CHAPTER XXI.

MINERAL INDUSTRY.

§ 1. The Mineral Wealth of Australia.

1. **Place of Mining in Australian Development.**—The value of production from the mineral industry is now considerably less than that returned by the agricultural or the pastoral industry, nevertheless it was the discovery of gold in payable quantities that first attracted population to Australia, and thus laid the foundation of its nationhood. Prior to 1851, the year when Hargraves' memorable discovery was made, coal and copper had both been mined to some extent, and the existence of deposits of other minerals, including gold, had been proved. But it was the news of the sensational finds of the precious metal in 1851 and the year immediately following that brought about a constant stream of immigration, and caused an increase in population from 405,000 at the end of 1850 to upwards of 1,146,000 at the end of 1860.

2. **Extent of Mineral Wealth.**—The extent of the total mineral wealth of Australia cannot yet be regarded as completely ascertained, as large areas of country still await systematic prospecting. The presence of considerable deposits of valuable minerals has long been known. Thus, coal was discovered in 1797, and a shipload was exported to Bengal in 1799, silver was discovered as early as 1839, and was worked as early as 1864; copper mining dates back to 1844; lead to about 1848; iron to about 1850; while the discovery of gold in payable quantities dates back to 1851. Cobalt, nickel, manganese, chromium, tungsten, molybdenum, mercury, antimony, bismuth, zinc, cadmium, radio-active ores, etc., have all been found, some in fairly large quantities. During recent years osmiridium has figured largely in the Tasmanian returns.

Among the more valuable non-metalliferous sustances may be mentioned coke, kerosene shale, graphite, alunite, asbestos, diatomaceous earth, phosphate, clays, ochres, etc.; in building stones—sandstones, syenites, granites, basalts, augite-andesite, porphyries, serpentines, slates, limestones, and marbles; in precious stones—diamonds, emeralds, rubies, sapphires, amethysts, precious opal, turquoise, topazes, garnets, chrysolites, cairngorm, agates, etc.

3. **Quantity and Value of Production during 1924.**—The quantities (where available) and the values of the principal minerals produced in each State, and in Australia as a whole during the year 1924, are given in the tables immediately following. It must be clearly understood that the figures quoted in these tables refer to the quantities and values of the various minerals in the form in which they were reported to the States Mines Departments, and represent amounts which the Mines Departments consider may fairly be taken as accruing to the mineral industry as such. They are not to be regarded as representative of Australia's potentiality as a producer of *metals*, this matter being dealt with separately in § 18 hereinafter. It may be explained, therefore, that the item pig-iron in New South Wales refers only to metal produced from locally-raised ore and so reported to the Mines Department. New South Wales is, of course, in normal times, a large producer of iron and steel from ironstone mined in South Australia. As the table shows, the latter State receives credit for this ironstone in its mineral returns, but the iron and steel produced therefrom cannot be assigned to the mineral industry of New South Wales. Similarly lead, silver-lead, and zinc are credited in the form reported to the State of origin—chiefly New South Wales—although the actual metal extraction is carried out to a large extent elsewhere.

MINERAL PRODUCTION.—QUANTITIES, 1924.

Minerals.	Unit.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Australia.
Alunite	ton	1,008	..	..	..	..	..	..	1,008
Antimony ..	"	..	276	..	..	..	..	..	276
Arsenic	"	4,416	..	564	68	Not stated	..	..	5,048
Asbestos ..	"	..	..	..	4	74	..	..	78
Barytes	"	150	..	..	1,898	..	..	..	2,048
Bismuth	cwt.	300	..	5	..	..	..	..	305
Brown coal ..	ton	..	127,490	..	..	..	..	..	127,490
Chromite	"	773	..	..	..	..	..	..	773
Coal	"	11,618,216	518,315	1,123,117	..	421,864	75,988	..	13,757,500
Cobalt	"	..	..	197	..	..	..	..	197
Copper (ingot, matte, etc.)	"	1,129	..	5,630	405	..	6,698	..	13,862
Copper ore ..	"	..	..	..	..	2,795	..	32	2,827
Diatomaceous earth	"	564	..	..	..	..	..	..	564
Gold	fine oz.	18,685	67,167	98,841	880	485,035	4,626	703	675,937
Gypsum	ton	2,666	13,268	..	65,690	4,237	..	..	85,861
Iron (pig) (*b*) ..	"	74,075	..	..	..	..	..	..	74,075
Iron oxide ..	"	4,863	..	..	..	..	..	..	4,863
Ironstone ..	"	..	..	..	580,308	..	..	..	580,308
Kaolin	"	3,087	1,741	..	..	..	..	..	4,828
Lead	"	..	..	3,695	..	..	4,559	..	8,254
Lead and silver ore, concentrates, etc.	"	240,957	..	..	6	4,854	..	..	245,817
Limestone flux ..	"	114,756	..	96,899	109,298	..	146,140	..	467,093
Magnesia	"	12,496	76	149	129	..	..	..	12,850
Manganese ore ..	"	4,387	..	..	316	20	..	..	4,723
Molybdenite ..	cwt.	210	840	55	..	..	..	..	1,105
Osmiridium ..	oz.	..	..	..	..	..	365	..	365
Phosphate ..	ton	107	532	..	84	..	..	..	723
Pigments ..	"	738	76	..	710	..	20	..	1,544
Platinum ..	oz.	646	..	..	..	..	..	..	646
Pyritic ore ..	ton	..	..	..	..	..	..	..	..
Salt	"	..	(*a*)	..	62,687	..	..	..	62,687
Sapphires ..	oz.	2,713	..	15,014	..	..	..	..	17,727
Shale (oil) ..	ton	642	..	..	..	..	1,576	..	2,218
Silver	fine oz.	93,484	4,216	276,651	1,017	89,146	642,158	..	1,106,672
Tin and tin ore ..	ton	1,041	38	1,196	..	87	1,108	97	3,567
Wolfram ..	"	9	..	1	..	..	54	..	64
Zinc ores and concentrates ..	..	353,650	..	128	..	..	2,749	..	356,527

(*a*) Not available for publication. (*b*) See letterpress preceding this table.

The values of the minerals raised in each State during 1924 are given in the following table :—

MINERAL PRODUCTION.—VALUE, 1924.

Minerals.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Australia.
	£	£	£	£	£	£	£	£
Alunite	4,032	..	..	..	..	..	..	4,032
Antimony ..	..	14,522	..	..	..	..	..	14,522
Arsenic	18,859	..	22,500	544	777	..	..	42,680
Asbestos ..	..	..	..	80	2,206	..	..	2,286
Barytes ..	300	..	..	5,694	..	..	..	5,994
Bismuth ..	3,135	..	110	..	..	..	..	3,245
Brown coal ..	..	41,116	..	..	..	..	..	41,116
Chromite ..	2,082	..	..	..	..	..	..	2,082
Coal	9,589,547	569,555	985,542	..	363,255	66,555	..	11,574,454
Cobalt	..	..	39,461	..	..	..	..	39,461
Copper (ingot and matte) ..	71,658	..	380,025	26,046	..	457,386	..	935,115
Copper ore ..	..	..	..	..	40,676	..	239	40,915
Diamonds ..	498	..	..	..	..	..	..	498
Diatomaceous earth	1,092	..	..	..	..	..	..	1,092
Gold	86,905	312,398	459,716	4,093	2,255,932	21,516	3,270	3,143,830
Gypsum ..	1,236	11,818	..	57,479	5,278	..	..	75,811
Iron (pig) (*b*) ..	518,525	..	..	..	..	..	..	518,525
Iron oxide ..	5,361	..	..	..	..	..	..	5,361
Ironstone ..	..	..	..	667,354	..	..	..	667,354
Kaolin	2,910	2,683	..	..	..	..	..	5,593
Lead	..	..	125,263	..	..	154,881	..	280,144
Lead and silver-lead ore, concentrates, etc. ..	4,297,748	..	..	219	83,095	..	..	4,381,062

MINERAL PRODUCTION—VALUE, 1924—*continued.*

Minerals.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	N. T.	Australia.
	£	£	£	£	£	£	£	£
Limestone flux ..	43,034	..	39,222	38,254	..	146,140	..	266,650
Magnesite ..	12,772	228	149	323	..	..	..	13,472
Manganese ore ..	13,281	..	..	1,128	160	..	..	14,569
Molybdenite ..	2,475	4,850	441	..	..	..	..	7,766
Opal	10,500	..	300	4,000	..	..	..	14,800
Osmiridium ..	..	..	..	..	..	10,617	..	10,617
Phosphate ..	209	532	..	117	..	..	..	858
Pigments ..	942	514	..	4,260	..	50	..	5,766
Platinum ..	12,422	..	..	..	..	..	..	12,422
Pyritic ore ..	..	..	..	..	..	..	..	..
Salt	..	(*a*)	..	141,046	..	..	..	141,046
Sapphires ..	5,659	..	24,340	..	..	..	..	29,999
Shale (oil) ..	962	..	..	..	..	1,526	..	2,488
Silver	12,612	645	42,206	154	13,409	97,837	..	166,863
Tin and tin ore ..	259,485	6,056	175,509	..	12,008	275,014	12,855	740,927
Wolfram ..	170	..	21	..	..	2,785	..	2,976
Zinc concentrates	1,296,571	..	4,283	..	..	90,485	..	1,391,339
Unenumerated ..	(*d*) 24,853	..	6,581	2,801	..	1,175	(*c*)2,774	38,184
Total ..	16,299,835	964,917	2,305,669	953,592	2,776,796	1,325,967	19,138	24,645,914

(*a*) Not available for publication. (*b*) See letterpress, page 719. (*c*) Includes mica, £2,719.
(*d*) Includes dolomite, £12,600 ; silica, £8,000.

It may be pointed out in connexion with the figures given in the above table that the totals are exclusive of returns relating to certain commodities, such as stone for building and industrial uses, sand, gravel, brick and pottery clays, lime, cement, and slates, which might rightly be included under the generic term " mineral." Valuations of the production of some of these may be obtained from the reports of the various Mines Departments, but in regard to others it is impossible to obtain adequate information. In certain instances, moreover, the published information is of little value. By restricting the comparison to items in connexion with which properly comparable information can be obtained for each State, it is believed that a satisfactory estimate of the progress of the mineral industry can be more readily obtained. The items excluded from the total for New South Wales in 1924 consist of—lime, £92,582 ; marble, £1,410 ; slate, £535 ; Portland cement, £1,200,000 ; coke, £932,926 ; chert, £1,000 ; granite, £1,538 ; granite gravels, £5,013 ; shell grit, £430 ; mineral water, £360 ; sulphur (obtained from roasting concentrates), £65,067 ; and brick and pottery clays, £20,260. From the Queensland returns, marble, £657 has been deducted, while carbide, £65,660, and cement £105,130 have been excluded from the Tasmanian figures.

4. Value of Production, 1920 to 1924.—The value of the mineral production in each State during the five years 1920 to 1924 is given in the table hereunder :—

MINERAL PRODUCTION.—VALUE, 1920 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	N. T.	Australia.
	£	£	£	£	£	£	£	£
1920 ..	9,791,979	1,435,135	3,617,870	1,150,849	4,110,376	1,426,442	80,101	21,612,752
1921 ..	12,052,509	1,218,783	1,495,899	904,659	3,463,764	822,767	19,003	19,977,384
1922 ..	12,951,164	1,244,966	1,859,084	331,866	3,041,112	878,009	9,959	20,316,160
1923 ..	14,176,688	1,031,223	2,215,498	890,378	2,747,101	1,154,397	16,612	22,231,897
1924 ..	16,299,835	964,917	2,305,669	953,592	2,776,796	1,325,967	19,138	24,645,914

For New South Wales the value of production in 1924 was the highest ever recorded, and was over two millions in excess of that for 1923, which showed the highest value previously. The principal increases in 1924 were in silver-lead and coal, the respective values of which were £1,356,000 and £982,000 above those recorded in 1923. The decrease in the Victorian returns for 1924 resulted chiefly from the decline in the yields from gold and tin.

