuddungra in central New South Wales. Most of the output of magnesite in Australia is used for refractory purposes, particularly in the steel industry, and small amounts are used in chemical, paper, glass, rubber, and ceramic industries. Particulars of the production of magnesite in each State for the years 1954 to 1958, are set out in the table below.

PRODUCTION OF MAGNESITE : STATES.

(Tons.)

Year.	New South Wales.	Queensland.	South Australia.	Western Australia.	Australia.
1954	42,825	..	235	92	43,152
1955	57,262	..	412	..	57,674
1956	63,050	..	831	804	64,685
1957	83,271	..	202	..	83,473
1958	69,030	20	341	..	69,391

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

The Commonwealth Mica Pool, details of which are given in § 19.2 on page 1094, 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 1954 to 1958.

MUSCOVITE MICA PRODUCTION.
(lb.)

Particulars.	1954.	1955.	1956.	1957.	1958.
New South Wales—					
Scrap	15,680	20,160	..	..	15,680
Queensland—					
Scrap	..	..	..	..	21,728
Northern Territory—					
Trimmed	84,619	56,649	28,837	36,713	31,391
Crude and Film	..	..	..	..	35,840
Scrap	65,184	..	..	40,600	11,088

7. Salt.—Salt is obtained in Australia by 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 1954 to 1958. Estimates of total Australian production are also shown.

SALT PRODUCTION.
('000 Tons.)

Particulars.	1954.	1955.	1956.	1957.	1958.
South Australia	304	291	332	339	336
Estimated Australian Total ..	379	369	409	428	430

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 centre producing first-grade quality barite is at Oraparinna in the North Flinders Range in South Australia. The production of barite in Australia during 1958 was 6,802 tons, of which 3,991 tons came from New South Wales, and 2,811 tons from South Australia.

(iii) *Diatomite.* Production of diatomite is carried on mainly in the eastern States of Australia. In 1958, 4,240 tons were produced, and of this total, New South Wales produced 3,100 tons.

(iv) *Dolomite.* Up to 1950, New South Wales was the main producer of dolomite, but in that year the Broken Hill Pty. Co. Ltd. opened up a large deposit of dolomite at Ardrossan in South Australia which now produces over 90 per cent. of the total output. In 1958, New South Wales produced 3,957 tons; Queensland, 2,779 tons; South Australia, 148,631 tons; Western Australia, 196 tons; and Tasmania, 2,585 tons, making an Australian total of 158,148 tons.

(v) *Felspar.* The main demand for felspar comes from the glass and ceramic industries. Most of the Australian production of felspar comes from New South Wales which produced 5,302 tons of the Australian total of 7,016 tons in 1958. Of the remainder, 1,033 tons came from South Australia and 681 tons from Western Australia.

(vi) *Gemstones.* (*a*) *Diamonds.* Gem quality diamonds are not produced in Australia but, in 1958, 158 carats of industrial diamonds valued at £2,000 were recovered during gold dredging operations on the Macquarie River in New South Wales.

(*b*) *Opals.* Most of the opals won in recent years came from the Coober Pedy and Andamooka fields in South Australia which produced opals worth £190,000 in 1958. Other production in 1958 was from Lightning Ridge in New South Wales, valued at £25,000, and the Quilpie district in Queensland, valued at £1,000.

(*c*) *Sapphires.* In 1958, sapphires produced in the Inverell District of New South Wales were valued at £1,000 and production from the Anakie Field in Central Queensland was also valued at £1,000.

(vii) *Silica.* The production of silica is not recorded in Victoria while production recorded in all other States may not be complete. The output of silica, which includes glass sand, quartz, quartzite, sand, sandstone, and silicious abrasives, but does not include production for use as building or road material, was 120,502 tons in New South Wales; 4,280 tons from Queensland; 7,552 tons in South Australia; 6,510 tons in Western Australia; and 6,639 tons in Tasmania, giving a total of 145,483 tons for those States during 1958.

(viii) *Sillimanite.* In 1958, 1,696 tons of sillimanite were produced in Australia. New South Wales contributed 863 tons and the remaining 833 tons came from South Australia.

(ix) *Talc.* The Australian output of talc (including steatite), was 15,393 tons in 1958. New South Wales produced 998 tons, South Australia 11,894 tons and Western Australia 2,501 tons.

(x) *Other.* Other non-metallic minerals produced in Australia in small quantities during 1958 were fluorite, garnet concentrate, glauconite, loam, mineral pigments, pebbles for grinding, perlite, petalite, phosphate rock, pyrophyllite, serpentine and slate.

