

## CHAPTER XXVI MINERAL INDUSTRY

NOTE.—Further detailed information on the subjects dealt with in this chapter is contained in the annual printed Bulletin *Primary Industries, Part II.—Non-Rural Industries and Value of Production* issued by this Bureau, and in *The Australian Mineral Industry—Annual Review* and other publications issued by the Bureau of Mineral Resources, Geology and Geophysics, which also issues, in co-operation with this Bureau, a quarterly publication *The Australian Mineral Industry*, comprising two parts—Part I.—Quarterly Review, and Part II.—Quarterly Statistics. The mimeographed statistical bulletin *Mining and Quarrying* of this Bureau contains annual statistics of the industry prepared and published as soon as possible after the data have been compiled. A monthly statistical bulletin *The Gold Mining Industry, Australia* is issued also, and other current information on mining or mine products is contained in the *Quarterly Summary of Australian Statistics*, the *Monthly Review of Business Statistics*, the *Digest of Current Economic Statistics*, and the *Monthly Bulletin of Production Statistics*.

Values of Australian oversea trade shown throughout this chapter are expressed as £A. f.o.b. port of shipment, except where otherwise indicated.

### § 1. Introduction

1. 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 .. Northern Territory	Mount Isa Tennant Creek
	Gold .. ..	Western Australia	Kalgoorlie and other localities
	Iron .. ..	South Australia .. Western Australia	Middleback Ranges Yampi Sound and Pilbara
	Lead-silver-zinc	New South Wales	Broken Hill
	Uranium .. ..	Queensland .. Queensland .. South Australia .. Northern Territory	Mount Isa Mary Kathleen Radium Hill Rum Jungle and South Alligator River area
	Palaeozoic (between 200 and 520 million years old)	Black coal ..	New South Wales  Queensland ..  Western Australia
Copper-gold ..		Queensland .. Tasmania ..	Mount Morgan Mount Lyell
Lead-silver-zinc		Tasmania ..	Mount Read and Rosebery
Tin (lode) ..		Queensland .. Tasmania ..	Herberton North-east of State
Tungsten ..		Tasmania ..	King Island and north-east of State

PRINCIPAL AUSTRALIAN MINERAL DEPOSITS—*continued*

Age of geological formation in which located	Metal or mineral	State or Territory	Locality
Mesozoic (between 75 and 200 million years old)	Black coal ..	Queensland ..	Ipswich
		South Australia ..	Leigh Creek
	Mineral sands(a)	Tasmania ..	St. Marys
		New South Wales ..	North coast
Cainozoic (less than 75 million years old)	Brown coal ..	Queensland ..	South coast
		Victoria ..	Gippsland
	Tin (alluvial) ..	New South Wales ..	Tingha
		Queensland ..	Herberton
	Bauxite ..	Tasmania ..	North-east of State
		Queensland ..	Weipa
	Western Australia	Darling Range	

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

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. All crude salt is produced by the evaporation of water from pans constructed along the sea coast or from inland lakes.

2. **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 salable 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.

Other methods of concentration used are gravity (alluvial tin, mineral sands), electromagnetic (wolfram, scheelite and mineral sands), and electrostatic (mineral sands).

3. **Government Aid to Mining, and Mineral Control.**—(i) *Aid to Mining—Commonwealth.* (a) *Income Taxation Concessions.* One-fifth of the net income derived from mining for prescribed minerals in Australia or the Territory of Papua and New Guinea is exempt from tax. The metals or minerals to which this concession applies are as follows:—asbestos, bauxite, chromite, emery, fluorspar, graphite, ilmenite, kyanite, magnesite, manganese oxides, mica, monazite, pyrite, quartz crystals (piezo-electric quality), radio-active ores, rutile, sillimanite, vermiculite and zircon; and ores of antimony, arsenic, beryllium, bismuth, cobalt, columbium, copper, lithium, mercury, molybdenum, nickel, osmiridium, platinum, selenium, strontium, tantalum, tellurium, tin, tungsten and vanadium.

Income derived from mining principally for gold in Australia or the Territory of Papua and New Guinea is exempt from tax. The exemption is also available in respect of income derived from mining principally for gold and copper if the value of the gold obtained is not less than 40 per cent. of the value of total output.

Income attributable to uranium obtained from working a mining property in Australia or the Territory of Papua and New Guinea, or from the treatment of ore in Australia or the Territory to recover uranium concentrates, is exempt from tax for residents of Australia and the Territory of Papua and New Guinea. The exemption is, however, conditional upon the uranium recovered being owned by the Commonwealth or disposed of to a person approved by the Commonwealth.

Dividends paid wholly and exclusively out of exempt mining income are also exempt from tax.

Further information is given in a booklet entitled *Income Tax for the Mining Industry*, issued by the Commissioner of Taxation.

(b) *Assistance to the Gold-Mining Industry.* The assistance to the gold-mining industry by subsidy was introduced at a time of rising costs in the industry and a fixed official world price for gold. Because many producers were faced with the likelihood of closing down, the Government decided to subsidize marginal producers in Australia and the Territories of Papua and New Guinea. Under the *Gold-Mining Industry Assistance Act 1954*, a producer the value of whose gold output exceeded 50 per cent. of the total value of his mine output was eligible for assistance, subject to certain conditions, on the production of gold from 1st July, 1954. The rate of subsidy payable under the original Act was 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 deliveries do not exceed 500 fine oz. is £2 8s. 0d. per fine oz., irrespective of cost of production or rate of profit. For large producers, subject to certain provisions, subsidy is paid at the rate of three-quarters of the excess of the average cost of production over £13 10s. per fine oz. with a maximum amount of subsidy of £3 5s. per fine oz. A producer whose deliveries during the year exceed 500 fine oz. may elect to be treated as a small producer. In this case, the subsidy rate payable per fine ounce on total deliveries is £2 8s. reduced by one penny for each fine ounce by which deliveries exceed 500 fine ounces. Where a producer receives an amount in excess of the official price of £15 12s. 6d. per fine oz. as a result of sales on overseas premium markets or otherwise, the subsidy payable is reduced by the amount of the excess. The subsidy is also limited, in the case of large producers, to the extent that the annual net profit of a producer shall not, with the addition of the subsidy, exceed 10 per cent. of the capital used in the production and sale of gold. The expenditure on development allowable in determining costs is subject to a limiting provision. A further condition of the Act is that the recovery rate of the mine shall not fall below nine-tenths of that for the year previous to the commencement of the Act. Payments under the Act are to apply to production until 30th June, 1965.

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 1959 to 1963 are shown in the table on page 1152.

The purpose of the *Gold Mines Development Assistance Act 1962* is to provide assistance to gold producers in Australia and the Territories of Papua and New Guinea not receiving subsidy under the *Gold-Mining Industry Assistance Act 1954-1962*, in order to increase the rate of their development work and so to add to their proved reserves of gold-bearing minerals. In recent years, these reserves had declined to the extent that the long-term prospects of the industry were jeopardized. The Act, which applies to 1962-63 and the next two financial years, provides that a development allowance is payable to a mine approved for the purposes of the scheme equal to the amount by which its allowable expenditure on development in a year, as defined in the Act, exceeds a defined base amount, which normally will be the average annual amount spent by the mine on development during the three years preceding 1962-63. The payment of allowance is also subject to a number of other conditions and limits provided for in the Act.

(c) *Assistance to the Copper Mining Industry.* After a Tariff Board investigation, assistance was accorded to the industry in 1958, partly by import duty and partly by bounty. The assistance to the industry was reviewed in 1960 and 1963, and the present bounty assistance will continue until 31st December, 1965. Under the *Copper Bounty Act 1958-1963*, bounty is payable, subject to specified conditions, on refined copper sold for use in Australia. The rate of bounty is £35 a ton when the overseas price, as determined by the Minister for Customs and Excise, is £290 (£Stg.232) or less. When the overseas price rises above £290, the bounty falls by the same extent, so that no bounty is payable when the overseas price is £325 (£Stg.260) or more. A duty is imposed on imports of copper when the overseas price falls below £290 a ton, to the extent of £1 for each £1 that the price falls below £290. Including freight and other charges, the landed cost of imported copper is thus expected not to fall below about £305 a ton.

(d) *Search for Petroleum.* The Commonwealth Government has encouraged the search for petroleum in Australia, Papua and New Guinea, and considerable sums have been spent during recent years in geological and geophysical surveys and in drilling operations.

The Bureau of Mineral Resources, in close co-operation with the Mines Departments of the States, has continued regional geological and geophysical surveys throughout Australia. In 1957, the Commonwealth Government introduced the *Petroleum Search Subsidy Act 1957*, whereby stratigraphic drilling operations were subsidized to the extent of 50 per cent. of cost. The *Petroleum Search Subsidy Act 1959* widened the scope of operations for which subsidy was offered to include all types of geophysical surveys and off-structure drilling operations.

Another amendment in 1961 further widened the scope of the 1959 Act to provide subsidy for test drilling and detailed structure drilling operations. It also provided for the calculation of drilling subsidies on a footage basis as an alternative to the total cost basis. A sum of £5 million was allocated to the petroleum search subsidy scheme for 1962-63. This amount was almost double the allocation of £2.7 million provided in the previous year. In spite of the increased allocation, applications for subsidy increased to such an extent that the maximum rate of subsidy was reduced from 50 per cent. of the allowable cost of approved operations to 30 per cent. in 1962-63. A cash allocation of £5 million was made for subsidy in the 1963-64 financial year.

To the end of 1963, actual payments of subsidy totalling more than £11 million had been made in accordance with the terms of the subsidy Acts. Further particulars of government assistance in petroleum exploration will be found in Year Book No. 48, pages 1095-6.

(e) *Assistance to Producers of Sulphuric Acid and Iron Pyrites.* Following recommendations of the Tariff Board, the Sulphuric Acid Bounty Act was extended for a period of five years from 1st July, 1960. Arising from these same recommendations, the *Pyrites Bounty Act* 1960 was enacted on 15th December, 1960, to be operative for a period of four and a half years from 1st January, 1961. The Acts provide for bounties to be paid, subject to specified conditions, on sulphuric acid produced from prescribed materials of Australian origin and to producers of iron pyrites.

(f) *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.

(g) *Research Investigations.* Research investigations into mineral problems are undertaken by the Australian Mineral Development Laboratories in Adelaide. This organization is sponsored by the Commonwealth Government, the South Australian Government and the Australian Mineral Industries Research Association (an association of companies engaged in the mineral industry formed to foster and develop mineral research). Ore-dressing and mineragraphic 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.

(h) *Department of Territories.* For particulars of the Northern Territory Administration, see paragraph (h) under section (ii) *Aid to Mining—States*, page 1135.

(ii) *Aid to Mining—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. A quantity of mechanical equipment is also available in several localities for hire at reasonable rentals to prospectors and small mine operators, and District Inspectors have geiger counters and scheelite detectors which are loaned to approved persons.

(c) *Victoria.* Loans may be granted to assist prospecting and development or the purchase of machinery for gold mining. 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 resources is in progress, in conjunction with the development of town water supplies from underground sources.

(d) *Queensland.* Various forms of assistance to mining are made available by the Queensland Department of 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. a week for a single man and £3 10s. a 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. This 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 battery 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, and purchase of basic metal ores from prospectors; (ii) geological examination of mineral deposits, water supply, dam foundation and drainage problems, guidance on mining legislation, and publication and issue of geological bulletins and maps. It also provides, through the Australian Mineral Development Laboratories, chemical and metallurgical and analytical and assay investigation, testing and treatment of ores and minerals, and 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 for the supply of some tools required for prospecting.

There are twenty State batteries operating intermittently throughout the goldfields 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 de-watering 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, through ore-dressing research into metallurgical recoveries, and the selection and design of treatment plant.

In consequence of a serious fall in world tungsten prices, the *King Island Scheelite Agreement Act 1963 (No. 1)* was passed. This Act permitted the Tasmanian Government to provide financial assistance until the end of August, 1963, so that production of scheelite on King Island could be continued. A second Act (*King Island Scheelite Agreement Act 1963 (No. 2)*) gave authority for advances in the period to 31st May, 1964.

(h) *Northern Territory.* To encourage the development of the mining industry, the Northern Territory Administration has erected four government batteries for the treatment of miners' ores. Only two of these, at Tennant Creek and Mount Wells near Burrundie, are now in operation. The re-opening of the other two batteries will depend on the revival of small scale wolfram and tin mining in Hatches Creek and Maranboy where these batteries are located.

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.

(iii) *Controls on Minerals and Metals.* Export controls are maintained over certain minerals and metals. These controls are enforced by means of the Customs (Prohibited Exports) Regulations as amended from time to time by Statutory Rules. To export these materials, it is necessary to obtain a clearance from the following Commonwealth authorities:—

Department of National Development—mineral sands in all forms (including concentrates) containing zircon, rutile or ilmenite; lithium ores and concentrates; beryllium ores and concentrates; manganese ores; iron ores, beneficiated iron ores and iron concentrates;

Department of Primary Industry—phosphate rock, phosphate and superphosphate, and fertilizers containing phosphate or superphosphate;

Australian Atomic Energy Commission—all radio-active minerals, metals and compounds, including uranium, thorium and monazite; lithium metal and alloys; beryllium metal, alloys and compounds; zirconium metal, alloys and compounds.

Further information concerning the Atomic Energy Commission appears in Chapter XIX. Education, Cultural Activities and Research.

## § 2. The Mineral Industry

1. *Sources and Scope 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 Bureau of Mineral Resources, Geology and Geophysics, the Joint Coal Board, the Division of Minerals of the United States Bureau of Mines, and from several other sources.

The coverage of the collection in respect of construction materials is incomplete in most States. This deficiency is due primarily to the inherent difficulty of obtaining complete lists of quarries (including those operated by governmental authorities) many of which operate intermittently and in different locations. There is difficulty also in obtaining satisfactory returns from quarries operated in conjunction with some other activity, e.g. road-making, brickworks, etc., and quarries operated in conjunction with large construction projects, such as the Snowy Mountains Scheme, are excluded from these statistics. In some States, there have been deficiencies also in the collection of data for certain non-metal (excluding fuel) mining industries, mainly because these are outside the fields normally under the administrative control of Mines Departments. Products chiefly affected are clays, loam and silica.

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 Mount Morgan and Mount Isa in Queensland and at Mount 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, and as tungsten 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 have been obtained annually, since 1952, from the Mining and Quarrying Census. 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. 56, 1961-62, pages 47 and 48. 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.

Statistics of oil search operations have been excluded in accordance with the definition of the mining industry on page 1136, but a special article on developments in the search for oil, contributed by the Commonwealth Bureau of Mineral Resources, may be found in Year Book No. 48, pages 1094-9. More recent developments are outlined in § 13 of this chapter. Details of the activities of establishments engaged in the mining and treatment of uranium ore have been excluded because of the confidential nature of these operations.

(ii) *Mineral Product Data.* In the preparation of Australian mineral production statistics, the quantities and values of individual minerals produced are recorded 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 recorded. 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. In general, 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. Number of Mines and Quarries.—The following table shows the number of mines and quarries which operated in each State and Territory in 1962.

MINING AND QUARRYING: NUMBER OF MINES AND QUARRIES, 1962

Industry	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal mining—									
Gold mining ..	42	24	53	3	141	4	19	..	286
Lead-silver-zinc mining ..	11	..	4	1	4	2	..	..	22
Copper-gold mining ..	12	2	53	2	33	1	..	..	107
Tin mining ..	53	5	216	..	10	33	27	..	344
Mineral sands mining ..	12	..	4	..	4	..	..	..	20
Other metal mining ..	32	3	6	5	36	3	2	..	87
<i>Total, Metal Mining</i>	<i>162</i>	<i>34</i>	<i>336</i>	<i>11</i>	<i>228</i>	<i>43</i>	<i>52</i>	<i>..</i>	<i>866</i>
Fuel mining—									
Black coal mining—									
Underground ..	97	3	73	..	3	(a) 10	..	..	(a) 186
Opencut ..	3	..	7	1	1	..	..	..	12
<i>Total .. ..</i>	<i>100</i>	<i>3</i>	<i>80</i>	<i>1</i>	<i>4</i>	<i>10</i>	<i>..</i>	<i>..</i>	<i>198</i>
Brown coal mining ..	..	6	..	..	..	..	..	..	6
<i>Total, Fuel Mining ..</i>	<i>100</i>	<i>9</i>	<i>80</i>	<i>1</i>	<i>4</i>	<i>10</i>	<i>..</i>	<i>..</i>	<i>204</i>
Non-metal (excluding fuel) mining(b) ..	345	53	102	128	76	25	2	..	731
<i>Total, All Mining ..</i>	<i>607</i>	<i>96</i>	<i>518</i>	<i>140</i>	<i>308</i>	<i>78</i>	<i>54</i>	<i>..</i>	<i>1,801</i>
Construction material quarrying(b) ..	384	254	60	241	44	74	40	10	1,107
<i>Total, All Mining and Quarrying ..</i>	<i>991</i>	<i>350</i>	<i>578</i>	<i>381</i>	<i>352</i>	<i>152</i>	<i>94</i>	<i>10</i>	<i>2,908</i>

(a) Includes one mine operating both underground and open-cut workings. (b) Incomplete, owing to difficulties of coverage. See para. 1. Sources and Scope of Statistics, p. 1136.

In the next table, the numbers of mines and quarries which operated in Australia in each of the years 1958 to 1962 are shown.

**MINING AND QUARRYING: NUMBER OF MINES AND QUARRIES, AUSTRALIA**

Industry	1958	1959	1960	1961	1962
<b>Metal mining—</b>					
Gold mining .. .. .	285	306	296	295	286
Lead-silver-zinc mining .. .. .	50	35	28	27	22
Copper-gold mining .. .. .	81	81	90	111	107
Tin mining .. .. .	180	216	216	266	344
Mineral sands mining .. .. .	28	22	22	21	20
Other metal mining .. .. .	84	96	94	85	87
<i>Total, Metal Mining</i> .. .. .	<i>708</i>	<i>756</i>	<i>746</i>	<i>805</i>	<i>866</i>
<b>Fuel mining—</b>					
Black coal mining .. .. .	227	218	218	202	198
Brown coal mining .. .. .	7	8	7	6	6
<i>Total, Fuel Mining</i> .. .. .	<i>234</i>	<i>226</i>	<i>225</i>	<i>208</i>	<i>204</i>
Non-metal (excluding fuel) mining(a) .. .. .	645	687	698	755	731
<i>Total, All Mining</i> .. .. .	<i>1,587</i>	<i>1,669</i>	<i>1,669</i>	<i>1,768</i>	<i>1,801</i>
Construction material quarrying(a) .. .. .	746	862	892	(b)1,056	(b)1,107
<b>Total, All Mining and Quarrying</b> .. .. .	<b>2,333</b>	<b>2,531</b>	<b>2,561</b>	<b>(b)2,824</b>	<b>(b)2,908</b>

(a) Incomplete. See para. 1. Sources and Scope of Statistics, p. 1136. with years prior to 1961, owing to extension of coverage in Victoria.

(b) Not comparable

4. **Employment in Mining and Quarrying.**—(i) *Persons Engaged.* Statistics of persons employed in the mining and quarrying industry are derived mainly from the annual census of that industry.

Data on the work force employed in the industry are also obtained from the population censuses of Australia. The population census figure for mining and quarrying includes a number of persons excluded by definition from the mining and quarrying census employment figure, e.g. prospectors, head office employees, etc.

In the following table, which shows particulars collected in the population censuses of Australia at 30th June, 1947, 1954, and 1961, the numbers of persons whose industry statements were classified to "mining and quarrying" are shown together with the numbers engaged in all primary industries and the total work force.