In Queensland the falling-off in 1921 was occasioned by the low prices realized for the principal industrial metals. None of the copper companies in the Cloncurry district resumed operations, and Mount Morgan, which in previous years contributed about 30 per cent. of the State's mineral yield closed down early in the year. Increases in the returns from copper, lead, silver, cobalt, and tin mainly accounted for the rise in value of production for 1923. The returns for 1924 showed an advance over those for 1923, the chief increases being in gold, tin, and coal. The low returns in South Australia for 1921 were due to the small production of copper, and this was followed by a still smaller yield in 1922, when the value dwindled to £74,000, the least return since 1844. A further factor in the reduction of the total for 1922 was the temporary cessation of operations at the ironstone deposits at Iron Knob, the value of the ore raised being £58,000, as compared with £587,000 in 1921. The improvement in the returns for 1923 was mainly accounted for by increases in the production from ironstone and copper, which amounted to £387,000 in the case of ironstone and £158,000 in the case of copper, over the figures for 1922. The returns for 1924 show an advance of £63,000 over those for 1923, and, while the yield from copper decreased by more than £206,000 this was compensated for by the heavier yield from ironstone, and from salt and gypsum. In Western Australia, while there was a small increase in 1924 as compared with 1923, the value of the total production was over one and a third millions less than in 1920. The collapse in the market for industrial metals, in conjunction with the increased cost of production, brought about the fall in production during 1921 in Tasmania. Improvement in the returns for tin, copper, lead, and limestone were mainly responsible for the increases during the last three years, the total for 1924 including also zinc to the value of £90,485. The stagnation in the base metal industry is reflected in the Northern Territory returns for 1922. It is stated that, unlike the Chinese miners, few Europeans in the Territory engage in mining for any length of time, the majority drifting away elsewhere.

5. Total Production to end of 1924.—In the next table will be found the estimated value of the total mineral production in each State up to the end of 1924. The figures given in the table are also exclusive of the same items referred to in connexion with the preceding table. Thus the total for New South Wales falls short by £21,233,000 of that published by the State Department of Mines, the principal items excluded being coke, £9,132,000; cement, £9,294,000; lime, £1,021,000; and marble, £48,000.

MINERAL PRODUCTION.—VALUE TO END OF 1924.

Minerals.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor.Ter.(a)	Australia.
	£	£	£	£	£	£	£	Million. £
Gold ..	63,539,761	302,667,456	85,390,112	1,621,473	154,785,378	8,875,743	2,279,730	619
Silver and lead ..	99,181,439	263,728	3,741,188	378,731	2,015,120	7,676,994	62,515	113
Copper ..	15,487,611	216,656	25,439,450	33,041,322	1,786,798	17,332,852	232,777	94
Iron ..	5,633,438	15,641	471,934	4,058,891	36,721	52,110	..	10
Tin ..	13,100,720	932,042	10,291,102	..	1,522,074	15,843,372	552,822	42
Wolfram	271,876	11,885	1,061,440	301	1,441	182,252	216,859	2
Zinc ..	17,593,137	..	4.283	15,993	5,437	126,805	..	18
Coal ..	141,651,393	7,671,441	13,204,231	..	4,195,133	1,274,087	..	168
Other ..	7,335,874	782,927	2,650,472	2,882,538	130,136	930,053	35,316	15
Total	363,795,249	312,561,776	142,254,212	41,999,249	164,478,238	52,294,268	3,380,019	1,081

(a) To 30th June, 1924.

The "other" minerals in New South Wales include alunite, £204,351; antimony, £344,588; bismuth, £229,554; chrome, £117,086; diamonds, £144,212; limestone flux, £1,040,954; molybdenite, £210,111; opal, £1,539,894; scheelite, £192,375; and oil shale, £2,690,710. In the Victorian returns antimony ore was responsible for £606,655. The value for coal in this State includes £297,288 for brown coal. Included in "other" in the Queensland production were opal, £181,495; gems, £569,675; bismuth, £118,218; molybdenite, £598,525; and limestone flux, £740,280. The chief items in South Australian "other" minerals were salt, £1,749,813; limestone flux, £330,545; gypsum, £341,030; and phosphate, £127,976. In the Tasmanian returns limestone flux was responsible for £268,568, osmiridium for £308,897, scheelite for £112,468, and iron pyrites for £93,916.

6. **Decline in the Metalliferous Industry.**—On the 1st December, 1921, a Select Committee was appointed by the Legislative Assembly of New South Wales to inquire into and report upon the serious decline in the metalliferous industry. The result of the Committee's investigations was published in a Report issued in 1922, wherein the chief contributing causes of the decline in New South Wales and in Australia generally were summarized as follows :—(1) High cost of production. (2) Deterioration in ore values in existing mines. (3) Inadequate machinery. (4) High freights. (5) High treatment charges. (6) Imperfect labour conditions in mines. (7) Lack of new payable discoveries. (8) Lack of efficiently-supported prospecting.

§ 2. Gold.

1. **Discovery in Various States.**—The discovery of gold in payable quantities was an epoch-making event in Australian history, for, as one writer aptly phrases it, this event "precipitated Australia into nationhood." A more or less detailed account of the finding of gold in the various States appears under this section in Official Year Books Nos. 1 to 4, but considerations of space preclude its repetition in the present issue.

2. **Production at Various Periods.**—In the following table will be found the value of the gold raised in the several States and in Australia as a whole during each of the six decennial periods from 1851 to 1920, and in single years from 1921 to 1924, from the dates when payable discoveries were first reported. Owing to defective information in the earlier years the figures fall considerably short of the actual totals, for during the first stages of mining development, large quantities of gold were taken out of Australia by successful diggers, who preferred to keep the amount of their wealth secret. For South Australia the records in the earlier years are somewhat irregular, and this remark applies to some extent also to the returns for Western Australia and Tasmania.

GOLD.—VALUE OF PRODUCTION, 1851 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor. Ter.	Australia.
	£	£	£	£	£	£	£	£
1851–60..	11,530,583	93,337,052	14,565	..	..	788,564	..	105,670,764
1861–70..	13,676,103	65,106,264	2,076,494	..	..	12,174	..	80,871,035
1871–80..	8,576,654	40,625,188	10,733,048	579,068	..	700,048	79,022	61,293,028
1881–90..	4,306,541	28,413,792	13,843,081	246,668	178,473	1,514,921	713,345	49,216,821
1891–1900	10,332,120	29,904,152	23,989,359	219,931	22,308,524	2,338,336	906,988	89,999,410
1901–10..	9,569,492	30,136,686	23,412,395	310,080	75,540,415	2,566,170	473,871	142,009,109
1911–20..	4,988,377	13,354,217	9,876,677	238,808	46,808,351	873,302	100,652	76,240,384
1921 ..	271,302	554,087	214,060	13,933	2,935,693	28,311	1,299	4,018,685
1922 ..	118,359	501,515	378,154	4,693	2,525,811	16,101	540	3,545,173
1923 ..	83,325	422,105	392,563	4,199	2,232,179	16,300	743	3,151,414
1924 ..	86,905	312,398	459,716	4,093	2,255,932	21,516	3,270	3,143,830
Total ..	63,539,761	302,667,456	85,390,112	1,621,473	154,785,378	8,875,743	2,279,730	619,159,653

The value of the gold yield in 1924 was the lowest recorded since the discovery of the precious metal in 1851.

The amount of gold raised in Australia in any one year attained its maximum in 1903, in which year Western Australia also reached its highest point. For the other States the years in which the greatest yields were obtained were as follows :—New South Wales, 1852; Victoria, 1856; Queensland, 1900; South Australia, 1904; and Tasmania, 1899.

The following table shows the quantity in fine ounces of gold raised in each State and in Australia during each of the last five years, the value of one ounce fine being taken at £5 12s. 6d. in 1920, at £5 6s. 0½d. in 1921, at £4 13s. 10¼d. in 1922, at £4 8s. 5¾d. in 1923, and at £4 13s. 0¼d. in 1924.

GOLD.—QUANTITY PRODUCED, 1920 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tasmania.	Nor. Ter.	Australia.
	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
1920 ..	48,908	152,792	115,229	1,697	617,843	6,246	(a) 939	943,654
1921 ..	51,173	104,512	40,376	2,628	553,731	5,340	(a) 245	758,005
1922 ..	25,222	106,872	80,584	1,000	538,246	3,431	(a) 115	755,470
1923 ..	18,833	95,403	88,726	949	504,511	3,684	(a) 168	712,274
1924 ..	18,685	67,167	98,841	880	485,035	4,626	(a) 703	675,937

(a) Year ended 30th June.

Unfortunately the general decline which has characterized Australia's gold output for a number of years has not been checked by new finds of importance, and unless more economic methods of exploiting existing low-grade deposits can be evolved the depression is likely to continue.

3. **Changes in Relative Positions of States as Gold Producers.**——A glance at the figures in the table showing the value of gold raised will sufficiently explain the enormous increase in the population of Victoria during the period 1851 to 1861, when an average of over 40,000 persons reached the State each year. With the exception of the year 1889, when its output was surpassed by that of Queensland, Victoria maintained its position as the chief gold-producer for a period of forty-seven years, or up to 1898, when its production was outstripped by that of Western Australia, the latter State from this year onward contributing practically half, and so far as recent years are concerned more than half the entire yield of Australia. New South Wales occupied the second place on the list until 1874, when Queensland returns exceeded those of the parent State, and, with the exception of the year 1921, maintained this pre-eminence to the end of 1924. South Australia has occupied the position of lowest contributor to the total gold yield since the year 1871. Taking the average of the last ten years, the relative position of each State in regard to the gold production of Australia was as follows :—

GOLD.—RELATIVE POSITION OF STATES AS PRODUCERS, 1915 TO 1924.

State.	Annual Average of Gold Production, 1915 to 1924.	Percentage on Total.	State.	Annual Average of Gold Production, 1915 to 1924.	Percentage on Total.
	Ozs.			Ozs.	
Total	1,125,524	100·0	New South Wales	63,852	5·7
Western Australia ..	755,177	67·1	Tasmania ..	9,037	0·8
Victoria	160,858	14·3	South Australia ..	3,755	0·3
Queensland ..	132,254	11·8	Northern Territory	591	..

4. **Methods of Gold Mining adopted in Each State.**—(i) *New South Wales.* In New South Wales the earlier "rushes" were to surface alluvial or shallow-sinking grounds. Many of these were apparently soon worked out, but there is reason to believe that in some instances payable results would be obtained by treating the rejected wash-dirt on more scientific principles. With the exhaustion of the surface deposits, discoveries were made by sinking to what are called deep alluvial leads, representing the beds of old drainage channels in Pliocene and Pleistocene times. The first of these deep alluvial leads was discovered at Forbes, in New South Wales, in 1862. The Tertiary deep leads at Gulgong were discovered in 1871. Cretaceous leads occur at Tibooburra, and detrital gold has been found in Permo-carboniferous conglomerates at Tallawang. The method of dredging is extensively used for winning gold from the beds of running streams, and from loose river flats and other wet ground where sinking would be impracticable. The system was introduced from New Zealand, where it was originally applied with great success on the Clutha River, and practically all the auriferous rivers of New South Wales have been worked by dredges. Hydraulic sluicing is employed also in several places, the necessary machinery being fitted to a pontoon for convenience in moving from place to place. The quantity of alluvial gold obtained, other than by dredging, amounted to 1,276 ozs. in 1924, the chief yields being obtained in the Tumut and Adelong District, 284 ozs.; Bathurst, 235 ozs.; Peel and Uralla, 232 ozs.; and Tambaroora and Turon Division, 144 ozs. The quantity obtained by dredging was 9,334 ozs.; the largest returns being obtained at Gundagai (Lachlan), 3,620 ozs.; Adelong (Tumut and Adelong District), 5,458 ozs.; and Araluen (Southern), 256 ozs. During 1924, the combined value of the dredging plants in the various areas was £63,412, but 4 dredges only were in operation. The quantity of gold won from quartz amounted to 6,833 ozs. In order of importance the yields in mining districts were—Lachlan, 2,707 ozs.; Southern, 1,418 ozs.; Bathurst, 1,021 ozs.; Tambaroora and Turon, 714 ozs.; Clarence and Richmond 175 ozs.; and Tumut and Adelong, 149 ozs. From the Cobar District, which for many years was the principal producer, the yield in 1924 was only 143 ozs., as compared with over 3,000 ozs. in 1922.