§ 18. Oversea Trade in Minerals and Mineral Products.

Particulars of the quantity and value of the principal mineral and mineral product items imported into and exported from Australia during the years 1956, 1957 and 1958 are shown in the following table.

IMPORTS AND EXPORTS OF PRINCIPAL MINERALS AND MINERAL PRODUCTS: AUSTRALIA.

Item.	Unit of Quantity.	Quantity.			Value. (£A'000 Port of Shipment).		
		1956.	1957.	1958.	1956.	1957.	1958.
IMPORTS.							
Aluminium, Refined—							
Ingots	ton	10,223	8,374	14,813	2,696	2,199	3,356
Plates, Sheets and Strips	,,	2,276	1,881	2,317	1,038	907	1,026
Foil	,,	1,938	2,193	2,409	1,206	1,512	1,711
Asbestos	short ton	29,578	33,888	38,888	1,842	2,377	2,493
Gold, Unrefined Bullion ..	fine oz.	201,871	159,998	160,232	3,182	2,479	2,502
Iron and Steel—							
Bars and Rods.. ..	ton	55,890	17,860	24,798	4,518	2,394	2,750
Ferro-alloys	,,	15,137	14,579	13,335	1,693	2,061	1,486
Plate and Sheet (Plain) ..	,,	37,808	15,404	15,918	4,970	2,860	3,354
Tinplate	,,	120,917	144,199	66,059	11,656	14,991	6,699
Petroleum Oils—							
Crude	'000 gals.	1,789,828	2,118,179	2,441,916	45,516	57,574	67,778
Enriched Crude ..	,,	198,822	142,908	95,302	7,226	6,156	,079
Kerosene	,,	135,755	112,789	97,403	7,107	6,280	337
Lubricating Oil ..	,,	42,751	40,165	41,665	6,070	5,831	5,759
Spirit	,,	327,007	183,132	207,500	20,515	11,940	12,565
Phosphate Rock	'000 tons	1,332	1,035	1,501	2,770	2,622	3,894
Sulphur	ton	202,977	120,277	202,421	2,620	1,459	2,254
Titanium Oxide	,,	8,177	6,172	6,996	1,936	1,383	1,482

IMPORTS AND EXPORTS OF PRINCIPAL MINERALS AND MINERAL PRODUCTS: AUSTRALIA—*continued.*

Item.	Unit of Quantity.	Quantity.			Value. (£A'000 Port of Shipment).		
		1956.	1957.	1958.	1956.	1957.	1958.
EXPORTS.							
Asbestos	short ton	7,720	11,329	10,433	721	1,212	933
Coal	ton	239,379	759,095	823,925	944	3,056	3,408
Copper, Blister	,,	15,574	19,131	14,471	5,792	5,004	3,156
Gold, Refined	fine oz.	530,968	783,814	128,550	8,331	12,275	2,111
Iron and Steel—							
Bars and Rods	ton	16,842	21,595	28,588	906	1,094	1,420
Plate and Sheet, Plain	,,	61,070	143,629	85,444	3,430	8,008	5,169
Plate and Sheet, Galvanized	,,	38,484	86,378	58,938	3,324	6,961	4,911
Scrap	,,	105,123	178,255	156,978	2,347	5,010	2,800
Lead—							
Ore and Concentrate	,,	77,362	91,236	83,984	5,454	5,813	4,776
Lead-Silver Bullion	,,	38,190	47,618	58,068	6,081	7,085	6,104
Pig	,,	149,061	160,589	155,730	20,897	19,368	13,729
Petroleum Oils—							
Spirit	'000 gals.	19,829	36,133	80,171	1,271	2,857	4,814
Diesel Oil	,,	2,693	21,294	43,081	171	1,465	2,511
Residual and Furnace Oil	,,	147,872	156,027	202,052	6,702	8,258	9,131
Rutile Concentrate	ton	89,887	119,052	75,615	6,598	8,617	4,630
Silver, Refined	'000 fine oz.	16,444	3,672	4,876	5,511	1,505	1,911
Zinc—							
Ore and Concentrate	ton	267,402	323,654	261,279	4,668	5,201	2,749
Refinery Type Shapes	,,	31,594	37,092	37,938	3,802	4,033	3,165

Considerable quantities of metallic ores, concentrates, slags and residues are exported from Australia for refining overseas. The following table shows the quantities of such items exported during 1958 and their principal metallic content as estimated by assay.

PRINCIPAL METALLIC CONTENTS OF SPECIFIED ORES AND CONCENTRATES, ETC., EXPORTED FROM AUSTRALIA DURING 1958.