**PERSONS ENGAGED IN MINING AND QUARRYING, AUSTRALIA**

Particulars	Census, 30th June—		
	1947	1954	1961
<b>Persons engaged in—</b>			
Mining and quarrying .. .. .	57,574	62,107	54,401
All primary industries .. .. .	563,697	560,100	513,286
<b>Total work force</b> .. .. .	<b>3,196,431</b>	<b>3,702,022</b>	<b>4,225,096</b>
<b>Persons engaged in mining and quarrying as a proportion of—</b>			
All primary industries .. .. . %	10.2	11.1	10.6
Total work force .. .. . %	1.8	1.7	1.3

NOTE.—An adjustment was made to the 1947 and 1954 industry data by distributing over the range of recorded industry the number of persons whose industry was not stated. No such adjustment was made to the 1961 figures.

The following table is derived from mining census data and shows the average numbers engaged in the various mining industries in each State or Territory in 1962.

## MINING AND QUARRYING: EMPLOYMENT(a), 1962

Industry	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
Metal mining—									
Gold mining .. .. .	15	220	132	..	4,796	..	127	..	5,290
Lead-silver-zinc mining ..	4,652	..	(b)	(b)	5	(b)	..	..	7,958
Copper-gold mining .. .. .	100	4	(b)	(b)	172	(b)	234	..	2,242
Tin mining .. .. .	103	5	499	..	57	468	25	..	1,157
Mineral sands mining .. .. .	869	..	(b)	..	(b)	..	..	..	1,408
Other metal mining .. .. .	28	6	8	(b)	342	(b)	2	..	968
<b>Total, Metal Mining</b>	<b>5,767</b>	<b>235</b>	<b>4,507</b>	<b>(b)</b>	<b>(b)</b>	<b>2,156</b>	<b>388</b>	<b>..</b>	<b>19,023</b>
Fuel mining—									
Black coal mining—									
Underground .. .. .	11,842	303	2,632	..	(b)	(b)	..	..	(b)
Opencut .. .. .	156	..	216	(b)	..	c 219	..	..	(b)
<b>Total .. .. .</b>	<b>11,998</b>	<b>303</b>	<b>2,848</b>	<b>(b)</b>	<b>(b)</b>	<b>219</b>	<b>..</b>	<b>..</b>	<b>16,312</b>
Brown coal mining .. .. .	..	1,453	..	..	..	..	..	..	1,453
<b>Total, Fuel Mining ..</b>	<b>11,998</b>	<b>1,756</b>	<b>2,848</b>	<b>(b)</b>	<b>(b)</b>	<b>219</b>	<b>..</b>	<b>..</b>	<b>17,765</b>
Non-metal (excluding fuel) mining(d) .. .. .	1,115	283	253	543	533	107	4	..	2,838
<b>Total, All Mining ..</b>	<b>18,880</b>	<b>2,274</b>	<b>7,608</b>	<b>1,183</b>	<b>6,807</b>	<b>2,482</b>	<b>392</b>	<b>..</b>	<b>39,626</b>
Construction material quarrying(d) .. .. .	1,776	1,933	456	853	246	244	32	59	5,599
<b>Total, All Mining and Quarrying ..</b>	<b>20,656</b>	<b>4,207</b>	<b>8,064</b>	<b>2,036</b>	<b>7,053</b>	<b>2,726</b>	<b>424</b>	<b>59</b>	<b>45,225</b>

(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, owing to difficulties of coverage. See para. 1. Sources and Scope of Statistics, p. 1136.

The following table shows particulars of mining employment in Australia for the years 1958 to 1962. The figures show the average number of persons employed during the whole year, including working proprietors.

## MINING AND QUARRYING: EMPLOYMENT, AUSTRALIA

Industry	1958	1959	1960	1961	1962
Metal mining—					
Gold mining .. .. .	5,901	5,948	5,544	5,438	5,290
Lead-silver-zinc mining .. .. .	9,461	9,031	8,731	8,158	7,958
Copper-gold mining .. .. .	2,057	2,301	2,364	2,322	2,242
Tin mining .. .. .	944	926	946	1,131	1,157
Mineral sands mining .. .. .	1,102	1,019	1,127	1,141	1,408
Other metal mining .. .. .	1,030	1,031	1,177	1,097	968
<b>Total, Metal Mining ..</b>	<b>20,495</b>	<b>20,256</b>	<b>19,889</b>	<b>19,287</b>	<b>19,023</b>
Fuel mining—					
Black coal mining .. .. .	20,795	18,678	18,529	16,957	16,312
Brown coal mining .. .. .	1,540	1,519	1,399	1,441	1,453
<b>Total, Fuel Mining ..</b>	<b>22,335</b>	<b>20,197</b>	<b>19,928</b>	<b>18,398</b>	<b>17,765</b>
Non-metal (excluding fuel) mining (a) .. .. .	2,728	2,975	2,925	2,942	2,838
<b>Total, All Mining ..</b>	<b>45,558</b>	<b>43,428</b>	<b>42,742</b>	<b>40,627</b>	<b>39,626</b>
Construction material quarrying (a) .. .. .	4,581	4,116	5,016	(b)5,498	(b)5,599
<b>Total, All Mining and Quarrying ..</b>	<b>50,139</b>	<b>47,544</b>	<b>47,758</b>	<b>b 46,125</b>	<b>b 45,225</b>

(a) Incomplete. See para. 1.—Sources and Scope of Statistics, p. 1136. (b) Not comparable with years prior to 1961 owing to extension of coverage in Victoria.

(ii) *Size Classification of Mines and Quarries.* Most of the mines and quarries worked during 1962 employed less than four persons, including working proprietors. However, more than half of the persons engaged in mining and quarrying were in the 48 mines each employing 200 persons or more. The following table shows the distribution of the total number of mines into various size groups according to the average number of persons employed during the period worked by each mine in 1962. For particulars of the method of compiling these industry statistics, see para. 2 (i), pages 1136-7.

#### MINING AND QUARRYING: SIZE CLASSIFICATION OF ESTABLISHMENTS, 1962

Mines and quarries employing on the average(a)—	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T. and A.C.T.	Aust.
<b>Less than 4 persons—</b>								
Establishments ..	709	144	413	270	243	91	87	1,957
Persons ..	1,114	265	660	407	575	169	126	3,316
<b>From 4 to 20 persons—</b>								
Establishments ..	168	174	92	96	82	46	13	671
Persons ..	1,288	1,377	1,019	773	680	307	99	5,543
<b>From 21 to 200 persons—</b>								
Establishments ..	87	29	71	13	17	12	3	232
Persons ..	6,623	1,101	(b)	(b)	1,346	661	142	13,924
<b>More than 200 persons—</b>								
Establishments ..	27	3	2	2	10	3	1	48
Persons ..	12,116	1,888	(b)	(b)	4,874	1,713	223	24,806
<b>Total—</b>								
Establishments ..	991	350	578	381	352	152	104	2,908
Persons ..	21,141	4,631	8,506	2,396	7,475	2,850	590	47,589

(a) Average during period worked. Includes working proprietors. (b) Not available for publication; included in total for Australia.

(iii) *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. In 1962, 40 persons were recorded as killed and 1,226 as injured in mining (excluding quarrying) accidents. Recorded deaths and injuries in that year were highest in black coal mines (20 and 352, respectively), gold mines (6 and 320), lead-silver-zinc mines (4 and 288), and copper-gold mines (1 and 80). Persons killed and injured in the construction material quarrying industry numbered 5 and 76, respectively, in 1962.

5. *Production Costs in Mining and Quarrying.*—(i) *Salaries and Wages Paid.* Salaries and wages paid in the mining and quarrying industries in Australia during each year 1958 to 1962 are shown in the following table. Information regarding rates of wages paid in the mining industry is shown in Chapter XIII. Labour, Wages and Prices (p. 451) and also in the *Labour Report*.

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

Industry	1958	1959	1960	1961	1962
<b>Metal mining—</b>					
Gold mining .. .. .	6,492	6,504	6,655	6,591	6,534
Lead-silver-zinc mining .. .. .	13,462	13,944	13,555	13,261	12,227
Copper-gold mining .. .. .	2,362	2,710	2,938	2,915	2,851
Tin mining .. .. .	737	814	905	946	1,050
Mineral sands mining .. .. .	1,327	1,188	1,336	1,474	1,739
Other metal mining .. .. .	1,108	1,058	1,338	1,277	1,188
<i>Total, Metal Mining</i> .. .. .	<i>25,488</i>	<i>26,218</i>	<i>26,727</i>	<i>26,464</i>	<i>25,589</i>
<b>Fuel mining—</b>					
Black coal mining .. .. .	24,501	23,437	25,918	25,460	24,849
Brown coal mining .. .. .	1,694	1,710	1,785	1,923	1,971
<i>Total, Fuel Mining</i> .. .. .	<i>26,195</i>	<i>25,147</i>	<i>27,703</i>	<i>27,383</i>	<i>26,820</i>
Non-metal (excluding fuel) mining(b) .. .. .	2,384	2,631	2,664	2,875	2,898
<i>Total, All Mining</i> .. .. .	<i>54,067</i>	<i>53,996</i>	<i>57,094</i>	<i>56,722</i>	<i>55,307</i>
Construction material quarrying(b) .. .. .	3,241	3,490	3,628	(c)4,018	(c)4,381
<i>Total, All Mining and Quarrying</i> .. .. .	<i>57,308</i>	<i>57,486</i>	<i>60,722</i>	<i>c 60,740</i>	<i>c 59,688</i>

(a) Excludes mines and quarries employing less than four persons, and drawings by working proprietors; the amounts are net after deducting value of explosives sold to employees. (b) Incomplete. See para. 1. Sources and Scope of Statistics, p. 1136. (c) Not comparable with years prior to 1961, owing to extension of coverage in Victoria.

(ii) *Power, Fuel, Light and Materials, etc., used.* The following table contains details of the value of power, fuel, materials and stores used by the mining and quarrying industry during each year 1958 to 1962.

**MINING AND QUARRYING: VALUE OF POWER, FUEL, LIGHT AND MATERIALS, ETC., USED, AUSTRALIA**  
(£'000)

Industry	1958	1959	1960	1961	1962
<b>Metal mining—</b>					
Gold mining .. .. .	4,970	5,069	4,909	4,979	4,947
Lead-silver-zinc mining .. .. .	10,025	10,367	12,106	10,303	8,671
Copper-gold mining .. .. .	2,969	3,325	3,288	3,503	3,384
Tin mining .. .. .	521	512	530	601	637
Mineral sands mining .. .. .	1,281	1,348	1,562	1,797	1,838
Other metal mining .. .. .	1,004	924	1,109	1,258	1,242
<i>Total, Metal Mining</i> .. .. .	<i>20,770</i>	<i>21,545</i>	<i>23,504</i>	<i>22,441</i>	<i>20,719</i>
<b>Fuel mining—</b>					
Black coal mining .. .. .	10,536	10,166	11,319	12,409	13,346
Brown coal mining .. .. .	612	593	623	622	672
<i>Total, Fuel Mining</i> .. .. .	<i>11,148</i>	<i>10,759</i>	<i>11,942</i>	<i>13,031</i>	<i>14,018</i>
Non-metal (excluding fuel) mining(a) .. .. .	2,389	2,359	2,340	2,508	2,818
<i>Total, All Mining</i> .. .. .	<i>34,307</i>	<i>34,663</i>	<i>37,786</i>	<i>37,500</i>	<i>37,555</i>
Construction material quarrying(a) .. .. .	3,312	4,167	4,427	(b)4,926	(b)4,500
<i>Total, All Mining and Quarrying</i> .. .. .	<i>37,619</i>	<i>38,830</i>	<i>42,213</i>	<i>(b)42,906</i>	<i>b 42,055</i>

(a) Incomplete. See para. 1. Sources and Scope of Statistics, p. 1136. (b) Not comparable with years prior to 1961, owing to extension of coverage in Victoria.

6. Value of Additions and Replacements to Fixed Assets in Mining and Quarrying.—The following table shows details for Australia of the value of additions and replacements to fixed assets during the years 1958 to 1962.

**MINING AND QUARRYING: VALUE OF ADDITIONS AND REPLACEMENTS TO FIXED ASSETS(a), AUSTRALIA**  
(£'000)

Industry	1958	1959	1960	1961	1962
<b>Metal mining—</b>					
Gold mining .. .. .	1,334	1,446	789	778	1,608
Lead-silver-zinc mining .. .. .	3,692	6,566	3,548	3,425	3,523
Copper-gold mining .. .. .	540	651	451	845	1,365
Tin mining .. .. .	75	66	185	261	270
Mineral sands mining .. .. .	894	787	481	728	1,876
Other metal mining .. .. .	624	713	1,369	1,138	2,577
<i>Total, Metal Mining</i> .. .. .	<i>7,159</i>	<i>10,229</i>	<i>6,823</i>	<i>7,175</i>	<i>11,219</i>
<b>Fuel mining—</b>					
Black coal mining .. .. .	7,912	7,707	10,947	11,535	13,048
Brown coal mining .. .. .	2,309	3,654	1,914	2,723	3,061
<i>Total, Fuel Mining</i> .. .. .	<i>10,221</i>	<i>11,361</i>	<i>12,861</i>	<i>14,258</i>	<i>16,109</i>
Non-metal (excluding fuel) mining(b) .. .. .	1,283	1,454	588	1,274	704
<i>Total, All Mining</i> .. .. .	<i>18,663</i>	<i>23,044</i>	<i>20,272</i>	<i>22,707</i>	<i>28,032</i>
Construction material quarrying(b) .. .. .	825	1,408	1,624	2,281	1,951
<b>Total, All Mining and Quarrying</b> .. .. .	<b>19,488</b>	<b>24,452</b>	<b>21,896</b>	<b>24,988</b>	<b>29,983</b>

(a) Excludes mines and quarries employing less than four persons.  
para. 1. Sources and Scope of Statistics, p. 1136.

(b) Incomplete. See

7. Mineral Production.—(i) *Quantity of Principal Minerals Produced.* In the following table, particulars of the quantity of the principal minerals produced during 1962 are shown for each State and the Northern Territory.

**QUANTITY OF PRINCIPAL MINERALS PRODUCED, 1962**

Mineral	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	Aust.
<b>METALLIC MINERALS</b>								
Antimony ore and concentrate tons	99	1	(a)	..	..	..	..	100
Bauxite .. .. .	5,225	4,413	19,909	..	..	..	..	29,547
Beryllium ore .. .. .	10	..	..	18	195	..	..	223
Copper ore(b) .. .. .	32	73	90,705	..	9,275	9,882	800	110,777
Copper concentrate .. .. .	642	..	308,862	..	5,277	49,361	31,285	395,427
Copper precipitate .. .. .	136	..	14	..	..	13	53	216
Gold(c) .. .. . oz.	488	(d)	(d)	(d)	(d)	453	(d)	(d)
Ilmenite concentrate .. .. . tons	4,288	..	..	..	175,206	..	..	179,494
Iron ore(e) .. .. . '000 tons	..	..	..	3,439	1,404	..	..	4,843
Lead ore(f) .. .. . tons	328	..	12,869	..	..	..	..	13,197
Lead concentrate .. .. .	384,535	..	123,556	..	443	13,742	..	522,276
Lead-copper concentrate .. .. .	..	..	..	..	..	11,192	..	11,192
Manganese ore .. .. .	583	..	2,880	..	67,871	..	312	71,646
Pyrite concentrate .. .. .	4,130	..	12,960	73,642	49,461	8,373	..	148,566
Rutile concentrate .. .. .	80,171	..	38,501	..	523	..	..	119,195
Tantalite-columbite concentrate lb.	..	..	..	..	43,097	..	..	43,097
Tin concentrate .. .. . tons	293	11	1,505	..	465	1,507	61	3,842
<b>Tungsten concentrates—</b>								
Scheelite concentrate .. .. .	..	..	..	..	7	988	..	995
Wolfram concentrate .. .. .	..	..	2	..	..	488	2	492
Zinc concentrate .. .. .	428,282	..	63,967	..	..	80,651	..	572,900
Zircon concentrate .. .. .	91,298	..	38,815	..	3,731	..	..	133,844

NOTE.—For footnotes see next page.

## QUANTITY OF PRINCIPAL MINERALS PRODUCED, 1962—continued

Mineral	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	Aust.
<b>FUEL MINERALS</b>								
Coal, black—								
Semi-anthracite .. '000 tons	..	..	68	..	..	2	..	70
Bituminous .. .. "	19,031	57	2,648	..	..	270	..	22,006
Sub-bituminous .. .. "	..	..	83	1,392	919	..	..	2,394
<i>Total</i> .. .. "	19,031	57	2,799	1,392	919	272	..	24,470
Coal, brown (lignite) .. .. "	..	17,137	..	..	..	..	..	17,137

## NON-METALLIC (EXCLUDING FUEL) MINERALS

Asbestos .. .. short tons	866	..	..	..	17,550	..	..	18,416
Barite .. .. .. tons	435	..	..	11,605	494	..	..	12,534
Clays—								
Brick clay and shale .. '000 tons	1,966	1,181	316	338	441	141	..	4,383
Other(g) .. .. .. "	623	140	3	68	48	31	..	913
Diatomite .. .. .. tons	4,318	770	2,209	..	15	..	..	7,312
Dolomite(h) .. .. .. "	4,919	..	3,708	169,853	..	2,217	..	180,697
Felspar .. .. .. "	5,925	..	..	1,321	1,267	..	..	8,513
Gypsum .. .. .. "	71,802	78,728	..	428,730	51,650	..	..	630,910
Limestone(h) .. .. '000 tons	2,432	1,214	(i)	1,400	(i)	319	..	6,415
Magnesite .. .. .. tons	61,672	..	..	295	224	..	..	62,191
Phosphate rock .. .. .. "	..	..	..	4,317	68	..	..	4,385
Salt, crude .. .. .. "	..	(i)	(i)	389,597	(i)	..	890	536,019
Silica (glass, chemical, etc.) (g) ..	158,619	..	25,614	23,446	10,351	514	..	218,544
Talc .. .. .. .. "	1,071	..	..	8,008	4,981	..	..	14,060

## CONSTRUCTION MATERIALS(g)

Sand .. .. .. .. '000 tons	2,957	2,797	n.a.	1,516	n.a.	98 (j)	167	7,535
River gravel and gravel boulders .. .. "	1,492	2,943	n.a.	747	n.a.	646 (j)	84	5,912
Dimension stone .. .. "	197	9	3	37	128	1 (j)	4	379
Crushed and broken stone .. .. "	3,947	11,205	2,363	8,302	1,320	617 (j)	190	27,944
Other (decomposed rock, etc.) ..	15,491	1,713	n.a.	n.a.	n.a.	106	n.a.	17,310

(a) Less than one half ton. (b) Includes cupreous ore for fertilizer. (c) Bullion, alluvial, retorted gold, etc. (d) Gross weight not available. (e) Iron oxide for metal extraction. (f) Includes lead-silver-zinc ore. (g) Incomplete, see para 1. Source and Scope of Statistics, p. 1136. (h) Excludes quantities used directly as a building or road material. (i) Not available for publication. (j) Includes Australian Capital Territory which is not available for separate publication.

NOTE.—Particulars of uranium concentrate produced are not available for publication and are excluded.

(ii) *Quantities of Principal Minerals Produced, Australia.* The following table shows the quantities of the principal minerals produced in Australia during the years 1958 to 1962.