(ii) *Victoria.* Reef mining predominates in Victoria, although gold is also obtained from alluvial workings, both surface and deep leads. Owing to the exhaustion of much of the payable auriferous area the yield has been on the down grade for many years, and the return for 1924 was the lowest experienced since 1851. A considerable amount of attention is given to dredging and hydraulic sluicing, particularly in the Beechworth, Maryborough, Castlemaine, Ararat, Stawell, Gippsland, and Ballarat districts. The yields from alluvial and quartz respectively as returned (in crude ounces) from the chief mining districts of the State during 1924 were as follows:—Ararat and Stawell, 2,839 and 32; Ballarat, 1,216 and 904; Beechworth, 4,762 and 20,716; Bendigo, 440 and 28,097; Castlemaine, 1,544 and 12,007; Gippsland, 654 and 724; Maryborough, 75 and 40. The yield from the cyanide plants amounted to 2,052 ozs.

The largest output from quartz mining in the Bendigo district was furnished by the New Red, White, and Blue, with 8,769 ozs., valued at £35,079; followed by the Hercules and Energetic, 8,686 ozs., £36,455; Carlisle, 3,401 ozs., £13,959; Central Red, White, and Blue, 1,003 ozs., £3,915; Bendigo Amalgamated, 892 ozs., £4,958; and Lansell's North Red, White, and Blue, 664 ozs., £2,656. In the Beechworth district the Morning Star Co., at Wood's Point, returned 12,265 ozs., valued at £42,408; the Rose, Thistle, and Shamrock at Harrietville, 3,960 ozs., £16,394; and the Biplane, at Harrietville, 1,391 ozs., £6,128. In the Daylesford area of the Castlemaine district the Ajax returned 3,981 ozs., £18,154; and Ajax North, 4,719 ozs., £18,880. From the once famous Ballarat area the yield in 1924 was less than £1,600.

From alluvial the principal yield was obtained by Cock's Pioneer Gold and Tin Mines, with 3,495 ozs., valued at £13,967. This Company, which operates in the Beechworth district, also produced about £6,000 worth of tin during the year. The New Langi Logan at Ararat returned 2,616 ozs., valued at £10,460.

(iii) *Queensland.* Operations in Queensland are chiefly confined to reefing, and to the production of gold in connexion with the smelting of copper and other ores, the yield from alluvial in 1924 being only 854 ozs., of which 564 ozs. were obtained at Batavia River, while the quantity produced from stone treated was 15,928 ozs.; from copper and other ores 78,406 ozs.; and from old tailings 3,653 ozs.; making a total production of 98,841 ozs. The yields from the principal fields were—Mount Morgan, 76,522 ozs.; Charters Towers, 1,350 ozs.; Gympie, 5,392 ozs.; Chillagoe, 1,949 ozs.; Etheridge, 1,669 ozs.; Ravenswood, 4,355 ozs.; and Mount Coolon, 5,916 ozs. Over three-fourths of the entire production came from Mount Morgan, the yields from Gympie and Charters Towers being much below those of the preceding year. The once famous Charters Towers field is apparently approaching exhaustion.

(iv) *South Australia.* Gold is found in widely-scattered localities in South Australia, but the production has at no period been large. During the last four years the yield has declined from 2,628 ozs. in 1921 to 880 ozs. in 1924. Alluvial gold is produced by the Echunga, Teetulpa, Barossa, and Ulooloo fields. Within recent years the chief source of the metal has been the copper ore of Wallaroo and Moonta, from which it is recovered by smelting and electrolytic refining.

(v) *Western Australia.* The auriferous deposits of Western Australia may be grouped under three headings—(1) superficial deposits, (2) deposits in beds of conglomerate, and (3) lode and vein deposits. The first class includes a number of deposits of alluvial type, either in the beds of existing watercourses or in deep leads up to 100 feet or more below present surface level. Associated with these are deposits of crystalline gold in "pug," oxide of iron, and soft weathered portions of underlying bed rock. Considerable areas of auriferous surface soil are also found, and these have apparently originated from the denudation by weathering of the bed rock and its associated veins. The shallow surface deposits have been worked by ground sluicing wherever water was available, but much of the ground was worked by "dry-blowing." The pug and clayey bedrock are usually treated in puddling machines. In regard to (2) it may be noted that in several localities on the Pilbara goldfield and in one on the Yalgoo, gold has been found in conglomerate of the Nullagine series of rocks, now tentatively accepted

as of Cambrian age. The gold is crystalline and is confined to the interstitial cementing material. Occasional occurrences of gold are met with in laterite conglomerate of tertiary and post-tertiary age, and at Kintore in conglomerate of the same age. Lode and vein deposits alluded to in (3) are found in great variety in Western Australia. The gold is always found associated with iron pyrites in the unoxidized portions of the lodes, and often also with copper pyrites, arsenical pyrites and galena. Tellurides of gold occur at times.

The yields from the principal fields in order of importance were as follows:—East Coolgardie, 336,099 ozs.; Mt. Margaret, 43,705 ozs.; Murchison, 24,425 ozs.; Coolgardie, 10,243 ozs.; North Coolgardie, 9,509 ozs.; Yilgarn, 8,451 ozs.; Yalgoo, 5,611 ozs.; East Murchison, 4,897 ozs.; North-East Coolgardie, 4,690 ozs.; Dundas, 3,429 ozs.; Broad Arrow, 2,661 ozs.; Pilbara, 2,134 ozs.; and Peak Hill, 2,113 ozs. Of the total yield of 458,208 ozs. reported to the Mines Department, 454,318 ozs. were obtained from ore treated, 2,723 ozs. from dollied and specimens, while the return from alluvial was about 1,167 ozs. The total referred to differs somewhat from that quoted in the first table in this chapter, which represents gold exported and minted. It may be noted here that the total amount of dividends paid by Western Australian mining companies to the end of the year 1924 was £28,505,000.

Western Australia reached its zenith as a gold-producer in 1903, when the output was valued at £8,771,000, but since then there has been a more or less steady decline until in 1924 the total had dropped to £2,256,000. Three causes may be adduced to account for this falling-off—(1) Exhaustion of known rich deposits. (2) Unwise development, *i.e.*, "picking the eyes" of good mines. (3) Increase cost of stores, equipment, and labour, rendering it unprofitable to treat low-grade ores.

(vi) *Tasmania.* The yield in Tasmania is chiefly obtained from reefing, and the returns from the principal districts in 1924 were as follows:—North-West and West Coasts, 2,226 ozs.; Mathinna, 1,571 ozs.; Lisle Golconda, 163 ozs.; Mt. Claude, 121 ozs.; Beaconsfield, 82 ozs.; Mt. Cameron, Mt. Victoria, and Warrentinna, 452 ozs.; Lefroy, 10 ozs. The total production was equal to 4,626 ozs. fine. During 1924 the blister copper produced by the Mt. Lyell Mining and Railway Co. Ltd. contained approximately 2,134 ozs. of gold.

(vii) *Northern Territory.* The production for 1924 amounted to only 703 ozs. fine. It is stated that the potentialities of the older fields have by no means been exhausted, although a revival of the industry depends on the expenditure of large sums of money, either by the Government or by mining speculators, on developmental work. The bulk of the production came from Fletcher's Gully, while small yields were recorded from the Golden Dyke mine, from Arltunga, and from Pine Creek and other old mining fields.

5. **Remarkable Masses of Gold.**—Allusion has already been made in preceding Year Books to the discovery of "nuggets" and other remarkable masses of gold, but it is not proposed to repeat this information in the present issue. (See Year Book No. 4, page 500.)

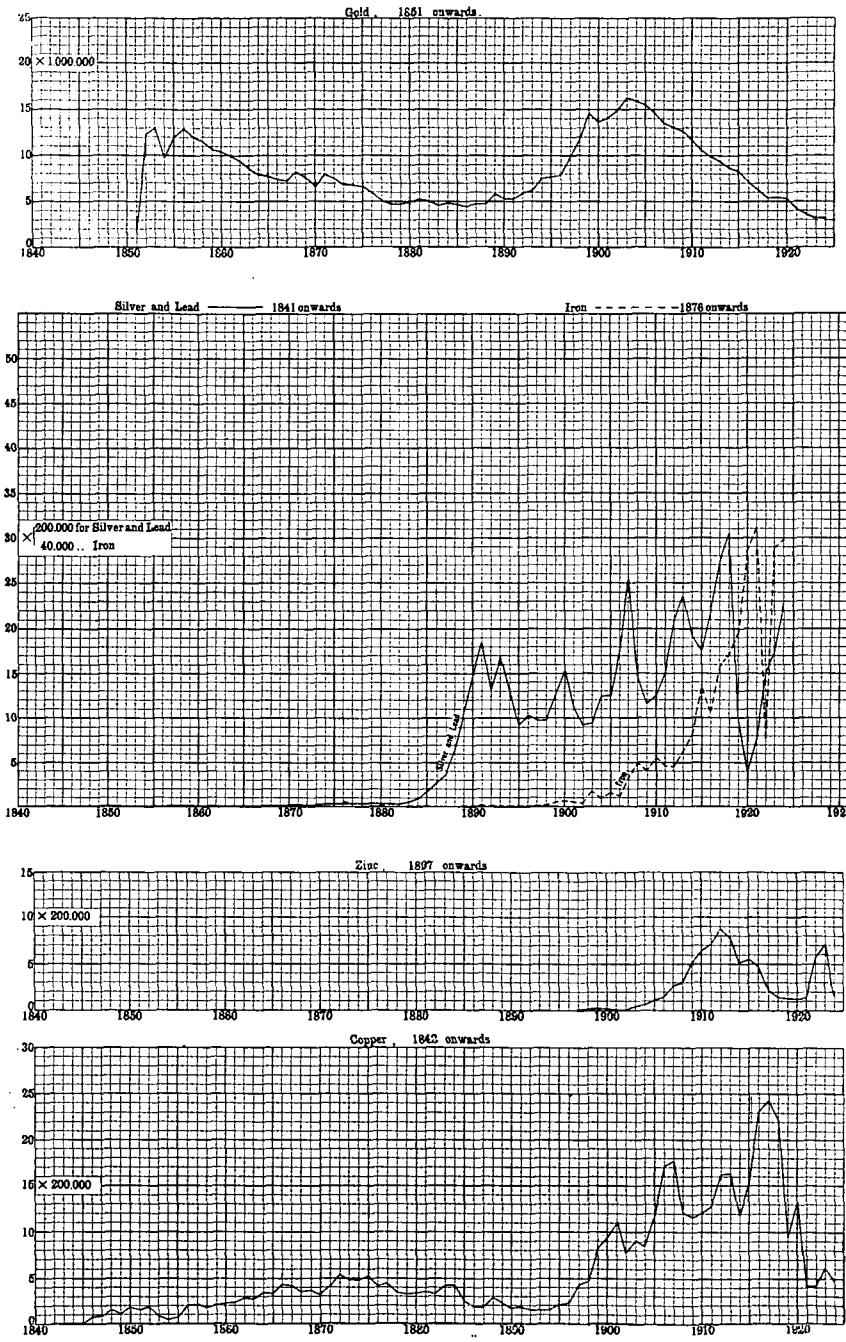
6. **Modes of Occurrence of Gold in Australia.**—This subject has been alluded to at some length in earlier issues of the Year Book, but considerations of space will not permit of repetition in the present issue.

7. **Place of Australia in the World's Gold Production.**—In the table given below will be found the estimated value of the world's gold production, and the share of Australia therein during the five years 1920 to 1924. The figures given in the table have been compiled chiefly from returns obtained directly by the Commonwealth Bureau of Census and Statistics from the gold-producing countries of the world.