Ores and Concentrates, etc.	Quantity Exported.	*Metallic Contents—Estimated from Assay.*						
		Copper.	Gold.	Lead.	Silver.	Tin.	Tungstic Oxide.	Zinc.
	ton.	ton.	fine oz.	ton.	fine oz.	ton.	ton.	ton.
Copper—								
Ore and Concentrate	14,951	3,767	4,416	..	123,085	..	..	..
Copper—Lead Dross and Speiss	7,709	1,856	74	3,904	358,742	3	..	..
Other Slags and Residues	1,332	179	..	..	39,760	..	..	..
Blister	14,471	14,297	..	..	108,000	..	..	..
Lead—								
Ore and Concentrate	83,984	1,470	17,963	55,287	1,964,187	..	..	6,156
Slags and Residues	2,604	..	..	1,437	192	9	..	..
Lead-Silver Bullion	58,068	..	..	57,661	4,696,063	..	..	..
Tin Ore and Concentrate	25	..	..	..	..	17	..	..
Tungsten—								
Scheelite Ore and Concentrate	506	..	..	..	..	..	341	..
Wolfram Ore and Concentrate	442	..	..	..	..	..	319	..
Zinc—								
Ore and Concentrate	261,279	..	..	3,978	77,777	..	..	137,323
Slags and Residues	3,476	..	..	..	..	..	..	2,755
Total Metallic Contents	..	21,569	22,453	122,267	7,367,806	29	660	146,234

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

1. Aid to Mining.—(i) *Commonwealth.* (*a*) *Assistance to the Gold Mining Industry.* For particulars of the subsidy paid to gold producers in Australia, *see* para. 9, page 1058.

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

(*c*) *Copper Bounty.* For particulars of the bounty paid on copper sold on the Australian market, *see* para. 8, page 1067.

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

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

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

The Commonwealth Government has encouraged the search for oil in Australia, Papua and New Guinea; details of the efforts made are outlined in earlier issues of the Official Year Book and in § 15, Mineral Oils (p. 1084).

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

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

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

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

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

(*d*) *Queensland.* Various forms of assistance to mining are made available by the Queensland Department of Development and Mines. Grants are made from the Consolidated Revenue Fund for use on construction and maintenance of roads in mining areas. Advances are made from the Gold Mining Encouragement Fund for mining development work. This assistance is restricted to gold mines and advances are repayable from proceeds of the mine, if any. From the Assistance to Metalliferous Mining Fund, plant, such as jackhammers, compressors and pumps, is purchased and maintained. Such plant is made available on hire, the rental payments being credited back to the fund. Prospecting assistance is made available in approved cases, the rates being £2 10s. per week for a single man and £3 10s. per week for a married man with dependants. This is not repayable. From the Advances to Mining Fund, assistance by way of subsidy is advanced for mine development. Such is repayable from proceeds of the mine. The Department also 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.

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

(*f*) *Western Australia.* Assistance is given to prospectors to the extent of £5 a week south of the 26th parallel of latitude, and of £6 a week north of that parallel; also provision is made of some tools required for prospecting.

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

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

(*g*) *Tasmania.* The Department of Mines provides financial assistance to mining lessees for the purchase of plant and machinery, for sinking, repairing or dewatering of shafts, for construction of dams and water races, for testing and proving a deposit of any mining product, for developmental work and for diamond and other types of drilling. The Department has available for hire percussion and diamond drills for exploration, as well as a complete plant for small shaft sinking and tunnelling. 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 has erected Government batteries at Tennant Creek, Hatches Creek, and Maranboy for the treatment of miners' ores. The Tennant Creek battery is the only one now in operation. After reconstruction, it was re-opened for public crushing in October, 1958, and has been fully employed since that date. The re-opening of the Hatches Creek and Maranboy batteries will depend on the revival of small scale wolfram and tin mining, respectively, in these areas. The crushing charges are subsidized by Government grants. In addition, the Administration provides cartage subsidies and financial advances to encourage miners to carry out developmental work. Roads and water supply services are provided and maintained for mines under active development throughout the Territory.

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

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

(*a*) the necessity of conserving resources;
(*b*) the inadequacy of local production to fulfil domestic demand;
(*c*) the strategic importance of the minerals.

Minerals and metals subject to export control include iron ore; manganese ore; beryllium ores, concentrates and metal; monazite; uranium ore, concentrates, residuals and metal. Mixed concentrates of beach sand minerals are prohibited exports but the major constituent minerals (rutile, zircon and ilmenite) may be exported.

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

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

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

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