## QUANTITIES OF PRINCIPAL MINERALS PRODUCED: AUSTRALIA

Mineral		1958	1959	1960	1961	1962
<b>METALLIC MINERALS</b>						
Antimony ore and concentrate ..	tons	1,116	1,022	256	190	100
Bauxite .. .. .	"	6,909	14,985	69,435	15,976	29,547
Beryllium ore .. .. .	"	247	317	190	306	223
Chromite .. .. .	"	776	120	529	..	369
Copper ore(a) .. .. .	"	58,109	77,738	68,321	75,215	110,777
Copper concentrate .. .. .	"	279,976	358,774	432,758	373,770	395,427
Copper precipitate .. .. .	"	1,536	1,379	1,301	825	216
Gold concentrate .. .. .	"	1,855	1,487	43	1	..
Gold—other forms(b) .. .. .	oz.	(c)	(c)	(c)	(c)	(c)
Ilmenite concentrate .. .. .	tons	69,948	83,577	106,586	166,400	179,494
Iron ore(d) .. .. .	'000 tons	3,917	4,141	4,355	5,342	4,843
Lead ore(e) .. .. .	tons	21,854	12,693	13,716	7,743	13,197
Lead concentrate .. .. .	"	492,908	461,055	449,590	382,292	522,276
Lead-copper concentrate .. .. .	"	7,630	6,010	6,797	8,057	11,192
Manganese ore .. .. .	"	59,683	89,971	60,646	87,411	71,646
Pyrite concentrate .. .. .	"	226,744	223,004	238,630	213,423	148,566
Rutile concentrate .. .. .	"	83,328	81,905	88,637	101,431	119,195
Tantalite-columbite concentrate .. .. .	lb.	13,507	18,950	23,677	31,808	43,097
Tin concentrate .. .. .	tons	3,128	3,304	3,099	3,870	3,842
Tungsten concentrates—						
Scheelite concentrate .. .. .	"	733	1	420	1,017	995
Wolfram concentrate .. .. .	"	517	903	1,131	1,142	492
Zinc concentrate .. .. .	"	503,752	473,276	549,000	542,640	572,900
Zircon concentrate .. .. .	"	59,269	113,356	102,362	136,462	133,844
<b>FUEL MINERALS</b>						
Coal, black—						
Semi-anthracite .. .. .	'000 tons	57	54	50	59	70
Bituminous .. .. .	"	18,616	18,576	20,641	21,991	22,006
Sub-bituminous .. .. .	"	1,769	1,668	1,878	1,956	2,394
<i>Total</i> .. .. .	"	20,442	20,298	22,569	24,006	24,470
Coal, brown (lignite) .. .. .	"	11,644	13,035	14,967	16,279	17,137
<b>NON-METALLIC (EXCLUDING FUEL) MINERALS</b>						
Asbestos .. .. .	short tons	15,568	17,875	15,613	16,746	18,416
Barite .. .. .	tons	6,802	6,214	11,417	19,217	12,534
Clays—						
Brick clay and shale .. .. .	'000 tons	3,829	4,299	4,636	4,344	4,383
Other .. .. .	"	775	823	880	912	913
Diatomite .. .. .	tons	4,240	5,089	4,659	5,417	7,312
Dolomite(f) .. .. .	"	138,832	160,084	190,868	191,624	180,697
Felspar .. .. .	"	7,016	6,750	8,414	8,209	8,513
Gypsum .. .. .	"	504,938	516,791	580,878	609,907	630,910
Limestone(f) .. .. .	'000 tons	5,324	5,305	5,669	6,146	6,415
Magnesite .. .. .	tons	69,391	60,586	62,166	98,795	62,191
Mica—muscovite, trimmed .. .. .	lb.	42,479	44,665	9,500	..	..
Phosphate rock .. .. .	tons	7,421	4,775	2,321	4,874	4,385
Salt, crude .. .. .	"	429,534	467,532	463,296	508,657	536,019
Silica (glass, chemical, etc.) .. .. .	"	145,483	154,778	210,100	212,575	218,544
Talc .. .. .	"	15,393	16,376	15,670	13,545	14,060

NOTE.—For footnotes see next page.

QUANTITIES OF PRINCIPAL MINERALS PRODUCED: AUSTRALIA—*continued*

Mineral	1958	1959	1960	1961	1962
CONSTRUCTION MATERIALS(g)					
Sand .. .. . '000 tons	4,118	4,623	5,934	7,427	7,535
River gravel and gravel boulders .. .. . "	2,265	2,524	2,932	6,018	5,912
Dimension stone .. .. . "	272	283	318	533	379
Crushed and broken stone .. .. . "	15,542	19,822	22,530	27,303	27,944
Other (decomposed rock, etc.) .. .. . "	12,722	13,699	15,586	16,482	17,310

(a) Includes cupreous ore for fertilizer. (b) Bullion, alluvial, retorted gold, etc. (c) Gross weight not available. (d) Iron oxide for metal extraction. (e) Includes lead-silver-zinc ore. (f) Excludes quantities used directly as a building or road material. (g) Incomplete owing to difficulties of coverage. See para. 1. Sources and Scope of Statistics, p. 1136. 1961 and later figures are not comparable with previous years owing to extension of coverage in Victoria.

NOTE.—Particulars of production of uranium oxide (U<sub>3</sub>O<sub>8</sub>) are not available for publication.

(iii) *Contents of Metallic Minerals Produced.* The following table shows the contents of metallic minerals produced in 1962 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, 1962

Content of metallic minerals produced	N.S.W.	Vic.	Q'land	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Alumina (Al <sub>2</sub> O <sub>3</sub> ) .. .. . tons	1,991	2,300 (a)	8,959	..	..	..	..	(b)13,250
Antimony .. .. . "	874	(c)	(c)	..	..	..	..	874
Beryllium oxide (BeO) .. .. . unit(d)	130	..	..	233	2,223	..	..	2,586
Bismuth .. .. . lb.	..	..	..	..	97	..	..	97
Cadmium .. .. . tons	920	..	..	..	..	72	..	992
Cobalt .. .. . "	77	..	..	..	..	1	..	78
Copper .. .. . "	3,747	10	79,242	2	1,488	14,515	7,968	106,972
Gold .. .. . fine oz.	11,234	28,262	67,729	48	860,039	32,115	69,410	1,068,837
Iron(e) .. .. . '000 tons	..	..	..	(a) 2,236	883	..	..	(b) 3,119
Lead .. .. . tons	292,381	..	62,669	..	306	14,754	..	370,118
Manganese(f) .. .. . "	..	..	1,296	..	32,862	..	..	34,150
Manganese dioxide (MnO <sub>2</sub> )(g) .. .. . tons	424	..	..	..	152	..	188	764
Molybdenum disulphide (MoS <sub>2</sub> ) .. .. . lb.	..	..	(a) 2,332	..	..	..	..	(a) 2,332
Monazite .. .. . tons	136	..	66	..	570	..	..	772
Platinum .. .. . oz.	2	..	..	..	..	..	..	2
Silver .. .. . '000 fine oz.	9,929	1	5,601	..	218	1,700	105	17,554
Sulphur(h) .. .. . tons	196,793	..	(b)27,151 (a)29,092 (b)23,209	..	..	36,558	..	b 312,803
Tantalite .. .. . columbite (Ta <sub>5</sub> O <sub>8</sub> +Nb <sub>5</sub> O <sub>8</sub> ) .. .. . lb.	..	..	..	..	18,879	..	..	18,879
Tin .. .. . tons	212	7	1,077	..	323	1,058	38	2,715
Titanium dioxide (TiO <sub>2</sub> ) .. .. . tons	79,157	..	37,472	..	98,865	..	..	215,494
Tungstic oxide (WO <sub>3</sub> ) .. .. . tons	..	..	1	..	5	1,035	1	1,042
Zinc .. .. . "	244,863	..	44,704	47	..	47,918	..	337,532
Zircon .. .. . "	89,947	..	38,468	..	3,694	..	..	132,109

(a) Estimated. (b) Partly estimated. (c) Less than one half ton. (d) 1 unit = 22.4 lb. (e) Excludes iron content of iron oxide not intended for metal extraction. (f) Content of metallurgical grade manganese ore. (g) Content of manganese ore of other than metallurgical grade. (h) Sulphur content of pyrite and other minerals from which sulphur is extracted.

NOTE.—Particulars of production of uranium oxide (U<sub>3</sub>O<sub>8</sub>) are not available for publication.

(iv) *Contents of Metallic Minerals Produced in Australia.* Particulars of the contents of metallic minerals produced in Australia in the years 1958 to 1962 are shown in the following table. Graphs showing details of the mine production of principal metals and coal from 1935 to 1963 may be found on pages 1147-8.

### CONTENTS OF METALLIC MINERALS PRODUCED: AUSTRALIA

Content of metallic minerals produced	1958	1959	1960	1961	1962
Alumina (Al <sub>2</sub> O <sub>3</sub> ) .. tons	3,533	6,914	31,393	7,464	13,250
Antimony .. "	1,356	1,280	786	680	874
Beryllium oxide (BeO) units(b)	2,900	3,587	2,221	3,585	2,586
Bismuth .. lb.	2,328	..	..	602	97
Cadmium .. tons	872	860	949	907	992
Chromic oxide (Cr <sub>2</sub> O <sub>3</sub> )(c)	386	60	265	..	185
Cobalt .. "	71	60	65	65	78
Copper .. "	75,715	94,950	109,435	95,626	106,972
Gold .. fine oz.	1,103,980	1,085,104	1,086,709	1,076,292	1,068,837
Iron(d) .. '000 tons	2,539	2,700	2,814	3,434	3,119
Lead .. tons	328,347	316,293	308,163	269,656	370,110
Manganese(e)	25,623	40,966	28,585	40,989	34,158
Manganese dioxide (MnO <sub>2</sub> )(f)	2,819	2,475	1,617	1,104	764
Molybdenum disulphide (MoS <sub>2</sub> ) .. lb.	(c) 8,568	..	..	2,630	(c) 2,332
Monazite .. tons	423	331	344	1,463	772
Osmiridium .. oz.	43	3	..	..	..
Platinum .. "	22	..	4	2	2
Silver .. '000 fine oz.	16,340	15,161	15,216	13,059	17,554
Sulphur(a)(g) .. tons	322,619	310,545	340,000	324,866	312,803
Tantalite-columbite (Ta <sub>2</sub> O <sub>5</sub> + Nb <sub>2</sub> O <sub>5</sub> ) .. lb.	6,736	8,499	11,500	13,814	18,879
Tin .. tons	2,237	2,351	2,202	2,745	2,715
Titanium dioxide (TiO <sub>2</sub> ) .. "	119,233	125,301	144,744	191,965	215,494
Tungstic oxide (WO <sub>3</sub> ) .. "	850	653	1,111	1,536	1,042
Zinc .. "	293,708	275,411	317,489	311,157	337,532
Zircon .. "	58,745	112,352	101,494	134,483	132,109

(a) Partly estimated. (b) 1 unit = 22.4 lb. (c) Estimated. (d) Iron oxide for metal extraction. Partly estimated. (e) Content of metallurgical grade manganese ore. (f) Content of manganese ore of other than metallurgical grade. (g) Sulphur content of pyrite and other minerals from which sulphur is extracted.

NOTE.—Particulars of production of uranium oxide (U<sub>3</sub>O<sub>8</sub>) are not available for publication.

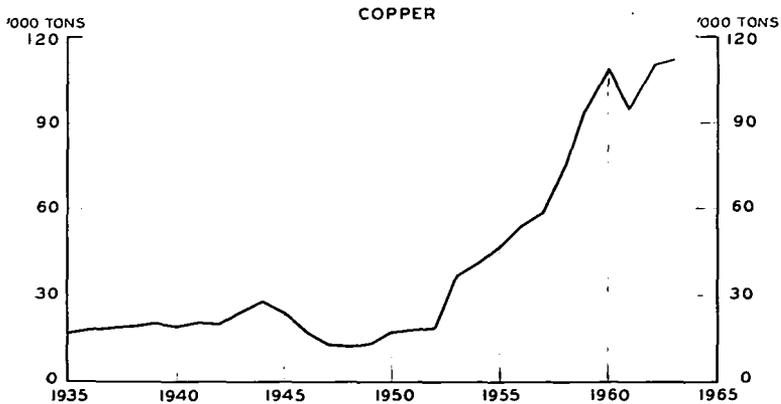
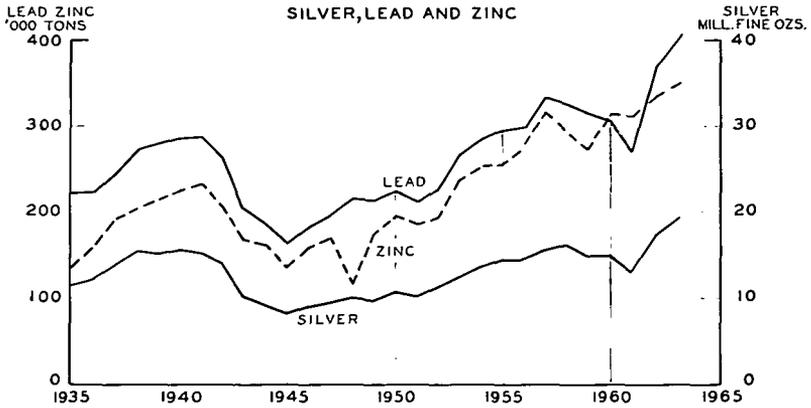
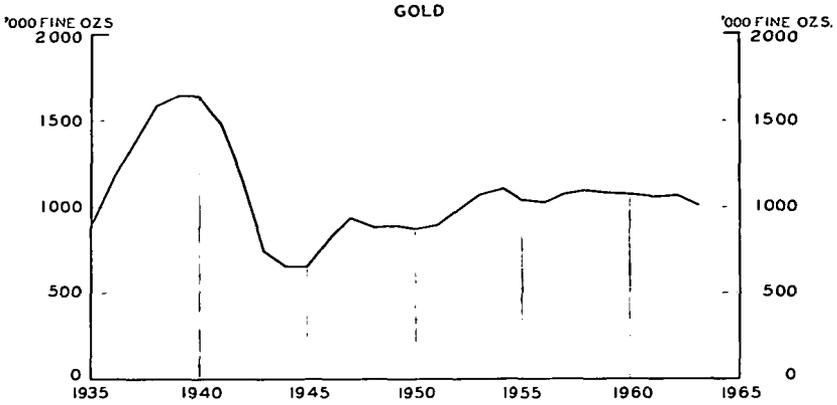
### § 3. Gold

1. **Historical.**—A brief history of gold-mining in Australia may be found in previous issues of the Year Book (see No. 48, p. 1059).

2. **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.

MINE PRODUCTION OF PRINCIPAL METALS  
(METALLIC CONTENT OF MINERALS)

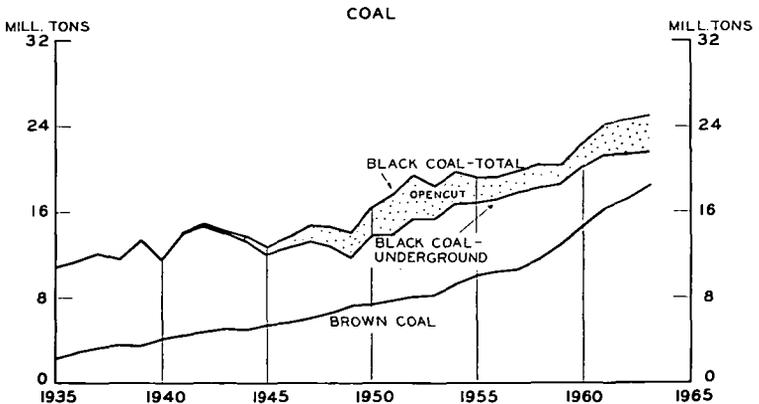
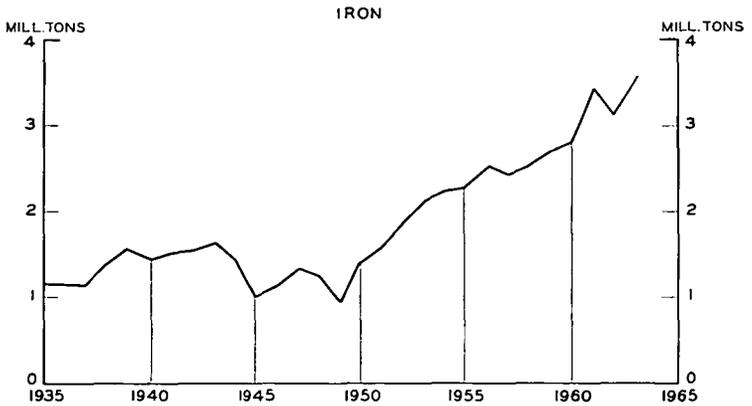
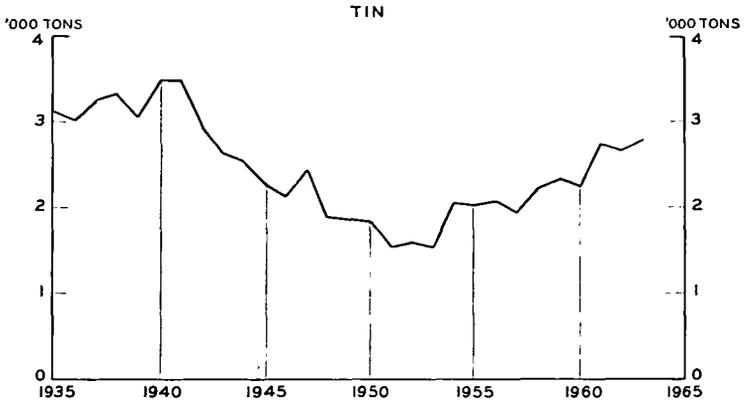
AUSTRALIA, 1935 TO 1963



MINE PRODUCTION OF PRINCIPAL METALS  
AND PRODUCTION OF COAL

(METALLIC CONTENT OF MINERALS)

AUSTRALIA, 1935 TO 1963



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 following table shows the mine production of gold (gold content of minerals produced) during 1962 according to the mineral in which it was contained and the State or Territory of origin. A small quantity of gold recovered from pyrite concentrate produced at Kalgoorlie, Western Australia, for sulphuric acid manufacture is included with gold ore, concentrate, etc.

GOLD: MINE PRODUCTION, 1962  
(Fine oz.)

Mineral in which contained	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	Aust.
Copper ore, concentrate, etc. ..	302	..	53,085	..	2,679	7,453	15,285	78,804
Gold ore, concentrate, etc. ..	432	28,262	14,644	48	857,360	414	54,125	955,285
Lead concentrate ..	8,902	..	..	..	..	3,384	..	12,286
Lead-copper concentrate ..	..	..	..	..	..	18,021	..	18,021
Zinc concentrate ..	1,598	..	..	..	..	2,843	..	4,441
<b>Total Gold ..</b>	<b>11,234</b>	<b>28,262</b>	<b>67,729</b>	<b>48</b>	<b>860,039</b>	<b>32,115</b>	<b>69,410</b>	<b>1,068,837</b>

The principal sources of production during 1962 were as follows.

(i) *New South Wales.* Most of the gold produced during 1962 was contained in lead and zinc concentrates produced at Broken Hill.

(ii) *Victoria.* At Chewton, near Castlemaine, one mine produced almost half of the State's production. Two other gold mines located in eastern Victoria produced the bulk of the remainder.

(iii) *Queensland.* The copper concentrate produced at Mount Morgan contained more than three-quarters of the State's output of gold, nearly all the remaining production coming from a mine at Cracow.

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

(v) *Western Australia.* More than half the total production came from the East Coolgardie goldfield, while most of the remaining production came from the Dundas, Murchison and Yilgarn goldfields. A single mine at Fimiston maintained its position as the largest gold producer in Australia, mining 181,095 fine oz. during 1962, and three other mines each produced over 100,000 fine oz. in the same period.