GOLD.—WORLD'S PRODUCTION, 1920 TO 1924.

Year.	World's Production of Gold.	Gold Produced in Australia.	Percentage of Australia on Total.
	£	£	%
1920	90,730,000	5,308,000	5.9
1921	83,772,000	4,019,000	4.8
1922	71,653,000	3,545,000	4.9
1923	78,367,000	3,151,000	4.0
1924	87,640,000	3,144,000	3.6

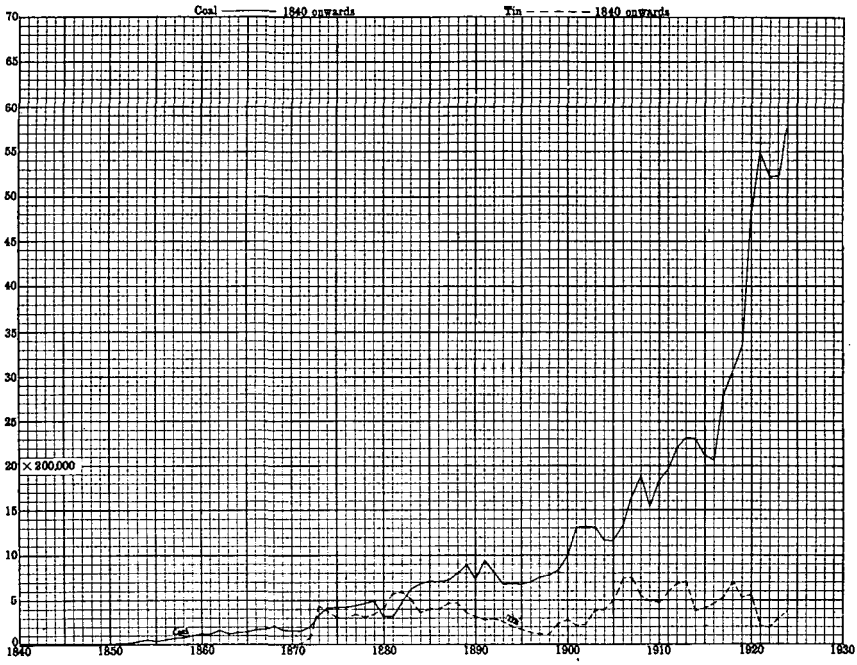
VALUES OF THE PRINCIPAL MINERALS PRODUCED—AUSTRALIA, 1840 TO 1924.

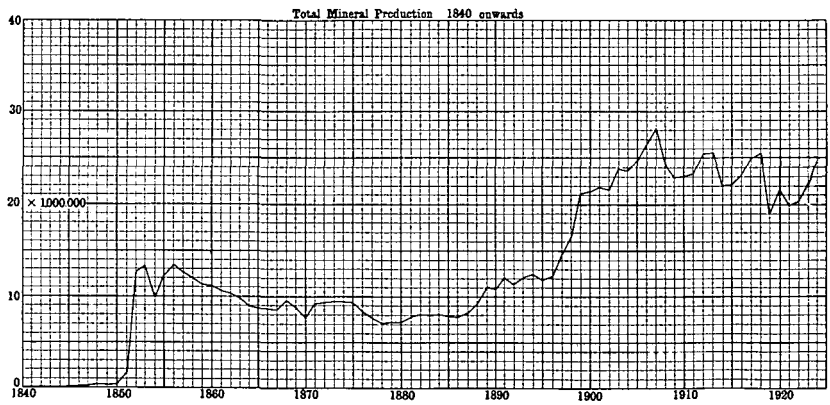


EXPLANANTION.—The values shown are those of the total Australian production of certain of the most important minerals in successive years from 1840 to 1924.

The base of each small square represents an interval of one year, and the vertical height represents in the case of gold £1,000,000; in the case of silver and lead, zinc and copper £200,000; and in the case of iron, £40,000.

VALUES OF PRINCIPAL MINERALS PRODUCED—AUSTRALIA, 1840 TO 1924 *continued.*





EXPLANATION.—The values shown are those of the total Australian production of certain of the most important minerals in successive years from 1840 to 1924.

The base of each small square represents an interval of one year, and the vertical height represents in the case of coal and tin £200,000, and in the case of total mineral production £1,000,000.

The value of the gold yield in the ten chief producing countries during each of the five years 1920 to 1924 is given in the table hereunder. Particulars of the quantity and value of the gold production for all countries for the ten years 1915–24 will be found in the Bulletin of Australian Production issued by this Bureau.

GOLD.—PRODUCTION, CHIEF COUNTRIES, 1920 TO 1924.

Country.	1920.	1921.	1922.	1923.	1924.
	£	£	£	£	£
Union of South Africa	45,892,000	43,096,000	32,895,000	40,480,000	44,534,000
United States ..	13,581,000	12,519,000	10,743,000	10,736,000	11,378,000
Canada	4,303,000	4,911,000	5,929,000	5,457,000	7,095,000
Australia	5,306,000	4,018,000	3,545,000	3,151,000	3,144,000
Mexico	4,154,000	3,626,000	3,512,000	3,437,000	3,686,000
Rhodesia	3,108,000	3,104,000	3,063,000	2,865,000	2,920,000
India	2,609,000	2,073,000	1,832,000	1,697,000	1,843,000
Colombia	1,578,000	1,539,000	1,201,000	1,220,000	1,237,000
Japan	1,499,000	1,408,000	1,239,000	1,154,000	1,252,000
Gold Coast ..	1,167,000	1,078,000	998,000	883,000	958,000

It has been deemed advisable to apportion values in accordance with Australian currency, *i.e.*, at £5 12s. 6d. for 1920, £5 6s. 0⅔d. for 1921, £4 13s. 10¼d. for 1922, £4 8s. 5¾d. for 1923, and £4 13s. 0¼d. for 1924.

The next table shows the average yearly value in order of importance of the yield in the chief gold-producing countries for the decennium 1915–1924.

GOLD.—AVERAGE ANNUAL PRODUCTION, CHIEF COUNTRIES, 1915 TO 1924.

Country.	Value.	Country.	Value.
	£		£
Union of South Africa ..	40,164,000	Russia	2,767,000
United States	14,361,000	India	2,131,000
Australia	5,156,000	Japan	1,288,000
Canada	4,557,000	Gold Coast	1,283,000
Rhodesia	3,215,000	Colombia	1,246,000
Mexico	3,157,000		

The comparison has been restricted to countries where the average for the period is in excess of a million sterling.

8. Employment in Gold Mining.—The number of persons engaged in gold mining in each State in 1901 and during each of the last five years is shown in the following table :—

GOLD MINING.—PERSONS EMPLOYED, 1901, AND 1920 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor. Ter.	Total.
	No.	No.	No.	No.	No.	No.	No.	No.
1901 ..	12,064	27,387	9,438	1,000	19,771	1,112	200	70,972
1920 ..	1,712	3,742	611	100	7,087	48	20	13,320
1921 ..	1,516	3,050	722	100	6,019	67	10	11,484
1922 ..	1,197	3,310	767	40	5,787	106	12	11,219
1923 ..	1,141	2,982	603	32	5,555	119	30	10,462
1924 ..	1,014	2,651	452	30	5,296	128	18	9,589

The heavy decline noticeable since 1901 is of course due to the exhaustion of accessible payable deposits and the failure to locate any considerable fresh sources of supply.

9. The Precious Metals Prospecting Act of 1926.—Under the provisions of this Act a sum of £40,000 was allocated by the Commonwealth Government to assist persons or companies engaged in prospecting for precious metals.

§ 3. Platinum and Platinoid Metals.

1. **Platinum.**—(i) *New South Wales.* The deposits at present worked in the State are situated at Platina in the Fifield division, near Parkes, and the production in 1924 amounted to 646 ozs., valued at £12,422, as compared with 586 ozs., valued at £10,204 in the preceding year, while the total production recorded to the end of 1924 amounted to 17,250 ozs., valued at £91,655. Production was stimulated by the local price for the metal, £18 10s. per oz., in December, and if a permanent water supply were assured the industry could afford a livelihood for a much larger number than the 80 men engaged in it during 1924.

(ii) *Victoria.* In Gippsland the metal has been found in association with copper, and 127 ozs. were produced in 1913, but there was no production in recent years.

(iii) *Queensland.* Platinum associated with osmiridium has been found in the beach sands between Southport and Currumbin, in creeks on the Russell goldfield near Innisfail, and in alluvial deposits on the Gympie gold-field, but no production has been recorded.

2. **Osmium, Iridium, etc.**—(i) *New South Wales.* Small quantities of osmium, iridium, and rhodium are found in various localities. Platinum, associated with iridium and osmium, has been found in the washings from the Aberfoil River, about 15 miles from Oban; on the beach sands of the northern coast; in the gem sand at Bingara, Mudgee, Bathurst, and other places. In some cases, as for example in the beach sands of Ballina, the osmiridium and other platinoid metals amount to as much as 40 per cent. of the platinum, or about 28 per cent. of the whole metallic content.

(ii) *Victoria.* In Victoria, iridosmine has been found near Foster, and at Waratah Range, South Gippsland.

(iii) *Tasmania.* For many years osmiridium has been known to exist in the bed of the Savage River, on the West Coast, and in rivulets and creeks in the serpentine country. The first recorded production was in 1910, when 120 ozs., valued at £530, or £4 8s. 4d. per oz., were raised. In 1914 the yield had increased to 1,019 ozs., valued at £10,076, or nearly £9 18s. per oz. From 1915 to 1917 the amount raised fell off considerably, owing to difficulty in disposing of the metal, but in 1918 there was an increase to 1,607 ozs., valued at £44,833; while in 1920 the 2,009 ozs. produced returned £77,114, or over £38 7s. 8d. per oz. In October of that year as much as £42 per oz. was obtained. For 1921 the production was 1,751 ozs., valued at £42,935, or about £24 10s. per oz. The price obtained in 1921, varied from £35 in January to £27 10s. in April, May, and June, to £23 in July and August, and to £20 from September to the close of the year. For 1922 the output reached 1,174 ozs., valued at £35,512. In 1923 the yield amounted to 673 ozs., valued at £19,642, and in 1924 to 365 ozs., valued at £10,617.

§ 4. Silver and Lead.

1. **Occurrence in Each State.**—Particulars regarding the occurrence of silver in each State will be found in preceding Year Books, Nos. 1 to 5, but considerations of space preclude the repetition of this matter in the present volume.

2. **Development of Silver Mining.**—The value of the production of silver, silver-lead and ore, and lead from each State during the five years ending 1924 is given hereunder :—

SILVER AND LEAD.—PRODUCTION, 1920 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor. Ter.	Australia.
	£	£	£	£	£	£	£	£
1920 ..	123,481	1,714	135,559	2,646	190,484	309,035	(a) 299	763,218
1921 ..	1,327,364	862	54,188	240	67,521	89,817	..	1,539,992
1922 ..	2,574,108	1,080	109,350	377	87,692	241,694	..	3,014,301
1923 ..	2,956,862	963	216,645	60	60,061	218,881	..	3,453,472
1924 ..	4,310,360	645	167,469	373	96,504	252,718	..	4,828,069

(a) Year ended 30th June.

The low production in 1920 was due to the suspension of operations owing to industrial troubles at the principal mines on the Broken Hill field. In addition to causing a cessation of mining operations and treatment of tailings on the Broken Hill field, the smelting works at Cockle Creek, upon which most of the silver-lead mines in other parts of the State depend for the sale of their ores, were forced to close. The resumption of normal production in 1921 by the mines on the Broken Hill field was largely hindered by

the low price of lead, and the destruction by fire of the smelting works at Port Pirie. Production in 1924 was greatly stimulated by the favourable price of the metals and with the exception of the Central mine, where work was restricted to fire-fighting, the chief mines on the Broken Hill lode were in full operation.

It must be understood that the totals for New South Wales in the above table represent the *net* value of the product (excluding zinc) of the silver-lead mines of the State. In explanation of the values thus given, it may be noted that the metallic contents of the larger portion of the output from the silver-lead mines in the State are extracted outside New South Wales, and the Mines Department considers, therefore, that the State should not take full credit for the finished product. The real importance of the State as a producer of silver, lead, and zinc is thus to some extent lost sight of. The next table, however, which indicates the quantity of these metals locally produced, and the average contents by assay of concentrates exported during the last five years, will show, as regards New South Wales, the estimated total production and the value accruing to Australia from the three metals :—

SILVER-LEAD MINES.—NEW SOUTH WALES, TOTAL PRODUCTION, 1920 TO 1924.

Year.	Metal Produced within Australia.				Contents of Concentrates Exported.			
	Silver.	Lead.	Zinc.	Value.	Silver.	Lead.	Zinc.	Value.
	ozs. fine.	tons.	tons.	£	ozs. fine.	tons.	tons.	£
1920 ..	196,111	1,749	(a) 10,565	515,728	479,221	3,025	21,742	274,061
1921 ..	3,624,413	47,426	(a) 1,425	1,723,864	617,477	6,539	19,272	261,238
1922 ..	6,648,825	97,867	23,724	4,113,427	3,264,102	19,328	132,186	1,272,074
1923 ..	7,233,236	124,570	41,153	5,707,739	4,834,718	40,906	149,319	1,813,287
1924 ..	6,292,978	120,380	43,579	6,472,812	2,963,693	21,513	114,374	1,292,220

(a) Including Zinc Oxide and Zinc Lead Oxide.

The figures given above are quoted on the authority of the Mines Department of New South Wales.

3. Sources of Production.—Broken Hill, in New South Wales, is the chief centre of silver production in Australia.

(i) *New South Wales.* (a) *Broken Hill.* A description of the silver-bearing area in this district is given in earlier issues of the Year Book. During 1913 the output of ore from the mines in this division amounted to 1,744,000 tons, the highest recorded in the history of the field, but, owing to the dislocation caused by the war the quantity raised in 1914 decreased to 1,442,000 tons. For the four years 1915 to 1918 the ore raised averaged over 1,200,000 tons, but, owing to the cessation of operations through industrial troubles and the fall in the price of metals the production in 1919 dwindled to 415,400 tons, and in 1920, when operations were carried on for a few weeks only, to 38,661 tons. In 1921 the output rose to 317,333 tons, in 1922 to 640,064 tons, in 1923 to 878,537 tons, and in 1924 to 1,050,674 tons, of which 1,037,243 tons were sulphide and 13,431 tons oxidized ore.

Although the returns are not complete in all cases, the following table relating to the companies controlling the principal mines at Broken Hill will give some idea of the richness of the field :—

SILVER.—BROKEN HILL RETURNS TO END OF 1924.

Mine.	Value of Output to end of 1924.	Dividends and Bonuses Paid to end of 1924.
	£	£
Broken Hill Proprietary Co. Ltd.	50,635,944	12,456,550
Broken Hill Proprietary Block 14 Co. Ltd. ..	4,092,081	632,160
British Australian Broken Hill Co. Ltd.	5,858,998	821,280
Broken Hill Proprietary Block 10 Co. Ltd. ..	4,946,989	1,432,500
Sulphide Corporation Ltd. (Central Mine)	22,899,310	2,979,375
Broken Hill South Ltd.	14,491,597	3,295,000
North Broken Hill Ltd.	9,515,429	2,743,940
Broken Hill Junction Lead Mining Co.	1,185,058	87,500
Junction North Broken Hill Mine	2,858,790	160,814
The Zinc Corporation Ltd.	4,174,320	1,682,455
Barrier South Ltd.	151,517	50,000
Totals	120,810,033	26,341,574

The returns relating to dividends and bonuses paid are exclusive of £1,744,000 representing the nominal value of shares in Block 14, British, and Block 10 companies, allotted to shareholders of Broken Hill Proprietary Company. If the output of the companies engaged in treating the tailings, etc., be taken into consideration, the totals for output and dividends shown in the table would be increased to about 128 millions and 29 millions respectively. The authorized capital of the various companies amounted to £7,823,000.

(*b*) *Picton Division.* The mines in the Yerranderie area produced 5,417 tons of ore in 1924, yielding 464,510 ozs. of silver, besides 784 ozs. of gold, and 1,213 tons of lead, the total production being valued at £108,022. Of the yield from this area in 1924, 3,354 tons valued at £84,000 were raised by the Silver Peaks Mines. Parts of one of the stopes in this mine showed over 10 feet of solid galena, yielding 120 ozs. of silver, and 33 per cent. of lead per ton. Ore to the value of £12,816 also was raised by the Wollondilly Silver Mining Co., and to the value of £8,734 by the Colon Peaks Mining Co. in this area.

(*c*) *Yass Division.* During 1924 the Kangiara mine produced 72 tons of ore yielding 869 ozs. of silver, 21 tons of lead, and 8 ozs. of gold.

(*d*) *Hillgrove Division.* In this division 41 tons of ore were raised in 1924, yielding 18,800 ozs. of silver, valued at £2,380.

(*e*) *Other Areas.* Small quantities of silver, lead, gold, and copper were produced during the year in the Cobar, Condobolin, Mount Hope, Orange, Tumbarumba, and Wilson's Downfall Divisions.

(ii) *Victoria.* The silver produced in 1924 amounted to 4,216 ozs., valued at £645, and was obtained in the refining of gold at the Melbourne Mint.

(iii) *Queensland.* The yields from the chief silver and lead producing centres in 1924 were as follows :—Chillagoe, silver £10,323, lead £60,785 ; Herberton, silver £9,370, lead £15,162 ; Brisbane, silver £13,651, lead £25,366 ; Mt. Morgan, silver £2,577 ; Etheridge, silver £2,435, lead £11,896 ; Cloncurry, silver £2,115, lead £7,307. Some of the mining leases in the Chillagoe area are owned by the State. The Mount Isa silver-lead field in the Cloncurry district was discovered in 1923, and the lodes so far opened are distributed over a length of 5 miles by a width of one mile along the west bank of the West Leichhardt River. Large accumulations of high grade carbonate of lead are in sight on this field, which, according to experts, is the largest find in importance since the discovery of Broken Hill.

(iv) *South Australia.* Rich specimens of silver ore have been discovered at Miltalie and Poonana, in the Franklin Harbour district, also at Mount Malvern and Olivaster, near Rapid Bay, and in the vicinity of Blinman and Farina. The surrounding district is also highly mineralized, but, so far, has not been thoroughly prospected. Attention has recently been devoted to the silver-lead ores at Eukaby, near Baratta. In 1923 a discovery of silver-lead ore was made between Ooloo Dam and Mount Distance, north of the Flinders Range, but operations of any magnitude thereat are at present unlikely. The production of silver in 1924 was valued at £154, and of silver-lead ore at £219.

(v) *Western Australia.* The quantity of silver obtained as a by-product and exported in 1924 was 89,146 ozs., valued at £13,409. In addition, 4,854 tons of lead and silver-lead ore and concentrates valued at £83,095 were exported. The production of lead ore from the Northampton mineral field amounted in 1924 to 36,750 tons.

(vi) *Tasmania.* The silver produced in 1924 amounted to 642,158 ozs., valued at £97,837, and the lead to 4,559 tons, valued at £154,881. Of the silver, Magnet Mines returned 151,084 ozs. ; North Mt. Farrell, 194,702 ozs. ; Zeehan Mines, 41,464 ozs. ; Dundas Mines, 77,215 ozs. ; Mt. Lyell, 147,376 ozs. ; and Round Hill, 24,169 ozs. The principal producers of lead were North Mt. Farrell, 1,933 tons ; Zeehan Mines, 446 tons ; Dundas Mines, 807 tons ; Round Hill, 368 tons ; and Magnet Mines, 901 tons.

(vii) *Northern Territory.* Silver-lead ores are found near Pine Creek, and at Mount Shoebridge near Brock's Creek railway station. There are a number of fair-sized galena lodes in the Pine Creek and McArthur River districts, but, owing to costs of transport and realization little attention is devoted to them. No production of silver-lead ores was recorded in 1924.

4. **World's Production.**—The world's production of silver during the last five years for which particulars are available is estimated to have been as follows :—

SILVER.—WORLD'S PRODUCTION, 1920–1924.

Total.	1920.	1921.	1922.	1923.	1924.
World's production in 1,000 fine ozs.	174,612	171,284	213,541	243,265	235,118

The share of Australia in the world's silver production in 1919 was estimated at 7,800,000 ozs., or about 4½ per cent. on the total production, but in 1921, owing to the cessation of operations at the Broken Hill field, the total local extraction fell to 4,573,000 ozs., and the estimated silver contents of the ores, bullion, and concentrates exported to 732,000 ozs., the total being a little over 3 per cent. on the world's production. For 1923 the local extraction was set down as 7,646,000 ozs., and the contents of concentrates etc., exported 5,110,000 ozs., the total representing about 5 per cent. on the world's production, while for 1924 local extraction was set down as 7,631,000, and exports as 2,242,000 ozs., the total being equivalent to about 4 per cent. on production for the world. The figures for the world's production are given on the authority of *The Mineral Industry*.

Arranged in order of importance the estimated yields in 1924 from the chief silver producing countries were as follows :—

SILVER.—PRODUCTION, CHIEF COUNTRIES, 1924.

Country.	Production.	Country.	Production.
	Fine ozs. ('000 omitted.)		Fine ozs. ('000 omitted.)
Mexico	91,000	Japan	3,300
United States	64,792	Central America	2,500
South America	25,000	East Indies	1,500
Canada	19,736	Transvaal	1,500
Australia	9,873	China	200
Europe	9.000	Rhodesia	160
British India	5,500	Congo	30

5. **Prices.**—As the production of silver is dependent to a very large extent on the price realized, a statement of the average price per standard ounce in the London market during the last five years is given below :—

SILVER.—PRICES, 1920 TO 1924.

Price.	1920.	1921.	1922.	1923.	1924.
Pence per standard oz. ..	61.59	36.89	34.41	31.93	33.97

In January, 1920, the price rose to 79.8d., and in February the record figure of 85d. per oz. was reached. Next month, however, there was a drop to a little over 74d., and from August, when the price was 59.87d., the quotations fell rapidly, the figure in December being 41.85d. The average for January, 1921, was about 40d., but by the end of June the price had fallen to less than 35d., followed by a rise to 41 $\frac{7}{16}$d. in October, and again declining to 35⅝d. at the end of the year. In March, 1922, the price fell to 33¼d., and in September the average stood at 35 $\frac{5}{16}$d., but thenceforward there was a rapid decline, the price for the closing month of the year being 31⅜d. There were no violent fluctuations in 1923, the lowest figure being 30.88d. in February, and the highest 33.38d. in December. The average for the year, 31.93d. was the lowest since 1916, when the figure was 31.32d. Although the range of prices in 1924 was slightly more than that in 1923, there were no violent fluctuations, the strength of the Indian demand and the inquiry for continental coinage exercising a steadying influence on the market.

6. **Employment in Silver Mining.**—The number of persons employed in silver mining during each of the last five years is given below :—

SILVER MINING.—PERSONS EMPLOYED, 1920 TO 1924.

Year.	N.S.W. (a)	Q'land.	W. Aust.	Tasmania.	Nor. Ter.	Australia.
	No.	No.	No.	No.	No.	No.
1920	1,931	143	(b) 238	517	2	2,831
1921	3,150	229	(b) 41	352	..	3,772
1922	4,712	321	(b) 152	495	..	(c) 5,686
1923	5,155	133	(b) 96	510	..	5,894
1924	5,468	759	(b) 141	479	15	(d) 6,874

(a) Silver, lead, and zinc. (b) Lead ore. (c) Including 6 in South Australia. (d) Including 12 in South Australia.