(vi) *Tasmania.* Lead-copper, lead and zinc concentrates milled at Rosebery contained more than three-quarters of the gold produced in Tasmania during 1962, nearly all the remaining production being contained in copper concentrate produced at Mount Lyell.

(vii) *Northern Territory.* Gold production is centred around Tennant Creek.

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 year 1959 to 1963 and total output since the first major discovery of gold in 1851. Owing to defective information in the earlier years, it is likely that the total production figures fall considerably short of the actual totals.

## GOLD: MINE PRODUCTION(a)

State or Territory	1959	1960	1961	1962	1963(b)	Total(b) 1851-1963
	f. oz.	'000 f. oz.				
New South Wales ..	13,275	13,628	12,034	11,234	11,604	16,458
Victoria ..	34,662	28,566	26,229	28,262	24,744	73,757
Queensland ..	91,687	78,267	64,786	67,729	67,534	22,888
South Australia ..	16	36	55	48	16	451
Western Australia ..	860,969	869,966	870,658	860,039	802,860	64,160
Tasmania ..	21,353	23,994	26,885	32,115	36,181	2,495
Northern Territory ..	63,142	72,252	75,645	69,410	79,738	1,607
<b>Australia ..</b>	<b>1,085,104</b>	<b>1,086,709</b>	<b>1,076,292</b>	<b>1,068,837</b>	<b>1,022,677</b>	<b>181,816</b>

(a) Gold content of minerals produced.

(b) Subject to revision.

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 1959 to 1963. The value of the refined newly-won gold is based on the price fixed by the Reserve 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	1959	1960	1961	1962	1963
-------------	------	------	------	------	------

## QUANTITY (FINE OZ.)

Australian origin—					
Newly-won gold .. ..	1,067,129	1,045,139	1,036,947	1,024,623	958,381
From scrap .. ..	20,617	22,699	22,593	21,806	20,404
Overseas origin—					
Newly-won gold .. ..	141,624	142,526	155,598	138,455	161,083
From scrap .. ..	1,075	1,164	1,277	188	290
<b>Total .. ..</b>	<b>1,230,445</b>	<b>1,211,528</b>	<b>1,216,415</b>	<b>1,185,072</b>	<b>1,140,158</b>

## VALUE (£'000) (a)

<i>Newly-won gold of Australian origin .. ..</i>	<i>16,677</i>	<i>16,396</i>	<i>16,241</i>	<i>16,021</i>	<i>14,997</i>
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(a) Based on the price fixed by the Reserve Bank. Includes allowance for premiums on sales of gold overseas and for industrial purposes in Australia.

5. Changes in Stocks of Gold held in Australia.—The following table shows particulars of production and consumption, imports and exports of gold and changes in stocks of gold held in Australia for each of the years 1959 to 1963.

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

Particulars	1959	1960	1961	1962	1963 (a)
Mine production of gold(b) ..	1,085,104	1,086,709	1,076,292	1,068,837	1,022,677
Imports of gold(c)(d) ..	136,674	144,033	146,279	132,963	162,065
<i>Total</i> .. ..	<i>1,221,778</i>	<i>1,230,742</i>	<i>1,222,571</i>	<i>1,201,800</i>	<i>1,184,742</i>
Exports of gold(c) .. ..	128,052	2,513,906	1,099,701	314,996	472,132
Gold content of ores and concentrates exported ..	17,941	25,803	39,835	44,166	50,683
Net industrial consumption of gold .. ..	33,938	40,972	35,429	47,881	61,042
<i>Total</i> .. ..	<i>179,931</i>	<i>2,580,681</i>	<i>1,174,965</i>	<i>407,043</i>	<i>583,857</i>
Changes in stocks of gold held in Australia(e) .. ..	+1,041,847	-1,349,939	+ 47,606	+ 794,757	+ 600,885

(a) Subject to revision. (b) Gold content of minerals produced in Australia. (c) Includes gold contained in matte. Excludes specie, leaf and foil and gold in unrefined forms other than the gold content of unrefined gold and silver bullion. (d) Excludes gold imported in some minor minerals. (e) Includes changes in holdings in Australia by official and banking institutions both on their own behalf and that of non-residents, together with the gold content of change in stocks of minerals awaiting refining. The sign near the figure indicates increase (+) or decrease (-) in stocks during the period shown.

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

Average prices of gold per fine oz. at mints in Australia and on the London gold market are shown in the following table for the years 1959 to 1963.

PRICES OF GOLD: AUSTRALIA AND LONDON  
(per fine oz.)

Place of sale	1959	1960	1961	1962	1963
At mints in Australia £A. s. d.	15 12 6	15 12 6	15 12 6	15 12 6	15 12 6
London .. fstg. s. d.	12 9 10½	12 11 2½	12 11 0	12 10 1	12 10 6½

7. Sales of Gold on Oversea Premium Markets.—In November, 1951, the Commonwealth Government decided to allow Australian gold producers to benefit from the higher prices then being paid for gold on some overseas markets. To implement this decision, producers formed the Gold Producers' Association Limited in December, 1951, and the first sales were made in that month. By arrangement with the Reserve Bank of Australia, the total quantity of newly-won gold delivered to the Bank by members of the Association in any calendar month, less the quantity required for industrial purposes in Australia, is available to the Association for sale on overseas premium markets during the ensuing two calendar months. The net proceeds from premium sales are distributed to members in proportion to their production of gold.

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 1959 to 1963.

### GOLD SOLD ON OVERSEA PREMIUM MARKETS

Particulars	Unit	1959	1960	1961	1962	1963
Quantity ..	fine oz.	37,346	320,151	733,217	320,323	512,805
Value ..	£A. f.o.b.	584,129	5,049,183	11,513,571	5,016,625	8,028,227
Average price ..	£A. s. d.	15 12 9 $\frac{3}{4}$	15 15 5	15 14 0 $\frac{1}{2}$	15 13 2 $\frac{1}{2}$	15 13 1 $\frac{1}{2}$

8. *Gold Subsidy*.—Details of amounts paid under the provisions of the *Gold Mining Industry Assistance Act 1954–1962* for the years 1959 to 1963 are shown in the following table. Particulars of this Act and other legislation are given in para. 3 (i) (b) on page 1133.

### 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
1959 .. ..	107	41,500	2,937	55	652,266	..	39,181	52,449	788,495
1960 .. ..	14	45,881	881	35	698,242	..	4,253	65,292	814,598
1961 .. ..	145	63,036	1,325	..	585,306	..	4,930	44,758	699,500
1962 .. ..	61	50,579	2,134	97	621,573	18	1,235	72,812	748,509
1963 .. ..	463	43,267	2,488	..	669,782	12	288	42,896	759,196

9. *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 1958 to 1962 are shown in the following table.

### GOLD: PRODUCTION IN PRINCIPAL COUNTRIES

(Source: Division of Minerals, United States Bureau of Mines)

('000 fine oz.)

Country	1958	1959	1960	1961	1962
South Africa .. ..	17,656	20,066	21,383	22,942	25,492
U.S.S.R.(a) .. ..	10,000	10,000	11,000	11,800	12,200
Canada .. ..	4,571	4,483	4,629	4,474	4,156
United States of America .. ..	1,759	1,635	1,680	1,567	1,556
Australia .. ..	1,104	1,085	1,087	1,076	1,069
Ghana .. ..	853	913	893	853	888
Rhodesia and Nyasaland .. ..	559	572	568	574	558
Philippines .. ..	423	403	411	424	423
Colombia .. ..	372	398	434	410	397
Japan .. ..	261	262	261	295	286
<i>Estimated World Total</i> .. ..	40,600	42,800	45,300	47,400	50,000

(a) Estimated.

## § 4. Lead, Silver and Zinc

1. **Historical.**—A brief history of silver-lead-zinc mining in Australia may be found in previous issues of the Year Book (see No. 48, p. 1065).

2. **Methods of Mining and Treatment.**—All the lead-zinc production from the large mines is obtained by underground mining. The lead-zinc sulphides mined are concentrated by differential flotation to produce separate lead and zinc concentrates, with the lead concentrate containing most of the silver.

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

LEAD, SILVER AND ZINC: CONTENT OF ORES AND CONCENTRATES PRODUCED, 1962

Mineral in which contained	N.S.W.	Vic.	Q'land	S.A.	W. Aust.	Tas.	N.T.	Aust.
<b>LEAD (tons)</b>								
Lead ore(a) ..	51	..	784	..	..	..	..	835
Lead concentrate ..	289,090	..	60,332	..	306	8,056	..	357,784
Lead-copper concentrate ..	..	..	..	..	..	4,228	..	4,228
Zinc concentrate ..	3,240	..	1,553	..	..	2,470	..	7,263
<i>Total Lead</i> ..	<i>292,381</i>	<i>..</i>	<i>62,669</i>	<i>..</i>	<i>306</i>	<i>14,754</i>	<i>..</i>	<i>370,110</i>
<b>SILVER (fine oz.)</b>								
Copper ore ..	61	..	..	..	..	12,308	..	12,369
Copper concentrate ..	6,370	..	630,766	..	6,421	72,605	105,095	821,257
Copper precipitate ..	..	..	..	..	..	1	..	1
Gold concentrate, etc. ..	35	472	13,059	..	211,733	..	24	225,323
Lead ore(a) ..	6,560	..	33,477	..	..	..	..	40,037
Lead concentrate ..	9,643,454	..	4,720,061	..	212	387,926	..	14,751,653
Lead-copper concentrate ..	..	..	..	..	..	994,880	..	994,880
Silver-copper concentrate ..	10,303	..	..	..	..	..	..	10,303
Zinc concentrate ..	262,396	..	203,139	..	..	232,333	..	697,868
<i>Total Silver</i> ..	<i>9,929,179</i>	<i>472</i>	<i>5,600,502</i>	<i>..</i>	<i>218,366</i>	<i>1,700,053</i>	<i>105,119</i>	<i>17,553,691</i>
<b>ZINC (tons)</b>								
Lead concentrate ..	17,257	..	11,314	..	..	2,113	..	30,684
Lead-copper concentrate ..	..	..	..	..	..	1,423	..	1,423
Zinc ore ..	..	..	..	47	..	..	..	47
Zinc concentrate ..	227,606	..	33,390	..	..	44,382	..	305,378
<i>Total Zinc</i> ..	<i>244,863</i>	<i>..</i>	<i>44,704</i>	<i>47</i>	<i>..</i>	<i>47,918</i>	<i>..</i>	<i>337,532</i>

(a) Includes lead-silver-zinc ore.

The principal sources of production of lead, silver and zinc during 1962, were as follows.

(i) *New South Wales.* Lead and zinc concentrates, produced at Broken Hill, contained nearly all the New South Wales production of lead, silver and zinc. During 1962, New South Wales mines produced (in terms of the content of all ores and concentrates produced) more than three-quarters of Australia's lead, more than two-thirds of the zinc and more than half of the silver.

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

(iii) *Queensland.* Mount Isa produced all the lead and zinc concentrates in Queensland during 1962. These concentrates contained almost all of the State's production of lead and silver and all the zinc. Nearly all the remaining silver was contained in copper concentrates produced at Mount Isa and at Mount Morgan.

(iv) *South Australia.* A small quantity of zinc ore for fertilizer was mined during 1962; there was no mine production of lead or silver during the year.

(v) *Western Australia.* Nearly all the silver produced was obtained from gold bullion produced by the gold-mining industry. All the lead was contained in lead concentrate produced in the Northampton district. No zinc was produced during 1962.

(vi) *Tasmania.* All the lead, silver and zinc was produced from mines on the West Coast. All the zinc and most of the lead and silver were produced from mines at Rosebery and Williamsford and milled at Rosebery to produce separate lead, zinc, and lead-copper concentrates.

(vii) *Northern Territory.* Almost all the silver was contained in copper concentrates produced at Tennant Creek and Rum Jungle.

The table hereunder shows the quantities of lead, silver and zinc contained in minerals won in the several States and the Northern Territory during the years 1958 to 1962.

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

State or Territory	1958	1959	1960	1961	1962
LEAD (tons)					
New South Wales .. ..	246,896	246,449	235,868	211,679	292,381
Queensland .. ..	65,799	54,415	57,518	45,280	62,669
South Australia .. ..	13	8	..	..	..
Western Australia .. ..	1,854	1,382	1,739	433	306
Tasmania .. ..	13,785	14,039	13,038	12,253	14,754
Northern Territory .. ..	..	..	..	11	..
<i>Australia</i> .. ..	<i>328,347</i>	<i>316,293</i>	<i>308,163</i>	<i>269,656</i>	<i>370,110</i>
SILVER (fine oz.)					
New South Wales .. ..	8,992,293	8,555,203	8,397,889	7,447,957	9,929,179
Victoria .. ..	3,018	2,016	576	573	472
Queensland .. ..	5,710,031	4,953,209	5,121,700	3,882,784	5,600,502
South Australia .. ..	613	394	..	..	..
Western Australia .. ..	189,375	179,601	196,756	209,647	218,366
Tasmania .. ..	1,394,818	1,369,070	1,398,424	1,436,023	1,700,053
Northern Territory .. ..	49,664	101,138	100,611	82,182	105,119
<i>Australia</i> .. ..	<i>16,339,812</i>	<i>15,160,631</i>	<i>15,215,956</i>	<i>13,059,166</i>	<i>17,553,691</i>

LEAD, SILVER AND ZINC: CONTENT OF ORES AND CONCENTRATES  
PRODUCED—*continued*

State or Territory	1958	1959	1960	1961	1962
ZINC (tons)					
New South Wales .. ..	227,440	216,993	248,164	237,834	244,863
Queensland .. ..	29,538	23,468	34,775	33,219	44,704
South Australia .. ..	113	..	35	12	47
Western Australia .. ..	20	..	..	..	..
Tasmania .. ..	36,597	34,950	34,515	40,092	47,918
Northern Territory .. ..	..	..	..	(a)	..
<i>Australia</i> .. ..	<i>293,708</i>	<i>275,411</i>	<i>317,489</i>	<i>311,157</i>	<i>337,532</i>

(a) Less than one half ton.

4. Smelter and Refinery Production.—(i) *Lead.* The bulk of 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 extracted as refined products. Cadmium is contained in the smelter fumes and is extracted. 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 recovered in various products which are sent to copper refineries for copper extraction.

In 1961, a new smelter was commissioned at Cockle Creek, New South Wales. It draws its supplies of lead and zinc concentrates from Broken Hill. This plant is unique in Australia in that the zinc content of lead concentrate is recovered. Previously this zinc content had accumulated in lead smelter slags. The bullion produced at this plant is exported for treatment while most of the refined zinc is used domestically. Sulphuric acid and cadmium are recovered as by-products. Some of the Broken Hill concentrate not treated at Port Pirie and Cockle Creek is exported for treatment overseas.

Lead ore and concentrate produced at Mount Isa is smelted at the mine to derive a lead bullion which is rich in silver. All 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 concentrates produced in Tasmania and lead concentrates produced in Western Australia are exported for smelting and refining overseas.

(ii) *Zinc.* A large proportion of the zinc concentrate produced at Broken Hill is exported, and the remainder is either shipped from Port Pirie to Risdon, near Hobart, or railed to Cockle Creek for smelting and 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.

Zinc concentrate produced at Mount Isa is refined overseas.

The following table gives, for the years 1958 to 1962, particulars of the production and sales of refined primary lead, silver and zinc as recorded from data received from the Bureau of Mineral Resources.

## REFINED LEAD, SILVER AND ZINC: PRODUCTION, SALES AND EXPORTS, AUSTRALIA

Particulars	1958	1959	1960	1961	1962
<b>LEAD (tons)</b>					
<b>Refined lead—</b>					
Production(a) .. .. .	191,474	185,805	189,823	162,264	190,125
Domestic sales(a) .. .. .	39,600	31,900	32,700	24,400	26,500
Exports .. .. .	155,730	138,448	125,265	145,174	197,049
<b>Silver-lead bullion (lead content)—</b>					
Production(a) .. .. .	57,171	50,310	52,723	48,090	73,110
Exports .. .. .	57,661	52,650	49,305	45,767	75,482
<b>SILVER ('000 fine oz.)</b>					
Production(a) .. .. .	9,101	7,805	8,085	7,099	7,378
Domestic sales(a) .. .. .	4,184	4,775	5,284	6,362	6,851
Exports .. .. .	4,876	3,001	2,800	1,055	346
<b>ZINC (tons)</b>					
Production(a) .. .. .	114,773	116,461	120,230	138,694	167,928
Domestic sales(a) .. .. .	72,844	78,753	90,240	76,295	82,047
Exports .. .. .	37,938	41,606	27,443	46,472	91,215

(a) Source: Bureau of Mineral Resources.

5. Prices of Lead, Silver and Zinc.—The following table shows average prices of lead, silver and zinc in Australia and on the London Metal Exchange during the years 1959 to 1963.

## AVERAGE PRICES OF LEAD, SILVER AND ZINC

Particulars	1959	1960	1961	1962	1963
<b>Australian prices, in Australian currency—</b>					
Lead, per ton(a) .. £	100	100	99	82	85
Silver, per fine oz.(b) s. d.	8 2½	8 3½	8 4½	9 6½	11 5
Zinc, per ton(c) .. £	105	113	102	100	111
<b>London Metal Exchange prices, in sterling—</b>					
Lead, per ton .. £	72	72	65	57	63
Silver, per fine oz. s. d.	6 7	6 7½	6 7½	7 7½	9 2
Zinc, per ton .. £	80	88	78	68	76

(a) Soft pig lead, f.o.b. Port Pirie.  
from London Metal Exchange prices.  
s.l.f. Sydney basis.

(b) Silver prices shown represent export parity calculated  
(c) Electrolytic zinc, f.o.b. Risdon for 1959-62, subsequently

6. Production in Principal Countries.—The following table shows, for the years 1958 to 1962, particulars of lead, silver and zinc production (mine basis) in principal producing countries, together with the estimated world total.

**LEAD, SILVER AND ZINC: MINE PRODUCTION IN PRINCIPAL COUNTRIES**  
(Source: Division of Minerals, United States Bureau of Mines)

Country	1958	1959	1960	1961	1962
<b>LEAD ('000 tons)</b>					
Australia .. .. .	328	316	308	270	370
U.S.S.R.(a) .. .. .	295	304	304	348	357
United States of America .. .. .	239	228	220	234	212
Mexico .. .. .	199	188	188	178	190
Canada .. .. .	167	167	184	163	189
Peru .. .. .	132	113	130	134	131
<i>Estimated World Total</i> .. .. .	<i>2,310</i>	<i>2,290</i>	<i>2,335</i>	<i>2,344</i>	<i>2,469</i>

<b>SILVER ('000 fine oz.)</b>					
Mexico .. .. .	47,592	44,075	44,526	40,349	41,249
United States of America .. .. .	34,111	31,194	30,766	34,794	36,798
Peru .. .. .	25,918	27,225	30,755	34,162	36,017
Canada .. .. .	31,163	31,924	34,017	31,382	30,669
U.S.S.R.(a) .. .. .	25,000	25,000	25,000	25,000	27,000
Australia .. .. .	16,340	15,161	15,216	13,059	17,554
Japan .. .. .	6,552	6,651	6,913	7,960	8,620
Germany, Eastern(a) .. .. .	4,800	4,800	4,800	4,800	4,800
Bolivia .. .. .	6,051	4,504	4,887	3,901	3,760
Congo .. .. .	3,794	4,768	3,963	3,473	1,190
<i>Estimated World Total</i> .. .. .	<i>239,000</i>	<i>221,900</i>	<i>240,500</i>	<i>236,500</i>	<i>242,400</i>

<b>ZINC ('000 tons)</b>					
United States of America .. .. .	368	380	389	415	451
Canada .. .. .	380	354	363	396	448
U.S.S.R.(a)(b) .. .. .	321	330	339	393	393
Australia .. .. .	294	275	317	311	338
Mexico .. .. .	221	260	258	265	247
Japan .. .. .	141	140	154	166	189
Peru .. .. .	133	141	175	171	164
Poland .. .. .	121	127	142	137	143
<i>Estimated World Total</i> .. .. .	<i>3,000</i>	<i>3,020</i>	<i>3,232</i>	<i>3,366</i>	<i>3,455</i>

(a) Estimated.