The bulk of the employment up to 1924, when Queensland assumed importance, was in New South Wales and Tasmania, the quantity of silver raised in the other States being unimportant. The closing of the mines on the Broken Hill field during the greater part of the year was responsible for the small total for 1920, while the resumption of normal activity in 1921 was delayed by the causes alluded to in sub-para. 2 hereinbefore.

§ 5. Copper.

1. **Production.**—The production of copper in the various States has been influenced considerably by the ruling prices, which have undergone extraordinary fluctuations. The quantity and value of the local production as reported and credited to the mineral industry for the years 1920 to 1924 are shown in the following table :—

COPPER.—PRODUCTION, 1920 TO 1924.

State.		1920.	1921.	1922.	1923.	1924.
		QUANTITY.				
		Tons.	Tons.	Tons.	Tons.	Tons.
New South Wales	Ingot and Matte	1,290	499	575	1,182	1,129
	Ore	..	..	50	79	..
Queensland	Ingot and Matte	15,897	2,428	5,104	6,243	5,630
	Ore	..	..	..	..	..
South Australia	Ingot and Matte	4,339	1,532	1,185	3,523	405
	Ore	..	..	..	..	..
Western Australia	Ingot and Matte	137	206	660	1,057	..
	Ore	1,511	1,040	352	3,394	2,795
Tasmania	Ingot and Matte	4,792	6,181	5,616	6,065	6,698
	Ore	..	..	..	..	..
Northern Territory	Ingot and Matte	..	..	..	..	..
	Ore	(a) 67	..	(a) 58	..	(a) 32
		VALUE.				
		£	£	£	£	£
New South Wales		127,978	41,267	36,233	82,375	71,658
Queensland		1,551,995	168,556	321,535	430,746	380,025
South Australia		423,601	106,370	73,646	232,172	26,046
Western Australia		25,165	24,601	20,379	65,100	40,676
Tasmania		528,237	463,163	391,535	435,413	457,386
Northern Territory ..		(a) 780	..	(a) 798	(a) 30	(a) 239
Australia		2,657,756	803,957	844,126	1,245,836	976,030

(a) Year ended 30th June.

The heavy fall during 1921 was due to the low price of the metal preventing the profitable working of many of the copper mines throughout Australia, and the continuation of low prices had a depressing effect on production in the following years.

2. **Sources of Production.**—(i) *New South Wales.* Production in this State in 1924 was valued at £71,658, as compared with £82,375 in the preceding year. As was the case in 1923, a fair proportion of the output was due to the extraction of the small copper content in the Broken Hill silver-lead and zinc ore, about 624 tons of copper, valued at £39,606 being obtained from this source. The depression in this branch of the mining industry during the last few years was again accentuated by the low prices ruling for copper in 1924, coupled with the high cost of production and transport. Practically the only mines in operation were the Mt. Royal group at Tottenham, and the Budgery mine at Hermidale. The former produced 2,300 tons of ore, and 68 tons of precipitates were obtained by leaching old dumps, while 1,921 tons of ore were raised by the latter. Small quantities were produced in the Barraba, Molong, Orange, and Yass divisions. No ore was raised in the Cobar division, which a few years ago was the largest producer of copper in the State, and the expensive machinery at the Great Cobar, Chesney, and Cobar Gold Mines, has been dismantled and removed.

(ii) *Queensland.* The yield in this State amounted in 1924 to 5,630 tons valued at £380,025, and shows a serious decline as compared with 1920 when nearly 16,000 tons valued at £1,552,000 were raised. The falling-off in the yield in recent years was, of course, due to the low prices realized for copper. Returns from the chief producing areas in 1924 were as follows:—Mount Morgan, 4,865 tons, valued at £323,837; Herberton, 83 tons, £5,636; Cloncurry, 261 tons, £17,617; Chillagoe, 355 tons, £23,997; and Gladstone, 46 tons, £3,135. These yields naturally compare very unfavourably with those of 1920. The Cloncurry district—reckoned the richest and most extensive cupriferous area in Australia—which under normal circumstances produces more than half the copper output of the State, returned a yield of 261 tons, as against 7,640 tons in 1920.

(iii) *South Australia.* Taking the entire period over which production extended, the yield of copper in South Australia easily outstrips that of any other State. In recent years, however, Queensland, Tasmania, and New South Wales have come to the front as copper producers, as the table on the preceding page shows. Deposits of copper ore are found over a large portion of South Australia. A short account of the discovery, etc., of some of the principal mining areas, such as Kapunda, Burra Burra, Wallaroo, and Moonta, was given in earlier issues of the Official Year Book. During 1922 the output amounted to 1,185 tons, valued at £73,646, the lowest recorded since 1844. The decline was due to the closing down during the greater part of the year of the Wallaroo and Moonta mines. In 1923 the production amounted to 3,523 tons, valued at £232,172, but there was a decline to 405 tons, valued at £26,046 in 1924. Underground work in connexion with the Wallaroo and Moonta mines has ceased, and operations in 1924 consisted mainly in the treatment of waste and residues, and in dismantling the plant. It is stated that the low price of copper is partly due to heavy production by companies in America, who, working with the latest appliances on immense deposits, can operate at a profit even with existing selling rates.

(iv) *Western Australia.* The value of the copper ore exported from this State in 1924 was £40,676. According to the returns, the production in the West Pilbara field was 79 tons, valued at £1,012; in the Northampton field, 10,672 tons, valued at £34,955; while a small quantity was raised in the Phillips River field. Operations were greatly restricted by the low price ruling for the metal.

(v) *Tasmania.* The quantity of copper produced in Tasmania during 1924 was 6,698 tons, valued at £457,386, the whole of the production being due to the Mount Lyell Mining and Railway Co. Ltd. This Company treated 51,616 tons of ore and concentrates and produced 6,761 tons of blister copper, containing copper, 6,698 tons; silver, 147,376 ozs.; and gold, 2,134 ozs.; the whole being valued at £488,989. The employees in 1924 numbered 1,012, of whom 504 were in the mining branch, 391 were engaged in the reduction works, and 117 in the railway department. Current for power and lighting is obtained from the Lake Margaret hydro-electric plant which also supplies the municipal requirements of Queenstown and Gormanston. To the end of 1924 this Company had paid upwards of £4,152,000 in dividends.

(vi) *Northern Territory.* Copper has been found at various places, but lack of capital and difficulty of transport prevent the development of the deposits. In 1924, the production was returned at 32 tons of ore, valued at £239. What is believed to be a rich deposit

was located during the year about 16 miles easterly from Barrow Creek. A small show was worked at the Cullen, and some mining for copper ore was carried out near Kilgour River in the Borroloola District.

3. **Prices.**—The great variation in price that the metal has undergone is shown in the following table, which gives the average price in London and New York during each of the last five years. The figures are given on the authority of the *The Mineral Industry*.

COPPER.—PRICES, 1920 TO 1924.

Year.	Average London Price per Ton Standard Copper.	Average New York Price in Cents per lb. Electrolytic Copper.
	£	Cents.
1920	97.48	17.46
1921	69.36	12.50
1922	62.12	13.38
1923	65.84	14.42
1924	63.15	13.02

As evidence of the tremendous monthly variation in the price of copper it may be noted that in December, 1916, the average London price of standard copper was £145 6s. 4d. per ton, while in April, 1922, it was quoted at £58 16s. In 1924 the price varied between £61 5s. 6d. in January, and £66 2s. 8d. in March.

4. **World's Production of Copper.**—The world's production of copper during the five years 1920 to 1924, is estimated to have been as follows. The figures have been taken from the latest issue of *The Mineral Industry*, and differ slightly from those quoted in the previous issue. :—

COPPER.—WORLD'S PRODUCTION, 1920 TO 1924.

Year	1920.	1921.	1922.	1923.	1924.
World's production—tons ..	937,900	547,700	853,100	1,225,800	1,344,900

The yields from the chief copper-producing countries in 1924 were as follows :—

COPPER.—PRODUCTION, CHIEF COUNTRIES, 1924.

Country.	Production.	Country.	Production.
	Tons.		Tons.
United States	729,400	Peru	34,400
Chile	187,300	Germany	19,200
Africa	102,400	Australia	15,000
Japan	61,900	Cuba	11,400
Spain and Portugal ..	54,200	Norway	9,700
Canada	45,500	Serbia	8,000
Mexico	43,900	Bolivia	7,300

The Australian production in 1924 amounted to a little over 1 per cent. of the total.

Over half the world's copper output is produced by the United States, while its smelters supply more than 50 per cent. of the world's requirements.

5. **Employment in Copper Mining.**—The number of persons employed in copper mining during each of the last five years was as follows :—

COPPER MINING.—PERSONS EMPLOYED, 1920 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Nor. Ter.	Australia.
	No.	No.	No.	No.	No.	No.	No.	No.
1920 ..	583	2	1,815	1,285	116	1,577	2	5,380
1921 ..	109	..	675	1,000	36	1,361	6	3,187
1922 ..	66	..	882	70	10	948	6	1,982
1923 ..	85	..	1,176	420	80	1,066	3	2,830
1924 ..	52	..	1,017	34	110	532	12	1,757

§ 6. Tin.

1. **Production.**—The development of tin mining is, of course, largely dependent on the price realized for the metal, and, as in the case of copper, the production has been subject to somewhat violent fluctuations. The tables below show the quantity and value of the production as reported to the Mines Departments in each of the States during the five years, 1920 to 1924 :—

TIN.—PRODUCTION, 1920 TO 1924.

State.		1920.	1921.	1922.	1923.	1924.
		QUANTITY.				
		Tons.	Tons.	Tons.	Tons.	Tons.
New South Wales ..	Ingots	887	816	734	896	1,041
	Ore ..	2,486	1,595	410	..	..
Victoria	Ingots	..	..	..	..	..
	Ore ..	84	80	115	78	38
Queensland	Ingots	(a)	(a)	(a)	(a)	(a)
	Ore (a)	1,486	1,050	1,098	903	1,196
Western Australia ..	Ingots	..	..	..	..	..
	Ore ..	243	67	110	131	87
Tasmania	Ingots	1,310	790	679	1,160	1,108
	Ore ..	(b)	..	..	..	..
Northern Territory ..	Ore ..	(c) 180	(c) 83	(c) 79	(c) 136	(c) 97
		VALUE.				
		£	£	£	£	£
New South Wales		413,794	163,451	154,698	180,789	259,485
Victoria		12,815	11,961	12,071	10,371	6,056
Queensland		252,054	98,471	99,758	114,945	175,5[illegible]9
Western Australia		49,449	6,485	10,930	15,095	12,008
Tasmania		369,362	130,257	112,407	236,955	275,014
Northern Territory		(c)27,610	(c) 7,793	(c) 5,891	(c) 13,887	(c) 12,855
Total		1,125,084	418,418	395,755	572,042	740,927

(a) Included with ore. (b) Included with ingots. (c) Year ending 30th June.

As the table shows, there was a heavy decline in the production of tin in 1922, the values being the lowest recorded for the quinquennium. The falling-off was due to low prices and high production costs, and in some instances to exhaustion of ore supplies. Dredging operations in certain districts were hampered by insufficiency of water.

2. **Sources of Production.**—(i) *New South Wales.* Tin-mining operations were stimulated by the increased price of the metal in 1924, and the yield from the New England district, which is the principal producing area, showed a great advance on that for the previous year. A large proportion of the output in New South Wales is obtained by dredging, the quantity so won in 1924 being 850 tons, valued at £142,472. Forty-one pump-dredges and one bucket dredge were in operation during the year. In the Tingha division of the Peel and Uralla district the yield amounted to 532 tons, valued at £87,741. The Emmaville division in the New England district showed a yield of 442 tons, valued at £73,107. In the Wilson's Downfall division, 48 tons, valued at £7,974, were raised. From the Torrington division, 127 tons, valued at £20,411, were returned. The Ardlethan field, in the Lachlan division, produced 11,400 tons of ore which yielded concentrates to the value of £50,650.

(ii) *Victoria.* The production in 1924 was obtained by dredging, the Cock's Pioneer Gold and Tin Co. in the Beechworth district contributing the whole of the output which amounted to 38 tons.

(iii) *Queensland.* The chief producing districts in Queensland during 1924 were Herberton, 804 tons, valued at £116,554; Kangaroo Hills, 207 tons, £30,292; Stanthorpe, 60 tons, £9,124; Cooktown, 58 tons, £9,278; Chillagoe, 55 tons, £8,578. The higher price of the metal in 1924 as compared with 1923 was responsible for an increase in production, but the total yield in 1924, amounting in value to £176,000, was much below that of 1920, when the yield was valued at £252,000.

(iv) *Western Australia.* The export of tin ore from the State during 1924 amounted to 87 tons, valued at £12,008. The production of black tin from the Greenbushes field amounted to 53 tons, valued at £7,469, and from the Pilbara field 29 tons, valued at £4,048. Deposits of tin occur in widely-separated localities in the Kimberley division, the Thomas River in the Gascoyne Valley, and at Poona and Coodardie on the Murchison gold-field.

(v) *Tasmania.* During 1924 the quantity of metallic tin won amounted to 1,108 tons, valued at £275,014. This return is a considerable advance on the figures for the years 1921 and 1922, but is still far below that recorded in 1919 and 1920. The yield from the North-Eastern division amounted in 1924 to 628 tons. Of the total, 362 tons were contributed by the mines in the Pioneer and Gladstone districts, while 262 tons came from the Ringarooma, Derby, and Branxholm area. The yield in the Eastern division amounted to 192 tons; the Avoca Mines furnishing 83 tons; the St. Helen's Mines 53 tons; and the Weldborough, Lottah, and Blue Tier, 56 tons. From the North-Western division the output was 246 tons, the bulk of it being raised by the Mt. Bischoff, with 222 tons, and Mt. Bischoff Extended, with 17 tons. The production in the Western division was returned at 40 tons.

(vi) *Northern Territory.* The yield of tin ore and concentrates in 1924 amounted to 97 tons, valued at £12,855, of which 30 tons were raised at Mt. Wells, 26 tons at Collah and Muldiva, 18 tons at Marranboy, 10 tons at Umbrawarra and Horseshoe Creek, and small quantities at Hayes Creek, Bynoe Harbour, Snadden's Creek, Hidden Valley, and Cullen. Two batteries for the treatment of tin ore have been erected by the Government, one at Marranboy, costing £20,163, and one at Hayes Creek, at an expense of £3,294.

3. **World's Production.**—According to *The Mineral Industry* the world's production of tin during each of the last five years was as follows. The figures have been slightly amended since last issue.

TIN.—WORLD'S PRODUCTION, 1920 TO 1924.

1920.	1921.	1922.	1923.	1924.
Tons.	Tons.	Tons.	Tons.	Tons.
122,910	109,709	129,329	125,747	133,233

The yields from the chief producing countries in 1924 were as follows:—

TIN.—PRODUCTION, CHIEF COUNTRIES, 1924.

Country.	Production.	Country.	Production.
	Tons.		Tons.
Federated Malay States ..	44,000	Unfederated Malay States	2,000
Bolivia	31,600	Great Britain	2,000
Banka	15,100	Australia	1,900
Billiton	11,500	South Africa	1,150
China	7,400	India	1,100
Siam	7,300	Congo	1,000
Nigeria	6,200		

Based on the results for the last three years, Australia's share of the world's tin production would appear to be about 2.2 per cent.

4. **Prices.**—The average price of the metal in the London market for the years 1920 to 1924 was as follows :—

TIN.—PRICES, 1920 TO 1924.

Year.	Average Price per Ton.			Year.	Average Price per Ton.		
	£	s.	d.		£	s.	d.
1920..	296	1	7	1923	202	5	0
1921..	165	5	4	1924	248	14	10
1922..	159	9	0				

The year 1921 was a disastrous one for the tin miner, as the price of the metal dropped by over £130 per ton as compared with that in the preceding year. Moreover, the fall had been more or less continuous since the early months of 1920, thus forcing the poorer mines to close down. In 1922, the London market opened at £168 15s., but fell to £139 in March. Thereafter prices generally increased to £183 15s. at the close of the year. Conditions greatly improved in 1923. The price in January averaged £181 18s. 7d. rising to £219 15s. in March, but there was a drop to £181 5s. 3d. in July. Thereafter the figures rose steadily until December when £235 2s. 3d. was realized, while the average for the year stood at £202 5s. Prices while extremely erratic in 1924, nevertheless showed a marked advance on those for 1923. The highest point reached in 1924 was in March, when £277 8s. 7d. was realized, but the average had fallen by more than £48 per ton in May. From July onwards the figure rose again from £233 6s. 7d. to £261 17s. 7d. in December.

5. **Employment in Tin Mining.**—The number of persons employed in tin mining during the last five years is shown below :—

TIN MINING.—PERSONS EMPLOYED, 1920 TO 1924.

Year.	N.S.W.	Victoria.	Q'land.	W. Aust.	Tas.	Nor. Ter.	Australia.
	No.	No.	No.	No.	No.	No.	No.
1920	1,822	48	920	187	1,318	120	4,415
1921	1,321	31	864	59	699	100	3,074
1922	1,090	13	659	31	620	120	2,533
1923	1,047	7	703	35	842	170	2,804
1924	1,004	2	698	40	781	115	2,640

Most of the tin in Victoria is produced by companies mining primarily for gold.

§ 7. Zinc.

1. **Production.**—(i) *New South Wales.* (*a*) *Values Assigned.* The production of zinciferous concentrates is practically confined to the Broken Hill district of New South Wales, where zincblende forms one of the chief constituents in the enormous deposits of sulphide ores. During the earlier years of mining activity on this field a considerable amount of zinc was left unrecovered in tailings, but from 1909 onwards improved methods of treatment resulted in the profitable extraction of the zinc contents of the accumulations at the various mines.

As the metallic contents of the bulk of the concentrates, etc., raised in the Broken Hill District are extracted outside New South Wales, the mineral industry of that State is not credited by the Mines Department with the value of the finished product. The figures given hereunder, therefore, refer to the quantity and value of the zinc concentrates actually exported during the years specified.

ZINC.—CONCENTRATES, ETC., EXPORTED FROM NEW SOUTH WALES, 1889 TO 1924.

Year.	Quantity of Zinc Concentrates, etc., Exported.	Value.	Year.	Quantity of Zinc Concentrates, etc., Exported.	Value.
	Tons.	£		Tons.	£
1889	97	988	1921	79,694	283,455
1891	219	2,622	1922	363,681	1,157,458
1899	49,879	49,207	1923	426,049	1,411,652
1920	71,043	249,456	1924	353,650	1,296,571

(*b*) *Local and Foreign Extraction.* A statement of the quantity of zinc extracted in Australia and the estimated zinc contents of concentrates exported overseas during the five years 1921 to 1925, will be found in § 18 hereinafter.

(ii) *Queensland.* At the Silver Spur mine at Texas, in the Stanthorpe division of Queensland, part of the ore is high in zinc and lead, but low in silver. Profitable extraction of the zinc and lead depends, however, on cheap transport. It is proposed to convey the high grade zinc ore by motor tractor to the railway at Inglewood. Zinc sulphide is produced by the Mount Garnet Mine in the Herberton district, and during 1916 several hundred tons of good quality ore were raised, but until a suitable treatment plant has been erected, it is stated that production cannot be economically undertaken. The total production of zinc in 1924 was returned at 128 tons, valued at £4,283, of which 78 tons were produced in the Chillagoe area, and 47 tons in the Stanthorpe area.

(iii) *South Australia.* Zinc is known to exist in various localities in South Australia, but there has been no production during recent years.

(iv) *Tasmania.* Investigations in regard to the Read-Roseberry zinc-lead deposits in Tasmania have proved the existence of 1,680,000 tons of ore, which, added to an estimated quantity of 915,000 tons of " probable " ore, make a total supply of 2,595,000 tons. During the year 1924 the production from local ores was taken as 2,748¾ tons, valued at £90,485.

The Electrolytic Zinc Co. at Risdon worked on raw materials obtained partly from the West Coast district of Tasmania, but chiefly from Broken Hill in New South Wales. From other than Tasmanian ores the production in 1924 consisted of 43,925 tons of zinc valued at £1,469,366, and 154 tons of cadmium, valued at £34,449. About 1,400 men were employed at these works. At Zeehan, where 158 men were employed, lead concentrate and zinc calcine were produced from Tasmanian ore.

2. **Prices.**—During the four years 1911 to 1914, the London price of zinc averaged £23 15s. per ton, ranging fom £21 in 1914 to £26 3s. 4d. in 1912. Owing to the heavy demand and other circumstances arising out of the war, the prices in 1915 and 1916 reached the very high average of £67 11s. 1d. and £72 1s. 5d. per ton respectively. For 1920 the average recorded was £44 7s. 5d., for 1921, £25 16s. 11d., for 1922, £30, for 1923, £33 1s. 2d., and for 1924, £33 14s. 7d. per ton.

§ 8. Iron.

1. **General.**—The fact that iron-ore is widely distributed in Australia has long been known, and extensive deposits have been discovered from time to time at various places throughout the States, but the utilization of these deposits for the production of iron and steel is, at present, confined to New South Wales.

2. **Production.**—(i) *New South Wales.* (*a*) *Extent of Deposits.* Iron ores of various composition are found widely distributed throughout the State, but some of the deposits are at present of no commercial importance on account of their small and scattered extent, or by reason of their distance from means of transport. Excluding deposits too far from existing railways, or too small to warrant exploitation, as well as aluminous ores, the quantity of iron ore available by quarrying has been set down as 15 million tons. There is, in addition, a large tonnage available by the more costly method of mining. Altogether it appears probable that the total quantity available for smelting is about 53 million tons. The chief sources of supply during recent years were the deposits at Cadia, Carcoar, and Tallawang.

(*b*) *Lithgow Iron Works.* Reference to the events leading up to the establishment of ironworks at Lithgow will be found in earlier issues of the Year Book (see No. 3, p. 508). During 1924 the following materials were received at the blast furnaces: Iron ore, 139,590 tons; limestone, 58,672 tons; slag, 3,446 tons; and coke, 100,952 tons. The iron ore was raised from quarries at Tallawang (Gulgong division), and Cadia (Orange division), and the pig iron produced therefrom amounted to 74,075 tons.

The following table shows the quantity and value of pig iron produced in New South Wales during the last five years from locally-raised ores only :—

PIG IRON.—PRODUCTION FROM LOCAL ORES, NEW SOUTH WALES, 1920 TO 1924.

Particulars.		1920.	1921.	1922.	1923.	1924.
Quantity ..	Tons	86,096	90,053	54,856	94,350	74,075
Value	£	645,720	639,376	248,909	707,625	518,525

The figures quoted above refer to production from *local* ores only, and as such credited to the New South Wales mineral industry. They do not, of course, represent the total production of pig iron in New South Wales, since, as shown in the succeeding paragraph, a considerable quantity of ore raised in South Australia and credited therefore to the mineral returns of that State is treated in New South Wales.

(*c*) *Newcastle Iron Works.* The Broken Hill Proprietary Company established works for the manufacture of iron and steel on a large scale at Newcastle, and operations were started early in 1915. The Company is utilizing the immense deposit of iron ore at the Iron Knob quarries in South Australia, which are connected with the seaboard at Whyalla, a distance of about 34 miles, by the Company's tramway. The ore quarried for the year ended 30th November, 1925, amounted to 615,266 tons. Extensive limestone works and loading bin at Devonport, Tasmania, as well as quarries in New South Wales for dolomite, magnesite, etc., are also owned by the Company.