(b) Smelter production.

## § 5. Copper

1. **Historical.**—A brief history of copper-mining in Australia may be found in previous issues of the Year Book (see No. 48, p. 1070).

2. **Assistance to the Copper Mining Industry.**—For particulars, see para. 3(i)(c), page 1133.

3. **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 open-cut methods at Mount Morgan, Mount Isa and Mount Lyell and by underground methods at Mount Isa and Ravensthorpe (Western Australia). Oxidized copper ore is mined at Mount 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 contained in it to be recovered by flotation. At Mount Lyell and Mount Morgan, the tailings from the copper flotation are subjected to a further flotation and a pyrite concentrate is produced. The oxidized ore mined at Mount Isa has, in the past, been fed direct to the smelter for fluxing purposes, but in 1962 some was concentrated. As part of the programme to develop a new open-cut operation at Mount Isa, large amounts of this oxidized ore have been removed but only material actually smelted or concentrated is recorded as current production.

4. **Mine Production.**—The following table shows for 1962 the copper content of all minerals produced in the several States and the Northern Territory.

**COPPER: CONTENT OF ORES AND CONCENTRATES PRODUCED, 1962**  
(Tons)

Mineral in which contained	N.S.W.	Vic.	Q'land	S. Aust.	W. Aust.	Tas.	N.T.	Aust.
Copper ore, concentrate, and precipitate ..	253	10	78,307	2	1,488	13,229	7,968	101,257
Lead concentrate ..	3,095	..	935	..	..	80	..	4,110
Lead-copper concentrate ..	..	..	..	..	..	961	..	961
Silver-copper concentrate ..	4	..	..	..	..	..	..	4
Zinc concentrate ..	395	..	..	..	..	245	..	640
<b>Total .. ..</b>	<b>3,747</b>	<b>10</b>	<b>79,242</b>	<b>2</b>	<b>1,488</b>	<b>14,515</b>	<b>7,968</b>	<b>106,972</b>

The following were the principal sources of copper during 1962.

- (i) *New South Wales.* Most of the copper produced was contained in lead and zinc concentrate milled at Broken Hill.
- (ii) *Victoria.* One mine produced a small quantity of copper ore during 1962.
- (iii) *Queensland.* Mount Isa was the most important copper producing centre in Australia, its 1962 output being almost 70 per cent. of the Australian total. The copper produced at Mount Isa is contained in copper sulphide concentrate, oxidized copper ore and lead concentrate. Copper concentrate produced at Mount Morgan contained most of the remainder of the State's production.
- (iv) *South Australia.* Only a small quantity of copper ore for fertilizer was produced during 1962.
- (v) *Western Australia.* Two-thirds of the copper mined was contained in copper concentrate produced at Ravensthorpe. The remainder was contained in copper ore won at various localities in the State for fertilizer manufacture.
- (vi) *Tasmania.* Most of the State's production was at Mount Lyell, where copper was contained in copper concentrate, ore and precipitate. Lead-copper concentrate and lead concentrate milled at Rosebery contained the remainder of Tasmania's production.
- (vii) *Northern Territory.* Copper concentrate from Tennant Creek and copper concentrate and precipitate from Rum Jungle contained almost all of the Territory's output of copper.

The table hereunder shows the quantities of copper contained in minerals produced in the several States and the Northern Territory during the years 1958 to 1962.

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

State or Territory	1958	1959	1960	1961	1962
New South Wales .. ..	4,023	3,728	3,572	3,510	3,747
Victoria .. ..	..	14	..	8	10
Queensland .. ..	50,511	66,798	82,753	66,505	79,242
South Australia .. ..	1	16	5	2	2
Western Australia .. ..	1,107	2,197	1,661	2,206	1,488
Tasmania .. ..	11,413	12,244	11,680	12,743	14,515
Northern Territory .. ..	8,660	9,953	9,764	10,652	7,968
<b>Australia .. ..</b>	<b>75,715</b>	<b>94,950</b>	<b>109,435</b>	<b>95,626</b>	<b>106,972</b>

5. **Smelter and Refinery Production of Copper.**—Most of the copper concentrate milled in Australia is smelted locally, blister copper being produced at Mount Isa, Mount Morgan, Mount Lyell and Port Kembla.

Blister copper smelted at Mount Isa is railed to Townsville for electrolytic refining. Mount Lyell blister copper is electrolytically refined at Mount Lyell and the bulk is re-melted and cast into primary shapes at Port Kembla. Mount Morgan blister copper is shipped to Port Kembla, where together with blister produced at Port Kembla, it is refined. All refined copper now produced in Australia is processed electrolytically.

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

In the following table, details are given of the production of blister copper, and the production and exports of refined copper for the years 1958 to 1962.

#### METALLIC COPPER: PRODUCTION AND EXPORTS, AUSTRALIA

(Source: Bureau of Mineral Resources)

(Tons)

Particulars	1958	1959	1960	1961	1962
Blister copper production ..	64,608	68,494	71,037	62,497	87,337
Refined copper production ..	43,276	51,593	70,652	63,723	79,450
Exports of blister and refinery shapes .. .. .	14,421	18,974	14,079	24,095	16,497

6. **Prices.**—Details of average market prices for the years 1959 to 1963 are given in terms of Australian currency and sterling in the following table.

#### AVERAGE PRICES OF ELECTROLYTIC COPPER IN AUSTRALIA AND THE UNITED KINGDOM

(£ per ton)

Country	1959	1960	1961	1962	1963
Australia — in Australian currency <sup>(a)</sup> .. .. .	312	324	307	305	305
United Kingdom—in sterling .. .. .	235	239	228	232	234

(a) Ex works Port Kembla.

7. **Production in Principal Countries.**—The following table shows the mine production of copper for the years 1958 to 1962 in the principal producing countries and the estimated world production in those years.

## COPPER: MINE PRODUCTION IN PRINCIPAL COUNTRIES

(Source: Division of Minerals of the United States Bureau of Mines)

('000 tons)

Country	1958	1959	1960	1961	1962
United States of America ..	874	736	964	1,040	1,097
U.S.S.R.(a) .. ..	420	429	491	536	625
Chile .. ..	460	538	528	542	577
Rhodesia and Nyasaland ..	401	545	581	579	567
Canada .. ..	308	353	392	392	416
Congo(b) .. ..	234	278	297	291	291
Peru .. ..	53	49	179	195	163
Australia .. ..	76	95	109	96	107
Japan .. ..	80	84	88	95	102
Philippines .. ..	46	49	43	51	54
South Africa .. ..	49	48	45	52	46
Mexico .. ..	64	56	59	49	46
<i>Estimated World Total ..</i>	<i>3,375</i>	<i>3,598</i>	<i>4,143</i>	<i>4,321</i>	<i>4,509</i>

(a) Estimated.

(b) Smelter production.

## § 6. Tin

1. Historical.—A brief history of tin-mining in Australia may be found in previous issues of the Year Book (*see* No. 48, p. 1073).

2. Methods of Mining and Treatment.—The greater proportion of tin concentrate production is obtained from alluvial workings as a gravity concentrate of cassiterite (tin oxide). The remainder is obtained from underground mining, where the tin mineralization is frequently associated with wolfram and sulphide minerals.

3. Mine Production.—The following table sets out the tin content of tin concentrate produced in Australia during the years 1958 to 1962. No tin is recorded from minerals other than tin concentrate.

## TIN: CONTENT OF TIN CONCENTRATES PRODUCED

(Tons)

State or Territory	1958	1959	1960	1961	1962
New South Wales .. ..	239	174	223	173	212
Victoria .. ..	..	..	..	..	7
Queensland .. ..	1,019	1,104	885	1,350	1,077
Western Australia .. ..	94	174	190	231	323
Tasmania .. ..	883	890	884	986	1,058
Northern Territory .. ..	2	9	20	5	38
<b>Australia .. ..</b>	<b>2,237</b>	<b>2,351</b>	<b>2,202</b>	<b>2,745</b>	<b>2,715</b>

The following were the principal sources of production in 1962.

- (i) *New South Wales.* All production was from alluvial deposits. The New England region, mainly around Tingha, Tenterfield and Deepwater produced over 70 per cent. of the total production.
- (ii) *Queensland.* Most of the tin concentrate produced was from the Herberton field, principally alluvial tin concentrate being produced. Tin concentrate was also produced in the Chillagoe, Kangaroo Hills, Cooktown and Mareeba districts.
- (iii) *Western Australia.* Nearly all the tin concentrate produced was alluvial tin won from the Pilbara field.
- (iv) *Tasmania.* Most of the tin concentrate produced was won in the north-east part of the State, from both lode and alluvial deposits. Wolfram concentrate, as well as tin concentrate, was produced.
- (v) *Northern Territory.* More than half of the output of tin came from mines in the Mount Masson area. Most of the remainder was produced at Boombera and Mount Harris.

4. *Smelter and Refinery Production.*—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 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:—1959, 2,226 tons; 1960, 2,254 tons; 1961, 2,546 tons; 1962, 2,704 tons; and 1963, 2,636 tons.

Consumption of refined tin has increased substantially in recent years following the introduction of tin-plate production in Australia; hot-dip plating began in 1957 and the electrolytic plant at Port Kembla, New South Wales, commenced operations early in 1962.

5. *Prices.*—Details of the movement in average market prices of tin for the years 1959 to 1963 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	1959	1960	1961	1962	1963
Australia — in Australian currency(a)	1,058	1,042	1,169	1,163	1,179
United Kingdom—in sterling(b)	786	794	895	898	909

(a) Delivered, Sydney.

(b) London Metal Exchange price.

6. *Production in Principal Countries.*—World production of tin reached its maximum in 1941, when 241,400 tons were recorded. Australia's contribution to the world's tin production is slightly above 1 per cent.

The mine production of tin for the principal producing countries and the estimated world totals in 1961 and 1962 were as follows.

## TIN: PRODUCTION IN PRINCIPAL COUNTRIES

(Source: Division of Minerals of the United States Bureau of Mines)

(Tons)

Country	Production		Country	Production	
	1961	1962		1961	1962
Malaya, Federation of	56,028	58,603	Australia . . . . .	2,745	2,715
China(a) . . . . .	30,000	30,000	South Africa . . . . .	1,430	1,422
Bolivia . . . . .	20,408	21,493	United Kingdom . . . . .	1,210	1,181
Indonesia . . . . .	18,574	17,583	Burma(b) . . . . .	1,130	950
Thailand . . . . .	13,270	14,680	Japan . . . . .	853	859
Nigeria . . . . .	7,779	8,210	<i>Estimated World</i>		
Congo(b) . . . . .	6,616	7,243	<i>Total</i> . . . . .	185,200	190,200

(a) Estimated smelter production.

(b) Estimated.

## § 7. 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 steelworks 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. The Koolyanobbing deposits will be worked on a very much larger scale eventually and will supply the ore for an iron and steel industry to be established at Kwinana, south of Perth. A blast furnace is expected to be in operation in 1968.

In December, 1960, the Commonwealth Government announced a partial relaxation of the embargo on the export of iron ore which had been in force since 1938. Permission has been granted for the export of iron ore from Tallering Peak-Koolanooka, Mount Goldsworthy, the Hamersley Range and the Scott River area in Western Australia, and from small deposits in New South Wales and Queensland.

Following the modification of the export embargo in 1960, known reserves of iron ore have greatly increased. The embargo was further relaxed in June, 1963.

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.**—Currently all iron ore and iron oxide is won by open-cut mining. The ore is selectively mined, crushed and screened to provide a standard assay and size for blast furnace use. Some concentration of lower grade ore from the Iron Knob area in South Australia is now carried out. In August, 1962, a scree ore treatment plant began operating at Iron Knob. Concentrates produced have an iron content of over 60 per cent. and recovery is of the order of 85 per cent. Sintering is now carried out at both Newcastle and Port Kembla to provide an improved blast furnace feed.

**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 1958 to 1962.

**IRON: ESTIMATED IRON CONTENT OF IRON ORE PRODUCED**  
(Tons)

State	1958	1959	1960	1961	1962
South Australia .. ..	2,173,922	2,218,846	2,227,551	2,581,313	2,235,832
Western Australia .. ..	365,275	480,769	586,404	852,663	883,263
<b>Australia .. ..</b>	<b>2,539,197</b>	<b>2,699,615</b>	<b>2,813,955</b>	<b>3,433,976</b>	<b>3,119,095</b>

The producing centres during 1962, were as follows.

- (i) *South Australia.* 3,439,742 tons of iron ore were drawn from the Iron Monarch and Iron Prince quarries 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. Production of beneficiated iron ore commenced at Iron Knob in the latter part of 1962.
- (ii) *Western Australia.* Ore shipped from Yampi Sound, north of Derby, to New South Wales for sintering and smelting amounted to 1,320,355 tons. A quantity of 83,987 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 1962, according to end use, is shown in the following table.

**IRON OXIDE PRODUCTION, 1962**  
(Tons)

Use	New South Wales	Victoria	Queensland	South Australia	Tasmania	Australia
For gas purification ..	634	81	..	..	84	799
For cement manufacture	17,160	..	2,337	..	3,998	23,495
For coal washing ..	1,715	..	..	..	..	1,715
For fluxing .. ..	..	..	..	14,400	..	14,400
<b>Total .. ..</b>	<b>19,509</b>	<b>81</b>	<b>2,337</b>	<b>14,400</b>	<b>4,082</b>	<b>40,409</b>

The principal sources of iron oxide production during 1962 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 Lithgow, Mudgee and Rylstone mining divisions. Magnetite, used in coal washing, was produced in the Copmanhurst mining division.
- (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) *South Australia.* A quantity of 14,400 tons drawn from the Middleback Ranges was dispatched to Port Pirie for use as a flux in lead smelting operations.
- (v) *Tasmania.* Iron oxide for gas purification and cement manufacture was mined in the vicinity of Penguin.

Particulars of Australian production of iron oxide according to end use are shown in the following table.

#### IRON OXIDE PRODUCTION: AUSTRALIA

(Tons)

Use	1958	1959	1960	1961	1962
For gas purification ..	2,864	4,355	2,970	1,446	799
For cement manufacture ..	6,093	9,485	15,776	21,786	23,495
For coal washing .. ..	25	30	386	1,260	1,715
For fluxing .. ..	8,100	9,600	9,600	8,850	14,400
<b>Total .. ..</b>	<b>17,082</b>	<b>23,470</b>	<b>28,732</b>	<b>33,342</b>	<b>40,409</b>

5. **Iron and Steel Production.**—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. Figures shown below may differ from corresponding figures in Chapter V. Manufacturing Industry because of revisions since that chapter was prepared.

#### PIG-IRON AND INGOT STEEL: PRODUCTION, AUSTRALIA

(Tons)

Year ended 31st May		Pig-iron (a)	Steel ingots (b)	Year ended 31st May		Pig-iron (a)	Steel ingots (b)
1954	.. ..	1,826,711	2,116,813	1959	.. ..	2,293,709	3,203,584
1955	.. ..	1,868,841	2,208,708	1960	.. ..	2,655,237	3,519,719
1956	.. ..	1,910,521	2,320,289	1961	.. ..	3,001,800	3,748,037
1957	.. ..	2,098,352	2,773,995	1962	.. ..	3,380,334	4,075,699
1958	.. ..	2,283,925	3,037,705	1963	.. ..	3,400,302	4,259,909

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

(b) Includes recovery from scrap.

In 1963, eleven blast furnaces were operating in Australia; four at Port Kembla and four at Newcastle, in New South Wales, two at Wundowie in Western Australia, and one at Whyalla, South Australia. Production of pig-iron throughout 1963 was at a record level. The fourth blast furnace at Newcastle, with a daily capacity of 1,400 tons of pig-iron, was commissioned in July, 1963.

During 1963, the bulk of Australia's ingot steel production was obtained from 17 open hearth furnaces (13 at Port Kembla and 4 at Newcastle). In addition, 3 other open hearth furnaces and 15 electric furnaces were in operation during 1963 for the production of special steels and ferro-alloys. The use of oxygen in steel-making assumed greater importance in Australia during 1963. All furnaces in the No. 2 open hearth shop at Port Kembla are now using oxygen lancing equipment and two basic oxygen steel-making units were in operation at Newcastle throughout the year. Annual steel-making capacity in Australia is now in excess of 5 million tons.

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 calendar years 1961 and 1962 are shown in the following table.

#### IRON AND STEEL: PRODUCTION IN PRINCIPAL COUNTRIES

(Source: Division of Minerals of the United States Bureau of Mines)

('000 Tons)

Country	Pig-iron and ferro-alloys		Steel ingots and castings	
	1961	1962	1961	1962
United States of America ..	59,569	60,389	87,513	87,793
U.S.S.R. .. .. .	50,089	54,643	69,456	75,089
Germany, Federal Republic ..	25,029	23,868	32,929	32,049
Japan .. .. .	16,124	18,147	27,821	27,111
United Kingdom .. .. .	14,747	13,830	22,087	20,491
France .. .. .	14,613	13,384	17,322	16,968
China (Mainland) .. .. .	19,643	17,679	13,393	11,607
Italy .. .. .	3,150	3,619	8,979	9,338
Poland .. .. .	4,695	5,232	7,120	7,563
Czechoslovakia .. .. .	4,893	5,116	6,932	7,411
Belgium .. .. .	6,343	6,642	6,900	7,245
Canada .. .. .	4,503	4,846	5,773	6,404
India .. .. .	4,616	5,818	4,007	4,962
Australia .. .. .	3,156	3,434	3,885	4,171
Luxembourg .. .. .	3,773	3,540	4,048	3,948
Germany, Eastern .. .. .	1,997	1,988	3,389	3,566
Sweden .. .. .	1,867	1,786	3,501	3,553
Austria .. .. .	2,226	2,085	3,052	2,923
<i>Estimated World Total ..</i>	<i>257,000</i>	<i>263,000</i>	<i>348,600</i>	<i>354,800</i>

## § 8. Mineral Sands

1. **Historical.**—Since the war, the growing world demand for rutile as a coating for electric welding rods and as a source of titanium metal, and for ilmenite in the production of titanium pigments, 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 this production comes from the mineral sands deposits on 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 pigment production. Operators produce separate concentrates of rutile, zircon and ilmenite and, in addition, a few companies produce high-grade monazite concentrate.

Following the record post-war output of rutile in 1957, production was on a reduced scale during the period 1958–60, mainly because of greatly reduced prices offering on world markets. Commencing with the second half of 1961, however, the price of rutile improved and production increased, resulting in a record level of production being achieved in 1963.

2. **Methods of Mining and Treatment.**—Mining on the east coast of Australia is mainly by suction dredging. In Western Australia, ilmenite is mined hydraulically or by earth-moving equipment. Heavy mineral concentrates are recovered by wet gravity concentration, using a combination of concentrating spirals and shaking tables. The constituent minerals of the heavy-mineral concentrates, mainly rutile, zircon, ilmenite and monazite are separated by electromagnetic and electrostatic methods.

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 1958 to 1962.

## TITANIUM DIOXIDE: CONTENT OF CONCENTRATES PRODUCED

(Tons)

State	1958	1959	1960	1961	1962
CONTAINED IN RUTILE CONCENTRATE					
New South Wales .. ..	44,915	44,792	52,262	64,284	77,227
Queensland .. ..	35,755	34,736	33,260	33,056	37,472
Western Australia .. ..	285	96	493	880	501
<i>Australia</i> .. ..	<i>80,955</i>	<i>79,624</i>	<i>86,015</i>	<i>98,220</i>	<i>115,200</i>
CONTAINED IN ILMENITE CONCENTRATE					
New South Wales .. ..	59	111	537	905	1,930
Queensland .. ..	..	..	21	2	..
Western Australia .. ..	38,219	45,566	58,171	92,838	98,364
<i>Australia</i> .. ..	<i>38,278</i>	<i>45,677</i>	<i>58,729</i>	<i>93,745</i>	<i>100,294</i>

(ii) *Zircon.* The quantities of zircon mineral contained in zircon concentrate produced during the years 1958 to 1962 are shown in the following table.

## ZIRCON: CONTENT OF ZIRCON CONCENTRATE PRODUCED

(Tons)

State	1958	1959	1960	1961	1962
New South Wales .. ..	32,230	71,156	65,764	98,421	89,947
Queensland .. ..	26,412	34,504	31,752	28,775	38,468
Western Australia .. ..	103	6,692	3,978	7,287	3,694
<b>Australia .. ..</b>	<b>58,745</b>	<b>112,352</b>	<b>101,494</b>	<b>134,483</b>	<b>132,109</b>

(iii) *Other Products.* During 1962, small quantities of monazite concentrate, magnetite and garnet concentrate were also recovered from mineral sands.

(iv) *Sources of Production.* The principal sources of mineral sands treated during 1962 were as follows.

- (a) *New South Wales and Queensland.* The main deposits of mineral sands occur along the eastern Australian coast from Wyong in New South Wales to Curtis Island, Queensland. At present, the principal mining operations are located between Lake Munmorah and Newcastle in the south, between Laurieton and Crescent Head on the central coast, and between Byron Bay and North Stradbroke Island in the north. Most mining operations are now confined to dunes and swampy areas lying behind beaches where high-grade deposits are now exhausted.
- (b) *Western Australia.* The chief deposits of mineral sands occur in the south-west corner of the State, between Bunbury and Wonnerup. During 1962, the bulk of production was from inland deposits in the Capel-Yoganup area.

## § 9. Aluminium

1. *Mine Production.*—The source of aluminium is bauxite. Until recent years, the only bauxite production in Australia was from small deposits in Queensland, New South Wales and Victoria. Production from these deposits has been used mainly by the chemical and steel industries.

Large deposits of bauxite exist at Weipa (North Queensland), Gove (Northern Territory) and Darling Range (Western Australia). The deposits at Weipa and the Darling Range are now being mined. Part of the bauxite from Weipa is shipped to Bell Bay (Tasmania) for treatment and part is exported to Japan. Bauxite from the Darling Range deposits is treated at Kwinana for the production of alumina. Part of the alumina from Kwinana is shipped to Point Henry (Victoria) for smelting to aluminium, and part is exported to Japan. Part of the deposits at Gove are being investigated under lease by an overseas company for the development of a bauxite exporting industry and possibly the establishment of an alumina plant. The remainder of the deposits at Gove are not held under lease at present, and the Commonwealth Government through the Department of Territories has called for proposals for the development of this remaining area. The alumina content of bauxite produced in Australia during the years 1958 to 1962 is shown in the following table.

## ALUMINA: CONTENT OF BAUXITE PRODUCED

(Tons)

State	1958	1959	1960	1961	1962
New South Wales .. ..	633	1,648	1,386	929	1,991
Victoria .. ..	2,304	1,991	2,306	2,035	2,300
Queensland(a) .. ..	596	..	14,442	4,500	8,959
Western Australia(a) ..	..	3,275	13,259	..	..
<b>Australia(b) .. ..</b>	<b>3,533</b>	<b>6,914</b>	<b>31,393</b>	<b>7,464</b>	<b>13,250</b>

(a) Estimated.

(b) Partly estimated.

2. **Refinery Production.**—There is a refinery for the production of alumina and refined aluminium at Bell Bay on the River Tamar 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 capacity of the Bell Bay plant was increased to 35,000 tons in 1962 and was further increased to 52,000 tons in 1963. A new smelter with an ultimate capacity of 40,000 tons is under construction at Geelong (Victoria). The first section of the plant was commissioned in 1963. The following table shows the production of alumina and refined aluminium in Australia during the years 1958 to 1962.

## ALUMINA AND REFINED ALUMINIUM: PRODUCTION, AUSTRALIA

(Source: Bureau of Mineral Resources)

(Tons)

Refinery product	1958	1959	1960	1961	1962
Alumina .. ..	22,490	26,900	29,801	29,468	33,806
Refined aluminium ..	10,869	11,370	11,655	13,204	16,152

## § 10. 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 has been for export overseas. During 1963, the principal producing centres were as follows.

- (i) *Queensland.* Uranium ore was mined by opencut methods at Mary Kathleen, 33 miles east of Mount Isa. Mining ceased in September, 1963, and the treatment plant at Mary Kathleen closed in October, 1963, following the completion of the operating company's contract to supply uranium oxide to the United Kingdom Atomic Energy Agency.
- (ii) *Northern Territory.* At Rum Jungle, stockpiled uranium ores were treated to produce  $U_3O_8$  concentrate. Shipments of uranium oxide from the Rum Jungle plant to the Combined Development Agency were completed early in 1963.

In the South Alligator River area, the El Sherana mine was operated to supply ore to a concentrating plant at Moline.

Domestic production in 1964 will be confined to Rum Jungle and Moline. Existing contracts with the U.K. Atomic Energy Authority are expected to keep the Moline plant operating until 1965. Operations at Rum Jungle will be maintained at about current levels and the uranium oxide produced and stockpiled will be available for sale overseas.

## § 11. 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 production was recommenced in 1960. Low prices have persisted and production since then has been on a limited scale. During 1963, the State Government provided financial assistance to the company producing scheelite on King Island to forestall a threatened closure of the mine due to marketing difficulties.

Particulars of the production of tungstic oxide contained in scheelite and wolfram concentrates produced during the years 1958 to 1962 are shown in the following table.

**TUNGSTIC OXIDE (WO<sub>3</sub>): CONTENT OF CONCENTRATES PRODUCED**  
(Tons)

State	1958	1959	1960	1961	1962
CONTAINED IN SCHEELITE CONCENTRATE					
New South Wales .. ..	1	(a)	(a)	(a)	..
Western Australia .. ..	..	..	..	..	5
Tasmania .. ..	477	..	291	709	686
<i>Australia</i> .. ..	478	(a)	291	709	691
CONTAINED IN WOLFRAM CONCENTRATE					
New South Wales .. ..	..	..	..	(a)	..
Queensland .. ..	5	..	..	1	1
Tasmania .. ..	360	645	804	810	349
Northern Territory .. ..	7	8	16	16	1
<i>Australia</i> .. ..	372	653	820	827	351

(a) Less than one half ton.

2. Manganese.—In recent years, Western Australia has been the principal State producing manganese ore, mined mainly from the Pilbara goldfield.

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 1958 to 1962.

**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 <sub>2</sub> ) content				
	N.S.W.	Q'land	W. Aust.	Aust.	N.S.W.	S. Aust.	W. Aust.	N. Terr.	Aust.
1958 ..	516	3,181	21,926	25,623	511	..	195	2,113	2,819
1959 ..	620	4,350	35,996	40,966	907	..	162	1,406	2,475
1960 ..	342	1,670	26,561	28,585	623	45	9	940	1,617
1961 ..	..	1,109	39,880	40,989	632	192	204	76	1,104
1962 ..	..	1,296	32,862	34,158	424	..	152	188	764

(a) Includes Victoria (12 tons).

The quantity of manganese dioxide recovered at the Risdon, Tasmania, refinery during 1962 amounted to 3,602 tons, of which 346 tons were sold for chemical processing and trace element fertilizer.

3. **Other.**—Production in 1962 (1961 shown in parentheses) of other metallic minerals are listed in the following paragraphs.

(i) *Antimony.* The antimony content of antimony-bearing minerals produced was 874 tons (680 tons). Of this amount, 808 tons (563 tons) were in lead concentrate and 66 tons (117 tons) in 100 tons (190 tons) of antimony ore and concentrate.

(ii) *Beryllium.* Production of beryllium ore was 223 tons (306 tons), which came mainly from the Yalgoo and Pilbara fields in Western Australia. The beryllium oxide content of the ore was 2,586 units of 22.4 lb. (3,585 units).

(iii) *Chromite.* Production of chromite in 1962 amounted to 369 tons with an estimated chromic oxide content of 185 tons. This was all mined in the Rockhampton district in Queensland. There was no production in the previous year.

(iv) *Tantalite-columbite.* The production of tantalite-columbite concentrate was 43,097 lb. (31,808 lb.) and the whole of this output came from Western Australia. The tantalum pentoxide and columbium pentoxide content of the concentrates was 18,879 lb. (13,814 lb.).

(v) *Other.* Other metallic minerals produced in 1962 were bismuth concentrate, 181 lb., from Western Australia; molybdenite concentrate, 2,800 lb., from Queensland; and platinum concentrate, 3 oz.

## § 12. Coal

1. **Historical.**—A brief history of coal-mining in Australia may be found in previous issues of the Year Book (see No. 48, p. 1086).

2. **Joint Coal Board.**—For details of the powers and functions of this Board, which has functioned since 1947, see page 887 of Year Book No. 39.

3. **Coal Industry Tribunal.**—The Coal Industry Tribunal was established under the Commonwealth *Coal Industry Act* 1946 and the New South Wales *Coal Industry Act*, 1946 to consider and determine interstate disputes and, in respect of New South Wales only, intra-State disputes between the Australian Coal and Shale Employees' Federation and employers in the coal-mining industry. Following legislation in 1951, the Tribunal was vested with authority to deal with all interstate industrial disputes in the coal-mining industry, irrespective of the trade union involved, and, in the case of New South Wales, intra-State disputes also. The Tribunal consists of one person who may appoint two assessors nominated by the parties to advise him in matters relating to any dispute.

4. **Australia's Coal Reserves.**—The latest available estimates of the measured and indicated coal reserves of Australia are those prepared by the Mines Departments in the various States for the Coal Utilization Research Advisory Committee whose report was issued by the Department of National Development in 1962. This information 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.

### ESTIMATED COAL RESERVES OF AUSTRALIA

(Source: State Mines Departments)

(Million Tons)

State	Type of coal	Measured and indicated	Inferred
New South Wales .. ..	Bituminous .. ..	(a) 3,050	(b)
Victoria .. ..	" .. ..	20	10
" .. ..	Brown .. ..	54,700	43,000
Queensland .. ..	Bituminous, sub-bituminous .. ..	950	(c)
South Australia .. ..	Sub-bituminous .. ..	130	..
" .. ..	Lignite .. ..	530	..
Western Australia .. ..	Sub-bituminous .. ..	274	1,603
Tasmania .. ..	Bituminous .. ..	(d)	(e) 137

(a) Recoverable reserves. (b) In excess of 30,000 million tons. (c) In excess of 10,000 million tons. (d) Very small; measured reserves in Tasmania amount to only several thousand tons. (e) Includes both indicated and inferred reserves.

5. *Mine Production of Black Coal.*—Production of black coal according to rank in the several States during the years 1959 to 1963 is set out in the following table. The tonnages produced by underground mining and opencut mining are also shown.

## BLACK COAL: PRODUCTION

(Tons)

Particulars	1959	1960	1961	1962	1963
<b>NEW SOUTH WALES</b>					
<i>Total(a)</i> .. ..	15,712,440	17,736,994	19,020,805	19,030,418	18,940,206
Underground mines	15,278,162	16,981,561	18,188,613	18,195,881	18,337,767
Opencut mines ..	434,278	755,433	832,192	834,537	602,439
<b>VICTORIA</b>					
<i>Total(b)</i> .. ..	90,438	76,972	66,363	56,721	50,711
<b>QUEENSLAND</b>					
Semi-anthracite ..	51,849	47,762	56,437	67,652	60,122
Bituminous .. ..	2,476,479	2,531,581	2,650,367	2,648,200	3,077,901
Sub-bituminous ..	66,059	70,769	75,362	82,989	107,403
<i>Total</i> .. .. .	2,594,387	2,650,112	2,782,166	2,798,841	3,245,426
Underground mines	2,142,302	2,269,564	2,157,790	2,194,351	2,433,221
Opencut mines ..	452,085	380,548	624,376	604,490	812,205
<b>SOUTH AUSTRALIA</b>					
<i>Total(c)</i> .. ..	690,374	884,819	1,115,156	1,392,085	1,511,719
<b>WESTERN AUSTRALIA</b>					
<i>Total(d)</i> .. ..	911,435	922,393	765,740	919,112	902,497
Underground mines	800,856	798,185	506,306	598,502	600,935
Opencut mines ..	110,579	124,208	259,434	320,610	301,562

NOTE.—For footnotes see next page.

BLACK COAL: PRODUCTION—*continued*

(Tons)

Particulars	1959	1960	1961	1962	1963
<b>TASMANIA</b>					
Semi-anthracite ..	2,217	2,333	2,142	1,649	2,081
Bituminous ..	297,151	295,337	253,686	270,693	204,841
<b>Total .. ..</b>	<b>299,368</b>	<b>297,670</b>	<b>255,828</b>	<b>272,342</b>	<b>206,922</b>
Underground mines	281,310	281,662	241,812	262,137	205,560
Opencut mines ..	18,058	16,008	14,016	10,205	1,362
<b>AUSTRALIA</b>					
Semi-anthracite ..	54,066	50,095	58,579	69,301	62,203
Bituminous ..	18,576,508	20,640,884	21,991,221	22,006,032	22,273,659
Sub-bituminous ..	1,667,868	1,877,981	1,956,258	2,394,186	2,521,619
<b>Total .. ..</b>	<b>20,298,442</b>	<b>22,568,960</b>	<b>24,006,058</b>	<b>24,469,519</b>	<b>24,857,481</b>
Underground mines	18,593,068	20,407,944	21,160,884	21,307,592	21,628,194
Opencut mines ..	1,705,374	2,161,016	2,845,174	3,161,927	3,229,287

(a) Bituminous coal from an opencut mine.

(b) Bituminous coal from underground mines.

(c) Sub-bituminous coal.

The principal producing centres during 1962 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 1962 were: northern field, 10,058,000 tons; southern field, 7,454,000 tons; and western field, 1,517,000 tons. All opencut coal was from the northern field.
- The coal fields of New South Wales, predominantly 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 steelworks. 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 was restricted to the Gippsland district. The State Coal Mine at Wonthaggi was the main producer, and the remaining production came from small privately-owned mines.
- (iii) *Queensland*. The principal producing centres were Ipswich, 1,657,733 tons; Bowen, 367,313 tons; Mount Morgan, 301,584 tons; and Maryborough, 155,680 tons. Opencut methods were used on the Bowen, Clermont and Mount Morgan fields, and the total coal won by this means was 21.6 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 1962 was from this source.
- (vi) *Tasmania.* Most of the coal produced was won in the north-east of the State, the principal producing centres in 1962 being Fingal, 108,959 tons; St. Mary's, 105,268 tons; and Avoca, 50,049 tons.

6. 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 1958 to 1962. 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 opencut mining.

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

Year	N.S.W.	Vic.	Q'land	W. Aust.	Tas.	Australia
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**PRODUCTION PER MAN-SHIFT WORKED AT COAL FACE**

1958	.. ..	14.48	2.04	7.28	6.67	8.01	11.96
1959	.. ..	18.07	2.10	7.53	7.60	7.34	14.13
1960	.. ..	20.64	2.16	8.37	8.12	7.64	16.08
1961	.. ..	24.61	2.15	8.69	8.09	8.77	19.04
1962	.. ..	25.92	1.94	9.25	8.90	11.04	20.13

**PRODUCTION PER MAN-SHIFT WORKED BY ALL EMPLOYEES**

1958	.. ..	4.35	0.89	2.90	3.02	3.91	3.95
1959	.. ..	4.90	0.93	2.95	3.35	3.72	4.37
1960	.. ..	5.39	0.94	3.19	3.62	3.87	4.81
1961	.. ..	6.23	0.83	3.46	4.00	4.09	5.55
1962	.. ..	6.57	0.78	0.36	4.32	4.71	5.84

(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. 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	
1958	.. ..	11.31	13.63	11.46	6.78	10.42	11.47
1959	.. ..	12.47	12.50	10.36	7.64	10.47	11.08
1960	.. ..	22.15	10.96	12.46	8.01	9.38	13.79
1961	.. ..	22.29	11.43	14.91	9.63	10.79	14.60
1962	.. ..	22.42	10.42	19.78	10.32	10.89	15.97

7. **Mine Production of Brown Coal.**—Brown coal is mined only in Victoria, and production in recent years has been as follows:—1959, 13,034,605 tons; 1960, 14,967,202 tons; 1961, 16,279,168 tons; 1962, 17,137,436 tons; and 1963, 18,456,838 tons. In the past ten years, the output of brown coal has nearly doubled, and further increases are expected in the future as electricity generation projects proceed.

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 salable coal for each district and for New South Wales as a whole are shown in the following table for the years 1958 to 1962. Salable 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, most 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 SALABLE COAL:  
NEW SOUTH WALES**

(s. d.)

Year	Northern District	Southern District	Western District	Average for State
1958.. .. .	56 1	55 0	47 5	54 10
1959.. .. .	52 5	54 4	47 6	52 7
1960.. .. .	51 11	55 11	48 1	52 8
1961.. .. .	51 5	55 1	46 9	52 3
1962.. .. .	51 3	52 9	44 4	51 2

9. **Values in New South Wales, United Kingdom and the United States of America.**—The following table shows for the years 1958 to 1962 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	1958	1959	1960	1961	1962
	<i>s. d.</i>				
New South Wales—bituminous(a)	54 10	52 7	52 8	52 3	51 2
United Kingdom—deep-mined(b)	85 1	83 5	86 1	90 10	91 9
United States of America— bituminous and lignite(c)	\$ 4.86	\$ 4.77	\$ 4.69	\$ 4.58	\$ 4.48

(a) Average selling value at the mine per ton of 2,240 lb.; the figures relate to salable 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. **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 1958–59 to 1962–63.

**BLACK COAL: PRODUCTION AND CONSUMPTION**  
(<sup>'000</sup> Tons)

Particulars	1958-59	1959-60	1960-61	1961-62	1962-63
Production(a) .. ..	20,459	21,223	22,947	24,427	24,301
Imports .. ..	8	8	7	5	8
<b>Total</b> .. ..	<b>20,467</b>	<b>21,231</b>	<b>22,954</b>	<b>24,432</b>	<b>24,309</b>
Consumption as fuel—					
Electricity generation .. ..	7,131	7,398	7,420	7,869	8,293
Factories .. ..	3,122	3,166	3,103	2,844	2,779
Railway locomotives(b) .. ..	2,050	2,002	1,847	1,627	1,481
Bunker coal(c) .. ..	203	169	136	115	115
<b>Total</b> .. ..	<b>12,506</b>	<b>12,735</b>	<b>12,506</b>	<b>12,455</b>	<b>12,668</b>
Consumption as raw material—					
For metallurgical coke .. ..	3,846	4,216	4,910	5,039	5,195
For other purposes .. ..	1,787	1,776	1,751	1,631	1,473
<b>Total</b> .. ..	<b>5,633</b>	<b>5,992</b>	<b>6,661</b>	<b>6,670</b>	<b>6,668</b>
Exports (oversea) .. ..	645	1,088	1,888	3,470	2,677
Mine washery refuse and dump losses(d) .. ..	660	982	1,072	1,341	1,278
Balance—unrecorded consumption, other purposes(e) .. ..	1,023	434	827	496	1,018
<b>Grand Total</b> .. ..	<b>20,467</b>	<b>21,231</b>	<b>22,954</b>	<b>24,432</b>	<b>24,309</b>

(a) Includes miners' and colliery coal. (b) Government railways only. (c) Figures refer only to New South Wales consumption by oversea, interstate and intrastate vessels. (d) Prior to 1959-60, figures refer only to New South Wales. Later figures include Tasmania. (e) 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 has since declined as production has expanded considerably. Since 1952-53, exports have exceeded imports by a wide margin; in 1962-63, exports of black coal were 2,676,522 tons and imports were 7,929 tons. These imports were of black coal only for special purposes.

(ii) *Brown Coal.* The table following shows the production and consumption of brown coal and the production of briquettes in Victoria for the years 1958-59 to 1962-63.

**BROWN COAL: PRODUCTION AND CONSUMPTION, VICTORIA**  
(<sup>'000</sup> Tons)

Particulars	1958-59	1959-60	1960-61	1961-62	1962-63	
Production .. ..	12,243	14,101	15,723	16,729	17,766	
Consumption as fuel—						
Electricity generation .. ..	} 9,289	10,498	9,970	10,981	{ 11,333	
Briquette factory .. ..						535
Other factories .. ..						894
<b>Total</b> .. ..	1,293	1,248	951	860		
Consumption as raw material—						
Briquette manufacture .. ..	1,639	2,396	4,764	4,862	4,980	
Balance(a) .. ..	+22	-41	+38	+26	+24	
Briquettes manufactured .. ..	643	975	1,807	1,820	1,805	

(a) The sign (+) indicates that the balance shown is available for other consumption and accumulation of stocks; the sign (-) indicates a reduction in stocks.

The State Electricity Commission of Victoria produces brown coal briquettes at Yallourn and Morwell, both situated on the brown coal deposits in Gippsland. The former commenced commercial production of briquettes in 1925, and initial output of the Morwell plant was in 1960. Output of briquettes (Yallourn and Morwell combined) was 1,819,954 tons in 1961-62, and 1,805,347 tons in 1962-63.

In December, 1956, the Lurgi high pressure brown coal gasification plant at Morwell was opened by the Gas and Fuel Corporation of Victoria. This plant operates on briquettes supplied by belt conveyor from the State Electricity Commission's Morwell works, and produces town gas which is sent to Melbourne through 103 miles of pipeline.

11. Exports.—The quantities and values of the oversea exports of Australian coal and of bunker coal for oversea vessels for the five years 1958-59 to 1962-63 are shown in the following table. These shipments were made mainly from New South Wales.

**COAL: OVERSEA EXPORTS AND BUNKER, AUSTRALIA**

Year	Oversea exports(a)		Bunker coal for oversea vessels	
	Quantity	Value	Quantity	Value
	Tons	£	Tons	£
1958-59 .. .. .	645,249	2,676,042	8,187	37,808
1959-60 .. .. .	1,087,844	4,326,810	8,117	25,380
1960-61 .. .. .	1,888,415	7,682,223	179	1,716
1961-62 .. .. .	3,469,552	13,611,122	37	410
1962-63 .. .. .	2,676,522	11,170,712	1,703	17,578

(a) Excludes bunker coal.

New South Wales, in addition to meeting requirements within the State, supplies considerable quantities of coal to other States and for export overseas. Of the total of 18,725,000 tons produced in 1962-63, 1,223,000 tons (6.5 per cent.) were exported interstate and 2,431,000 tons (13.0 per cent.) were exported overseas. The demand for bunker coal continues to decline, and in 1962-63 a total of 115,000 tons (0.6 per cent.) of New South Wales production was supplied for interstate, intrastate and oversea vessels.

12. Production in Principal Countries.—The following table shows the production of coal in the principal countries and estimated world totals in 1961 and 1962.

**COAL: PRODUCTION IN PRINCIPAL COUNTRIES**  
(Source: Division of Minerals, United States Bureau of Mines.)  
(\*000 Tons)

Country	Black Coal		Brown Coal and Lignite	
	1961	1962	1961	1962
China (Mainland) .. .. .	(a) 375,000	(a) 375,000	(b)	(b)
United States of America .. .. .	372,683	389,275	2,695	2,728
U.S.S.R. .. .. .	371,064	375,966	131,407	132,868
United Kingdom .. .. .	190,464	197,388	..	..
Germany, Federal Republic of .. .. .	143,082	141,392	95,661	99,652
Poland .. .. .	104,922	107,873	10,175	10,916
India .. .. .	(a) 55,243	(a) 60,578	(b)	(b)
Japan .. .. .	53,623	53,535	1,288	1,094
France .. .. .	51,531	51,532	2,860	2,837
South Africa .. .. .	38,940	40,623	..	..
Czechoslovakia .. .. .	25,819	27,754	64,271	68,107
Australia .. .. .	24,006	24,470	16,279	17,137
Belgium .. .. .	21,196	20,891	..	..
Korea (North) .. .. .	(a) 11,604	(a) 12,991	(b)	(b)
Spain .. .. .	13,578	12,466	2,056	2,443
Netherlands .. .. .	12,421	11,390	..	..
Korea, Republic of .. .. .	5,791	7,328	..	..
Canada .. .. .	7,312	7,168	1,972	2,014
Turkey .. .. .	6,281	6,348	3,713	3,888
China, Republic of (Formosa) .. .. .	4,170	4,482	..	..
Hungary .. .. .	3,022	3,290	24,707	24,912
Colombia .. .. .	2,755	2,953	..	..
Germany, Eastern .. .. .	2,634	2,539	232,666	243,296
New Zealand(c) .. .. .	2,768	2,402	157	148
<i>Estimated World Total</i> .. .. .	<i>1,920,117</i>	<i>1,959,197</i>	<i>651,348</i>	<i>677,621</i>

(a) Includes lignite. (b) Included with black coal. (c) Source: New Zealand Mines Department Report, 1962.

13. **Coke and Other By-products from Coal.**—(i) *Coke.* The production of metallurgical coke in Australia during 1962–63 was 2,759,060 tons, compared with 2,716,894 tons during 1961–62.

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 1962–63 was 694,575 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 1958–59 to 1962–63. The figures exclude output of coke breeze, which amounted to 456,719 tons in 1961–62 and 379,183 tons in 1962–63.

#### COKE PRODUCTION: AUSTRALIA

(Tons)

Industry	1958–59	1959–60	1960–61	1961–62	1962–63
Coke works .. ..	2,210,621	2,376,097	2,738,505	2,716,894	2,759,060
Gas works .. ..	815,464	758,668	764,626	761,355	694,575
<b>Total .. ..</b>	<b>3,026,085</b>	<b>3,134,765</b>	<b>3,503,131</b>	<b>3,478,249</b>	<b>3,453,635</b>

(ii) *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 1962–63 (1961–62 in parentheses) were: crude tar, 53,886,802 gallons (56,883,264 gallons); refined tar, 38,514,896 gallons (24,070,783 gallons); and ammonium sulphate, 93,675 tons (103,918 tons).

NOTE.—Figures shown in this paragraph may differ from corresponding figures in Chapter V. Manufacturing Industry because of revisions since that chapter was prepared.

### § 13. Oil Exploration in Australia

1. **Introduction.**—A comprehensive survey of developments in the search for oil up to the end of 1961 and early 1962 was presented on pages 1094–8 of Year Book No. 48 and continued into 1962 in Year Book No. 49, pages 1185–6. A summary of developments in 1963 is given below.

2. **Developments in 1963.**—The search for petroleum continued with increasing effort throughout 1963, following earlier successes achieved in Queensland. To the end of 1963, seventeen wells had been drilled in the Moonie field, two of which proved dry. Commercial production from this field commenced early in 1964 at a daily rate of 7,000–10,000 barrels of oil. The oil is transported 200 miles to Brisbane through a 10-inch pipeline which was completed in October, 1963.

No new oil fields have been discovered since Moonie, but several important oil and gas strikes were made in the Bowen–Surat Basin in Queensland. Three wells in the Bony Creek area and two in the Westgrove area were completed as gas wells, while in the Richmond area two wells produced light oil with gas on tests.

During 1963, combined private and government expenditure on petroleum exploration is estimated at about £23.5 million. Total expenditure to date on the search for, and development of, petroleum is of the order of £125 million. Information regarding government assistance in the search for oil is given in para. 3 (i) (d) on pp. 1133-4.

3. Footage Drilled in the Search for Oil.—The following table shows details of footage drilled in the search for oil in Australia, Papua and New Guinea during the years 1959 to 1963.

#### FOOTAGE DRILLED IN THE SEARCH FOR AND DEVELOPMENT OF PETROLEUM

(Source: Bureau of Mineral Resources(a))

(Feet)

State or Territory	1959	1960	1961	1962	1963
New South Wales .. .. .	17,422	6,169	7,779	34,031	72,922
Victoria .. .. .	8,395	14,682	22,439	42,635	28,023
Queensland .. .. .	30,328	54,841	74,931	237,380	433,790
South Australia .. .. .	12,637	..	8,945	40,836	65,941
Western Australia .. .. .	36,020	17,193	13,712	38,400	41,416
Northern Territory .. .. .	2,458	1,373	1,024	9,347	18,954
<b>Australia .. .. .</b>	<b>107,260</b>	<b>94,258</b>	<b>128,830</b>	<b>402,629</b>	<b>661,046</b>
Papua and New Guinea .. .. .	13,389	10,042	..	5,947	4,657

(a) Based on figures obtained from State Departments of Mines and the Northern Territory Mines Branch.

### § 14. Sulphur

1. Mine Production.—There is no production of elemental sulphur (brimstone) in Australia. However, while sulphur is itself non-metallic, considerable quantities are contained in certain metallic minerals produced. 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 1962 from which sulphur was subsequently recovered.

#### SULPHUR: CONTENT OF METALLIC MINERALS PRODUCED, 1962

(Tons)

Mineral in which contained	N.S.W.	Q'land	S. Aust.	W. Aust.	Tas.	Australia
Lead concentrate ..	57,848	..	..	(a) 62	2,817	(b) 60,727
Lead-copper concentrate ..	..	..	..	..	2,926	2,926
Pyrite concentrate ..	2,012	6,681	(a) 29,092	23,147	4,131	(b) 65,063
Zinc concentrate ..	136,933	(a) 20,470	..	..	26,684	(b) 184,087
<b>Total ..</b>	<b>196,793</b>	<b>(b) 27,151</b>	<b>(a) 29,092</b>	<b>(b) 23,209</b>	<b>36,558</b>	<b>(b) 312,803</b>

(a) Estimated.

(b) Partly estimated.

The principal producing centres during 1962 were as follows.

(i) *New South Wales.* All the sulphur produced 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.* Sulphur is contained in the copper, lead and zinc concentrates milled at Mount Isa and in the copper and pyrite concentrates produced at Mount Morgan. Zinc concentrate produced at Mount Isa was exported.

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

(iv) *Western Australia.* Sulphur was recovered from pyrite concentrates produced at Norseman and at Kalgoorlie.

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

The following table shows for the years 1958 to 1962 the sulphur content of minerals from which sulphur was recovered.

#### SULPHUR: CONTENT OF METALLIC MINERALS PRODUCED

(Tons)

State	1958	1959	1960	1961	1962
New South Wales .. ..	197,736	188,892	204,358	194,659	196,793
Queensland(a) .. ..	14,647	17,464	24,612	20,515	27,151
South Australia(b) .. ..	32,129	27,616	31,717	33,357	29,092
Western Australia(a) .. ..	22,635	24,473	24,556	24,046	23,209
Tasmania .. ..	55,472	52,100	54,757	52,289	36,558
<b>Australia(a) .. ..</b>	<b>322,619</b>	<b>310,545</b>	<b>340,000</b>	<b>324,866</b>	<b>312,803</b>

(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 concentrate is used at Risdon. In June, 1961, acid production from lead-zinc sinter gases commenced at Cockle Creek, near Newcastle, New South Wales. Pyrite concentrate is used as a source of sulphur for acid manufacture at Cockle Creek and at Port Kembla in New South Wales, and at Melbourne, Brisbane, Adelaide, Perth and Fremantle. However, about half the sulphuric acid produced in Australia is made from imported elemental sulphur. The next table shows, for the years 1959 to 1963, 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	1959	1960	1961	1962	1963
Production of sulphuric acid (mono) .. .. .	1,000,458	1,109,751	1,137,501	1,229,256	1,315,562
Sulphur in sulphuric acid (mono) produced from—					
Sulphur (elemental)(a) ..	153,195	179,752	182,554	202,659	212,208
Zinc concentrate ..	39,933	42,946	52,423	65,342	72,059
Lead concentrate ..	19,619	21,573	22,440	20,247	24,643
Pyrite ..	103,596	104,406	100,520	97,927	108,692
Spent oxide ..	3,655	3,814	2,277	2,381	132
Other materials ..	7,151	10,396	11,749	13,410	12,455
<b>Total Sulphur Content</b>	<b>327,149</b>	<b>362,887</b>	<b>371,963</b>	<b>401,966</b>	<b>430,189</b>

(a) All imported.

## § 15. Non-metallic Minerals

1. **Asbestos.**—Production of asbestos has been confined mainly to crocidolite in Western Australia, principally at Wittenoom Gorge in the north-western part of the State. Deposits of chrysotile, located mainly at Nunyerry in Western Australia and at Baryulgil in New South Wales, are relatively small and widely scattered.

The production of chrysotile and crocidolite in Australia during the five years 1958 to 1962 is shown in the following table.

## PRODUCTION OF ASBESTOS

(Short tons of 2,000 lb.)

Year	Chrysotile			Crocidolite
	New South Wales	Western Australia	Australia	Australia(a)
1958 .. .. .	712	1,543	2,255	13,313
1959 .. .. .	726	707	1,433	16,442
1960 .. .. .	1,072	69	1,141	14,472
1961 .. .. .	794	175	969	15,777
1962 .. .. .	866	59	925	17,491

(a) Wholly produced in Western Australia.

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 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 1962.

## PRODUCTION OF CLAYS, 1962

(Tons)

Type	New South Wales	Victoria	Queensland	South Australia	Western Australia	Tasmania	Australia
Bentonite and bentonitic clay ..	..	..	299	..	485	..	784
Brick clay and shale	1,966,322	1,181,058	315,862	338,180	441,156	140,536	4,383,114
Cement clay and shale ..	274,351	n.a.	n.a.	14,606	21,635	n.a.	(a)310,592
Damouritic clay ..	..	..	..	485	..	..	485
Fireclay, n.e.l. ..	120,753	28,207	2,948	20,853	24,785	..	197,546
Fuller's earth ..	272	..	..	..	120	..	392
Kaolin ..	21,072	11,404	116	2,190	682	606	36,070
Stoneware clay ..	101,187	37,979	..	30,386	n.a.	..	(a)169,552
Tile clay ..	101,513	61,952	n.a.	..	n.a.	4,724	(a)168,189
Other clays ..	4,181	..	n.a.	..	n.a.	25,242	(a) 29,423

(a) Incomplete, see para. 1. Sources and Scope of Statistics, p. 1136.

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 the total Australian production of gypsum in 1962 came from that State, where the main centres of production are Kangaroo Island, Stenhouse Bay 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. Substantial quantities of gypsum are also exported to Japan, Malaya and the Philippines.

The production of gypsum in Australia is set out in the following table for the five years 1958 to 1962.

## PRODUCTION OF GYPSUM

(Tons)

Year	New South Wales	Victoria	South Australia	Western Australia	Australia
1958 .. ..	90,664	72,010	306,749	35,515	504,938
1959 .. ..	101,143	81,101	296,816	37,731	516,791
1960 .. ..	95,514	100,386	340,762	44,216	580,878
1961 .. ..	97,250	80,223	387,289	45,145	609,907
1962 .. ..	71,802	78,728	428,730	51,650	630,910

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

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

**PRODUCTION OF LIMESTONE(a)**  
(’000 Tons)

Year	N.S.W.	Vic.	Q’land	S.A.	W.A.	Tas.	Aust.
1958 .. ..	2,061	859	(b)	1,220	(b)	235	5,324
1959 .. ..	2,056	1,120	(b)	1,017	(b)	230	5,305
1960 .. ..	2,400	1,157	(b)	1,064	(b)	215	5,669
1961 .. ..	2,576	1,243	(b)	1,105	(b)	204	6,146
1962 .. ..	2,432	1,214	(b)	1,400	(b)	319	6,415

(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, Thuddungra and Lake Cargelligo in central New South Wales, and at Ravensthorpe in Western Australia. Most of the output of magnesite in Australia is used for refractory purposes, mainly 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 1958 to 1962 are set out in the table below.

**PRODUCTION OF MAGNESITE**  
(Tons)

Year	New South Wales	Queensland	South Australia	Western Australia	Australia
1958 .. ..	69,030	20	341	..	69,391
1959 .. ..	59,777	..	790	19	60,586
1960 .. ..	61,668	..	498	..	62,166
1961 .. ..	88,511	..	659	9,625	98,795
1962 .. ..	61,672	..	295	224	62,191

6. **Salt.**—Salt is obtained in Australia from solar evaporation pans and dry salt lakes. Production satisfies local requirements and provides a considerable surplus for export, mainly to Japan. Recorded production in South Australia (the chief producing State) is shown in the following table for the years 1958 to 1962. Estimates of total Australian production are also shown.

**SALT PRODUCTION**  
(’000 Tons)

Particulars	1958	1959	1960	1961	1962
South Australia .. ..	336	358	359	387	390
Estimated Australian total ..	430	468	463	509	536

7. **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 barite is at Orparinna in the North Flinders Range in South Australia. The production of barite in Australia during 1962 was 12,534 tons, of which 11,605 tons came from South Australia, 494 tons from Western Australia and 435 tons from New South Wales.

(iii) *Diatomite.* Production of diatomite is carried on mainly in the eastern States of Australia. In 1962, 7,312 tons were produced, of which New South Wales produced 4,318 tons, mainly at Coonabarabran and Barraba. The remaining 2,994 tons were produced in Queensland (2,209 tons), Victoria (770 tons) and Western Australia (15 tons).

(iv) *Dolomite.* In 1962, South Australia continued to supply the bulk of the requirements of the iron and steel industry from quarries at Ardrossan. During the year, production in the various States was South Australia, 169,853 tons; New South Wales, 4,919 tons; Queensland, 3,708 tons; and Tasmania, 2,217 tons; making an Australian total of 180,697 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 5,925 tons of the Australian total of 8,513 tons in 1962. Of the remainder, 1,321 tons came from South Australia and 1,267 tons from Western Australia.

(vi) *Gemstones.* (a) *Opals.* Most of the opals won in recent years came from the Coober Pedy and Andamooka fields in South Australia, which produced opals worth £949,000 in 1962. Other production in 1962 was from Lightning Ridge in New South Wales, valued at £100,000.

(b) *Sapphires.* In 1962, sapphires produced in the Glen Innes and Inverell Districts of New South Wales were valued at £31,000 and production from the Anakie field in Central Queensland was valued at £5,000.

(vii) *Phosphate Rock.* During 1962, 4,385 tons of phosphate rock were produced, of which 4,317 tons came from South Australia and the remaining 68 tons from Western Australia. Phosphate deposits at Rum Jungle were tested by the Bureau of Mineral Resources in 1962. Further testing is required but present indications are that the phosphate rock is not likely to be suitable for the production of superphosphate. A programme to test phosphate deposits in the Amadeus Basin, west of Alice Springs, is planned for 1963.

(viii) *Silica.* The production of silica is not recorded in Victoria and 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 158,619 tons in New South Wales; 25,614 tons in Queensland; 23,446 tons in South Australia; 10,351 tons in Western Australia; and 514 tons in Tasmania; making a total of 218,544 tons recorded for those States during 1962.

(ix) *Sillimanite.* In 1962, 2,637 tons of sillimanite were produced in Australia, 1,359 tons of which came from South Australia and 1,278 tons from New South Wales.

(x) *Talc.* The Australian output of talc (including steatite) was 14,060 tons in 1962. South Australia produced 8,008 tons, Western Australia 4,981 tons, and New South Wales 1,071 tons.

(xi) *Other.* Other non-metallic minerals produced in Australia in small quantities during 1962 were garnet concentrate, foundry loam, lithium ores, mineral pigments, pebbles for grinding, perlite, pyrophyllite, rhodonite and serpentine.

## § 16. Value of Production

1. **Local Value of Mining and Quarrying Production, 1962.**—The following table shows particulars of the local value of production for individual mining industry groups and quarrying for the year 1962. It should be stressed 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 (j), pages 1136-7. A more detailed reference to the value of production of mining and quarrying and other industries together with a brief explanation of terms used will be found in Chapter XXX. Miscellaneous.

## MINING AND QUARRYING: LOCAL VALUE OF PRODUCTION(a), 1962

(£'000)

Industry	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
<b>Metal mining—</b>									
Gold mining ..	7	473	231	1	14,148	(b)	926	..	15,786
Lead-silver-zinc mining ..	17,494	..	(c)	4	14	(c)	..	..	40,564
Copper-gold mining ..	26	3	(c)	(b)	287	(c)	1,548	..	7,842
Tin mining ..	211	8	1,107	..	334	1,220	35	..	2,915
Mineral sands mining ..	3,005	..	1,775	..	715	..	..	..	5,495
Other metal mining ..	81	16	(c)	4,571	2,277	(c)	2	..	7,524
<b>Total, Metal Mining</b>	<b>20,824</b>	<b>500</b>	<b>26,715</b>	<b>4,576</b>	<b>17,775</b>	<b>7,225</b>	<b>2,511</b>	<b>..</b>	<b>80,126</b>
<b>Fuel mining—</b>									
Black coal mining ..	47,034	316	8,143	1,449	1,981	616	..	..	59,539
Brown coal mining ..	..	7,841	..	..	..	..	..	..	7,841
<b>Total, Fuel Mining ..</b>	<b>47,034</b>	<b>8,157</b>	<b>8,143</b>	<b>1,449</b>	<b>1,981</b>	<b>616</b>	<b>..</b>	<b>..</b>	<b>67,380</b>
<b>Non-metal (excluding fuel) mining—</b>									
Clays(d) ..	1,110	1,121	101	239	161	49	..	..	2,781
Gypsum ..	137	82	..	499	45	..	..	..	763
Limestone ..	1,270	610	(c)	1,087	(c)	(c)	..	..	3,973
Salt ..	..	(c)	(c)	779	(c)	..	13	..	1,023
Other non-metal (excluding fuel) mining(d)	718	(c)	26	1,269	1,581	(c)	..	..	3,617
<b>Total, Non-metal (excluding Fuel) Mining ..</b>	<b>3,235</b>	<b>1,968</b>	<b>751</b>	<b>3,873</b>	<b>1,960</b>	<b>357</b>	<b>13</b>	<b>..</b>	<b>12,157</b>
<b>Total, All Mining ..</b>	<b>71,093</b>	<b>10,625</b>	<b>35,609</b>	<b>9,898</b>	<b>21,716</b>	<b>8,198</b>	<b>2,524</b>	<b>..</b>	<b>159,663</b>
Construction material quarrying(d) ..	8,871	9,383	1,490	5,489	1,529	705	158	281	27,906
<b>Total, All Mining and Quarrying ..</b>	<b>79,964</b>	<b>20,008</b>	<b>37,099</b>	<b>15,387</b>	<b>23,245</b>	<b>8,903</b>	<b>2,682</b>	<b>281</b>	<b>187,569</b>

(a) Value of output or selling value of products at the mine or quarry. (b) Less than £500.  
(c) Not available for publication, included in total for Australia. (d) Incomplete; see para. 1.  
Sources and Scope of Statistics, p. 1136.

2. Local Values, 1958 to 1962.—In the following table, the local value of mining and quarrying production is shown by States and Territories.

## MINING AND QUARRYING: LOCAL VALUE OF PRODUCTION(a)

(£'000)

Year	N.S.W.	Vic.	Q'land	S. Aust.	W. Aust.	Tas.	N.T.(b)	Aust.
1958 ..	71,414	13,694	27,632	12,308	20,777	7,358	2,772	155,955
1959 ..	71,090	14,935	33,329	13,209	21,787	7,639	2,996	164,985
1960 ..	79,641	16,267	37,608	13,952	22,166	8,067	3,539	181,240
1961 ..	78,171	c 20,027	32,220	15,912	22,496	7,959	3,366	180,151
1962 ..	79,964	c 20,008	37,099	15,387	23,245	8,903	2,963	187,569

(a) Value of output or selling value of products at the mine or quarry. (b) Includes Australian Capital Territory.  
(c) Not comparable with years prior to 1961 owing to extension of coverage of quarrying activities.

3. Net Value of Mining and Quarrying Production.—The following table shows particulars of the net value of production for individual mining industry groups and construction material quarrying for the year 1962.

**MINING AND QUARRYING: NET VALUE OF PRODUCTION(a), 1962**  
(£'000)

Industry	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T.	A.C.T.	Aust.
<b>Metal mining—</b>									
Gold mining .. ..	6	(b)	(b)	(b)	9,556	(c)	799	..	10,839
Lead-silver-zinc mining ..	13,001	..	(b)	(b)	2	(b)	..	..	31,893
Copper-gold mining .. ..	18	2	(b)	(b)	112	(b)	1,122	..	4,458
Tin mining .. ..	186	7	798	..	250	1,014	23	..	2,278
Mineral sands mining .. ..	2,009	..	(b)	..	(b)	..	..	..	3,657
Other metal mining .. ..	69	(b)	(b)	(b)	1,828	(b)	(d) 2	..	(e)6,282
<b>Total, Metal Mining</b>	<b>15,289</b>	<b>333</b>	<b>20,758</b>	<b>(b)</b>	<b>(b)</b>	<b>4,839</b>	<b>1,946</b>	<b>..</b>	<b>59,407</b>
<b>Fuel mining—</b>									
Black coal mining .. ..	35,975	219	6,716	(b)	(b)	508	..	..	46,193
Brown coal mining .. ..	..	7,169	..	..	..	..	..	..	7,169
<b>Total, Fuel Mining ..</b>	<b>35,975</b>	<b>7,388</b>	<b>6,716</b>	<b>(b)</b>	<b>(b)</b>	<b>508</b>	<b>..</b>	<b>..</b>	<b>53,362</b>
<b>Non-metal (excluding fuel) mining—</b>									
Clays(f) .. ..	853	1,030	(d) 101	210	111	43	..	..	(e)2,348
Gypsum .. ..	102	63	..	(b)	(b)	..	..	..	608
Limestone .. ..	914	349	(b)	911	(b)	(b)	..	..	2,804
Salt .. ..	..	(b)	(b)	612	(b)	..	12	..	(g) 831
Other non-metal (excluding fuel) mining(f)	605	(b)	24	(b)	(b)	(b)	..	..	2,748
<b>Total, Non-metal (excluding Fuel) Mining ..</b>	<b>2,474</b>	<b>1,597</b>	<b>499</b>	<b>3,358</b>	<b>1,181</b>	<b>218</b>	<b>12</b>	<b>..</b>	<b>9,339</b>
<b>Total, All Mining ..</b>	<b>53,738</b>	<b>9,318</b>	<b>27,973</b>	<b>8,566</b>	<b>14,990</b>	<b>5,565</b>	<b>1,958</b>	<b>..</b>	<b>122,108</b>
<b>Construction material quarrying(f) ..</b>	<b>(d)8,871</b>	<b>6,879</b>	<b>1,030</b>	<b>4,641</b>	<b>1,132</b>	<b>552</b>	<b>114</b>	<b>187</b>	<b>e 23,406</b>
<b>Total, All Mining and Quarrying ..</b>	<b>62,609</b>	<b>16,197</b>	<b>29,003</b>	<b>13,207</b>	<b>16,122</b>	<b>6,117</b>	<b>2,072</b>	<b>187</b>	<b>145,514</b>

(a) Local value (i.e. value of output at mine) less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted. (b) Not available for publication, included in total for Australia. (c) Less than £500. (d) No allowance has been made for costs of power, fuel, light and other materials and stores used, particulars of which are not available. (e) See footnote (d). (f) Incomplete; see para. 1. Sources and Scope of Statistics, p. 1136. (g) No allowance has been made for cost of power, fuel, light and materials and stores used by the salt industry in Victoria as particulars are not available.

4. Net Value of Production, 1958 to 1962.—In the following table, the net value of mining and quarrying production and the value per head of population are shown by States and Territories.

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

Year	N.S.W.	Vic.	Q'land	S.A.	W.A.	Tas.	N.T. and A.C.T.	Aust.
NET VALUE OF PRODUCTION(a) (£'000)								
1958 .. ..	55,801	10,987	19,796	9,999	14,454	5,168	2,131	118,336
1959 .. ..	56,331	12,101	24,481	10,698	14,765	5,398	2,381	126,155
1960 .. ..	63,214	13,158	27,460	11,404	15,444	5,476	2,871	139,027
1961 .. ..	60,684	(b)16,479	23,434	13,103	15,553	5,203	2,789	137,245
1962 .. ..	62,609	(b)16,197	29,003	13,207	16,122	6,117	2,259	145,514

NET VALUE OF PRODUCTION(a) PER HEAD OF POPULATION  
(£)

1958 .. ..	15.0	4.0	13.6	11.0	20.5	15.3	32.3	11.9
1959 .. ..	14.8	4.3	16.6	11.5	20.6	15.7	31.9	12.4
1960 .. ..	16.3	4.5	18.3	11.9	21.2	15.6	35.5	13.4
1961 .. ..	15.4	(b) 5.6	15.4	13.4	20.9	14.6	31.4	13.0
1962 .. ..	15.6	(b) 5.4	18.7	13.2	21.1	16.9	23.3	13.5

(a) Local value, or value of output, less cost of power, fuel, light and other materials and stores used; depreciation and maintenance costs have not been deducted. (b) Not comparable with years prior to 1961 owing to extension of coverage of quarrying activities.

5. Local Value of Minerals Produced, 1958 to 1962.—Particulars of the estimated values of minerals (mine and quarry products) produced 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	1958	1959	1960	1961	1962
METALLIC MINERALS					
Copper ore, concentrate, etc. .. ..	14,770	21,165	25,439	21,249	24,302
Gold ore, concentrate, other forms, etc. ..	16,251	15,853	15,870	15,859	15,627
Iron ore .. ..	(a) 4,393	4,633	4,844	5,899	5,325
Lead and lead-silver ore and concentrate, lead-copper concentrate, etc. .. ..	22,493	21,477	20,396	16,933	19,548
Manganese ore .. ..	460	626	329	427	480
Pyritic concentrate .. ..	1,112	1,068	1,136	1,252	1,115
Rutile concentrate .. ..	4,524	3,838	3,639	3,314	3,519
Tin concentrate .. ..	1,739	2,043	1,940	2,786	2,834
Tungsten concentrates .. ..	871	410	940	1,033	559
Zinc ore and concentrate .. ..	2,565	4,888	7,730	5,295	4,555
Zircon concentrate .. ..	487	1,008	972	1,267	1,291
Other metallic minerals .. ..	525	512	575	769	947
<i>Total, Metallic Minerals</i> .. ..	<i>70,190</i>	<i>77,521</i>	<i>83,810</i>	<i>76,083</i>	<i>80,102</i>
FUEL MINERALS					
Coal, black .. ..	51,658	49,211	55,201	57,081	59,539
Coal, brown .. ..	5,418	6,123	6,845	7,722	7,841
<i>Total, Fuel Minerals</i> .. ..	<i>57,076</i>	<i>55,334</i>	<i>62,046</i>	<i>64,803</i>	<i>67,380</i>
NON-METALLIC (EXCLUDING FUEL) MINERALS					
<i>Total, Non-metallic (excluding Fuel) Minerals</i> .. ..	<i>(b) 10,192</i>	<i>(b) 10,533</i>	<i>10,843</i>	<i>11,494</i>	<i>12,160</i>

NOTE.—For footnotes see next page.

LOCAL VALUE OF MINERALS PRODUCED: AUSTRALIA—*continued*  
(£'000)

Mineral	1958	1959	1960	1961	1962
<b>CONSTRUCTION MATERIALS(c)</b>					
Total, Construction Materials .. ..	18,497	21,597	24,541	(d) 27,771	(d) 27,927
<b>TOTAL</b>					
Total, All Minerals and Construction Materials(e) .. ..	155,955	164,985	181,240	180,151	187,569

(a) Includes the value of iron oxide for fluxing. (b) Excludes Australian Capital Territory, details of which are included with construction materials. (c) Incomplete owing to difficulties of coverage. See para. 1. Sources and Scope of Statistics, p. 1136. (d) Not comparable with years prior to 1961 owing to extension of coverage in Victoria.

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

Owing to the necessity of classifying individual mines according to the principal mineral produced, the values in the table on page 1184 for mining industry groups differ slightly in some cases from totals of the corresponding groups of mine products shown in the table above.

## § 17. Oversea Trade in Minerals and Mineral Products

Particulars of the quantity and value (£A. f.o.b. port of shipment) of the principal mineral and mineral product items imported into and exported from Australia during the years 1960 to 1962 are shown in the following table.

IMPORTS AND EXPORTS OF PRINCIPAL MINERALS AND MINERAL PRODUCTS:  
AUSTRALIA

Item	Quantity			Value (£A.'000 f.o.b.)		
	1960	1961	1962	1960	1961	1962
<b>IMPORTS</b>						
Aluminium, refined—						
Ingots .. .. tons	26,432	16,141	31,389	6,448	3,883	7,443
Plates, sheets and strips .. ..	5,770	1,953	2,163	2,432	802	929
Foil .. .. "	3,909	2,002	2,101	2,560	1,343	1,424
Asbestos .. .. short tons	41,002	36,901	39,105	2,568	2,310	2,437
Gold, unrefined bullion(a) .. fine oz.	144,029	146,131	135,084	2,238	2,283	2,074
Iron and steel—						
Iron ore .. .. tons	278,502	270,422	260,431	310	321	291
Ferro-alloys .. .. "	41,315	55,959	16,218	3,391	4,195	1,296
Tinplate .. .. "	63,741	38,355	31,102	6,039	3,661	2,818
Petroleum oils—						
Crude .. .. '000 gals.	2,705,989	2,837,372	2,976,789	67,743	66,455	66,675
Enriched crude .. .. "	237,336	404,861	398,340	6,923	11,831	11,666
Kerosenes .. .. "	102,965	110,906	103,176	5,368	5,673	5,488
Lubricating oil .. .. "	49,837	50,117	52,296	6,809	7,208	7,220
Gasolenes and solvents .. .. "	238,208	190,245	234,186	13,247	10,284	13,087
Phosphate rock .. .. '000 tons	1,491	1,766	1,721	4,075	4,768	4,484
Sulphur .. .. tons	221,778	182,052	229,195	2,285	1,920	2,389
Titanium oxide (pigments) .. .. "	5,054	5,139	5,947	971	1,017	1,144

NOTE.—For footnotes see next page.

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

Item	Quantity			Value (£A.'000 f.o.b.)		
	1960	1961	1962	1960	1961	1962
<b>EXPORTS(b)</b>						
Asbestos .. .. short tons	8,299	8,060	9,738	784	800	981
Coal .. .. tons	1,577,140	2,850,307	2,909,169	6,327	11,505	11,694
Copper, blister .. .. "	502	1,022	..	162	395	..
Gold, refined .. .. fine oz.	2,513,583	1,099,701	314,971	39,275	17,265	4,932
Iron and steel—						
Iron ore .. .. tons	10	43	107	(c)	(c)	1
Pig iron .. .. "	99,847	296,050	157,502	2,199	6,588	3,514
Ingots, blooms and slabs .. .. "	9,619	86,860	97,950	380	3,102	3,210
Tinplate .. .. "	8,080	16,644	25,238	699	1,338	2,134
Scrap .. .. "	205,747	223,320	138,977	3,431	3,957	1,967
Lead—						
Ore and concentrate(d) .. .. "	74,696	86,268	109,058	4,172	4,590	5,596
Lead-silver bullion .. .. "	49,653	46,089	76,014	5,268	4,476	6,212
Pig .. .. "	125,265	145,174	197,049	10,970	11,382	13,199
Petroleum oils—						
Gasolenes and solvents .. '000 gals.	37,312	63,214	32,075	2,586	3,635	2,131
Automotive distillate .. .. "	179,490	139,311	165,222	10,232	6,884	8,288
Residuals and heavy distillates .. .. "	..	..	..	..	..	..
Rutile concentrate .. .. '000 gals.	175,330	238,318	350,662	7,346	8,096	10,376
Silver, refined .. .. '000 fine oz.	93,706	99,652	117,291	4,064	3,207	3,629
Zinc—	2,800	1,055	346	1,150	437	158
Ore and concentrate .. .. tons	321,930	276,109	255,209	5,395	5,056	4,072
Refinery type shapes .. .. "	27,443	46,472	91,215	3,066	4,482	7,459

(a) Includes gold contained in matte. (b) Includes re-exports. (c) Less than £500.  
(d) Includes lead-copper concentrate.

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 1962 and their principal metallic content as estimated by assay.

**PRINCIPAL METALLIC CONTENTS OF SPECIFIED ORES AND CONCENTRATES, ETC., EXPORTED FROM AUSTRALIA DURING 1962**

Ores and concentrates, etc.	Quantity exported	Metallic contents—estimated from assay						
		Copper	Gold	Lead	Silver	Tin	Tungstic oxide	Zinc
	tons	tons	fine oz.	tons	fine oz.	tons	tons	tons
<b>Copper—</b>								
Ore and concentrate .. ..	78,983	19,375	19,708	..	197,573	..	..	..
Copper-lead dross and speiss .. ..	4,686	757	..	3,162	199,332	7	..	..
Other slags and residues .. ..	196	127	..	3	..	3	..	..
<b>Lead—</b>								
Ore and concentrate(a) .. ..	109,058	1,140	24,027	74,586	2,632,866	..	..	7,209
Slags and residues .. ..	12,069	429	431	5,236	14,136	14	..	934
Lead-silver bullion .. ..	76,014	..	..	75,482	4,865,453	..	..	..
<b>Tungsten—</b>								
Scheelite ore and concentrate .. ..	450	..	..	..	..	..	316	..
Wolfram ore and concentrate .. ..	711	..	..	..	..	3	516	..
<b>Zinc—</b>								
Ore and concentrate .. ..	255,209	..	..	1,979	60,491	..	..	132,571
Slags and residues .. ..	5,006	..	..	..	..	..	..	3,385
<b>Total Metallic Contents .. ..</b>	..	21,828	44,166	160,448	7,969,851	27	832	144,099

(a) Includes lead-copper concentrate.