The output of pig iron for the year ended 30th November, 1925, amounted to 348,592 tons, and of steel ingots to 341,060 tons. Further details in regard to the activities of these works in 1921 were given on page 347 of Official Year Book No. 15. The steel works possess three blast furnaces of a normal daily producing capacity of 1,300 tons, and a fourth furnace of 100 tons for the production of foundry iron. There are nine 65-ton basic open-hearth furnaces capable of producing 10 to 12,000 tons of ingot steel weekly. The works are supplied with a 35-inch blooming mill for the production of blooms, plates, etc., a 28-inch rolling mill for the manufacture of heavy rails, structural steel, billets, etc., an 18-inch mill for making light rails, structural shapes, fishplates, and heavy sections of merchant bar and billets, a 12-inch mill and an 8-inch mill, each for merchant bars, etc., a continuous rod mill for the production of wire rods, and a fishplate mill. A steel foundry, containing one acid open-hearth furnace, and a cupola furnace for iron castings, with a direct metal foundry which takes the hot metal from the blast furnaces, supply all necessary castings.

The company also possesses 224 by-product coke ovens, and connected with this department are the tar, sulphate of ammonia, and benzol plants.

(*d*) *Iron Oxide, etc.* A quantity of iron oxide is purchased by the various gasworks for use in purifying gas, and it is also to some extent employed as a pigment, the output in New South Wales being drawn chiefly from the deposits in the Port Macquarie, Moss Vale and Goulburn Divisions. During 1924 the iron oxide raised amounted to 4,863 tons, valued at £5,361, the product being partly used for the purposes mentioned.

(ii) *Victoria.* Iron ore has been located at various places in Victoria, particularly at Nowa Nowa in the Gippsland district, and at Dookie. A blast furnace was erected in 1881 near Lal Lal, on the Moorabool River, and some very fair quality iron was produced, which was used for truck wheels and stamper shoes at the Ballarat mines. The fall in the price of the metal, however, led to the closing of the works. In his report for 1905 the Secretary for Mines stated that without special assistance to the industry there does not seem to be any prospect of the deposits being profitably worked.

(iii) *Queensland.* Queensland possesses some extensive deposits of iron ore, which are mined chiefly for fluxing purposes in connexion with the reduction of gold and copper ores. During the year 1921, 4,061 tons of ironstone flux, valued at £5,976, were raised, the bulk of which came from Iron Island in the Rockhampton district. No production was recorded in 1922, and 200 tons only were raised in 1923, while there was no output recorded in 1924. It is stated that Queensland possesses within its own border an abundance of the ore, fuel, and fluxes required for the carrying on of a large ironworks.

(iv) *South Australia.* South Australia possesses some rich deposits of iron ore capable of being mined for an indefinite period. The best known deposit is the Iron Knob, a veritable hill of iron ore of high percentage, situated about 40 miles W.S.W. from Port Augusta. A recent survey places the probable reserves of ore in the Iron Knob and Iron Monarch deposits at 133 million tons, with an average content of 63.64 per cent. iron. The Broken Hill company utilizes ore from this quarry at its ironworks at Newcastle, New South Wales, and the amount raised for the year 1921 was 506,993 tons, valued at £587,267, and for 1922, 51,423 tons, valued at £58,177, the heavy fall in the latter year being due to the temporary closing of the works. Owing to resumption of activity in 1923 the production for that year rose to 384,434 tons, valued at £445,303, and in 1924 the record output of 580,308 tons, valued at £667,354 was reached. It is estimated that the deposits in the Middleback Range contain 32 million tons of slightly higher grade ore than that at the Iron Knob.

(v) *Western Australia.* This State has some very rich deposits of iron ore, but, owing to their geographical position, the most extensive fields at the present time are practically unexploited, the production in the State being confined chiefly to that needed for fluxing purposes. The ores are found over a stretch of country from Kimberley to Cape Leeuwin. Amongst the most important of the high-grade deposits are those at Yampi Sound in the Kimberley division, which are estimated to contain 97 million tons of very rich ore; Wilgie Mia, where the ore in sight is estimated at 27 million tons; Gabanintha, near Nannine, with over a million tons above surface level; Mount Gibson, in the south-west corner of the Yalgoo gold-field, where there are about 10 million tons of ore adapted for steel manufacture by the acid process; Tallering Range in the westernmost angle of the Yalgoo gold-field where the deposits amount to several millions of tons; and Koolyanobbing, near Southern Cross, where there is a very large deposit of high-grade micaceous hematite. There was no record of production during the last two years.

(vi) *Tasmania.* Probably the most extensive deposits of iron ore in Tasmania are those at Rio Tinto, Savage River. The ore is chiefly magnetite, containing over 65 per cent. iron, and is well situated for open cutting to a great depth. Estimates place the quantity of ore available at as high as 50 million tons. There is an immense deposit of red hematite at the Blythe River, near Burnie, the lode being over a mile in length, and up to 100 feet in width. Estimates as to the quantity of ore available vary from 17 to 30 million tons. In fairly close proximity to the Hampshire Railway Station there is a deposit of magnetite estimated to contain 20 million tons, while a deposit at the Tenth Legion mine in the Zeehan district is stated to contain 2 million tons. Deposits of brown oxide and magnetic iron ore containing 1½ million tons are found in the Beaconsfield district. On the Dial Range there is a deposit of red hematite containing high grade ore. North-west of this outcrop is situated the Iron Cliffs lode, about 4 miles from Penguin. These two deposits are estimated to contain 700,000 tons. Extensive deposits of hematite and magnetite are found on the Nelson River, the outcrop being 100 feet wide over a large distance. The total quantity of iron ore available in Tasmania has been roughly estimated at 100 million tons.

The production of iron ore in 1908 was 3,600 tons, valued at £1,600, raised by the Tasmanian iron mine at Penguin, but since the closing down of that mine in 1909 there has been no further production. Iron pyrites for the manufacture of sulphuric acid and of manures is produced on the West Coast, the quantity raised in 1923 being 11,882 tons, valued at £26,737, but there was no production recorded in 1924.

(It may be noted here that the Sulphur Bounty Act of 1923 provides for a bounty of £2 5s. per ton in respect of sulphur produced from Australian pyrites and other sulphide ores and concentrates.)

(vii) *Northern Territory.* Large bodies of rich ironstone have been discovered in various parts of the Territory, particularly between the Adelaide River and Rum Jungle. Owing to the lack of local coal, however, the deposits possess no immediate value.

3. Iron and Steel Bounties.—The local production of iron and steel has been encouraged by various legislative enactments (see Official Year Book No. 15, p. 348). Under "The Iron and Steel Products Bounty Act 1922," bounties are payable on fencing wire, galvanized sheets, wire-netting, and traction engines made in Australia. It is essential that these articles be made from materials produced and manufactured in Australia, unless imported material is authorized after inquiry and report by the Tariff Board. The

total payments in any one financial year must not exceed £250,000. Rates of bounty are—for fencing wire and galvanized sheets, £2 12s. per ton; for wire-netting, £3 8s. per ton; and for traction engines from £40 to £90 each, according to brake horse-power. The amounts paid in each case during the year ended 30th June, 1925, were £71,948, £44,545, £90,340, and £500.

4. **World's Production of Iron and Steel.**—The Australian production of iron and steel at present forms a very small proportion of the world's output. According to The Statesman's Year Book, the world's production of each commodity in the years specified for the principal countries was as follows:—

PIG IRON AND STEEL.—WORLD'S PRODUCTION, 1913, AND 1922 TO 1924.

Country.	Pig Iron.				Steel—Ingots and Castings.			
	1913.	1922.	1923.	1924.	1913.	1922.	1923.	1924.
	(Tons—000's omitted.)				(Tons—000's omitted.)			
United States ..	30,653	26,851	40,026	31,000	31,301	35,603	44,944	37,800
Great Britain ..	10,260	4,902	7,440	7,400	7,664	5,881	8,482	8,250
France	5,126	5,147	5,346	7,500	4,614	4,464	5,029	6,850
Belgium ..	2,428	1,578	2,154	2,800	2,428	1,539	2,250	2,850
Luxemburg ..	..	1,650	1,384	2,125	..	1,368	1,182	1,850
Germany ..	19,000	8,000	4,400	8,200	18,631	9,000	5,900	8,500
Czecho-Slovakia ..	..	339	750	700	..	630	1,000	800
Poland	..	458	492	500	..	930	935	950
Japan	56	300	300	350	13	500	500	550
Other Countries ..	9,659	2,713	4,179	4,055	10,368	3,183	4,874	6,975
Total ..	77,182	51,938	66,471	64,630	75,019	63,098	75,096	75,375

The returns for the year 1924 have been partly estimated and are subject to revision when the complete particulars for all countries have been received.

§ 9. Other Metallic Minerals.

1. **Antimony.**—The production of antimony ore in New South Wales amounted in 1921 to 125 tons, valued at £900, the output being obtained in the Hillgrove and Kempsey divisions, but the low prices ruling in the last three years caused a temporary cessation of mining. Deposits of the mineral are also found in the Glen Innes and Drake divisions, and in other areas. The total quantity of antimony (metal and ore) raised in New South Wales up to the end of 1924 was 19,032 tons, valued at £344,588. The production of antimony concentrates in Victoria during 1924 amounted to 276 tons, valued at £14,522. The whole of the production came from ore raised by a company operating at Costerfield. In Queensland extensive deposits are found at Neerdie in the Wide Bay district, at Wolfram Camp, on the Hodgkinson field, on the Palmer River in the Ravenswood district, and at various places in the Herberton district. Ore has also been obtained in the Dividing Range near Herberton and adjacent to some of the central tributaries of Emu Creek. Owing to the low price of the metal in 1919 production was practically negligible; while none was recorded during the period 1920 to 1924. In Western Australia lodes of stibnite carrying gold have been found in the Roeburne district. During 1917, 12 tons of antimony, valued at £258 were exported, but there was no subsequent production until 1920, when 3 tons, valued at £45, were exported. There was no record of production in the years 1921 to 1924.

2. **Arsenic.**—In New South Wales the production of arsenical ore in 1924 amounted to 4,416 tons, valued at £18,859, of which 479 tons were raised by the Valla Gold Mines in the Bellingen division; 1,809 tons at the Ottery Mine in the Emmaville division; 1,290 tons in the Hillgrove division; and 176 tons in the Torrington division. The mineral is also found in the Deepwater, Moruya, Tumut, and Port Macquarie divisions.

During 1917 the high price ruling for arsenic, and the urgency for the need of supplies in connexion with the destruction of prickly pear, led to the reservation by the Queensland Mines Department of an extensive area of arsenic-bearing deposits at Jibbinbar, in the Stanthorpe district. Production in 1924 from the Stanthorpe district amounted to 563 tons, valued at £22,500, of which 379 tons were raised at the State mine. The product is used not only for the destruction of prickly pear, but for the manufacture of arsenical dip solutions and other purposes. In South Australia attention is being devoted to arsenic-bearing minerals at some of the old mines, and prospecting is being carried on at the Preamimma Mine in the Monarto district, and ore is also raised from a mine near Callington. Production in 1924 amounted to 68 tons, valued at £544. During 1920, Western Australia exported 1,765 tons of arsenical ore, valued at £4,260. In 1921, the export fell to 7 tons, valued at £16, but there was an increase to 1,075 tons, valued at £1,784, in 1922. The arsenical ore (contained in gold ore) exported in 1923 was valued at £686, and in 1924 at £777.

3. **Bismuth.**—Ores of this metal are found in association with tungsten and molybdenum, and sometimes tin, in New South Wales, but owing to lack of a market the production of ore and concentrates in 1924 was only 15 tons valued at £3,135, the greater portion of the yield being obtained in the Glen Innes division in conjunction with mining for molybdenite. A deposit chiefly of bismuth oxide has been located in the Mt. Darling Ranges about 15 miles north-east of Broken Hill. The total production to the end of 1924 was 794 tons valued at £229,554. In Queensland wolfram and bismuth have been found in various districts, but, owing to the low prices obtainable the chief centres of production—Mount Carbine, Wolfram, Bamford, etc.—were practically idle in 1924. In South Australia deposits are found at Balhannah, at Mount Macdonald, and at Murninnie on the shores of Spencer's Gulf. A small quantity of bismuth was exported from Western Australia in 1919, but none was recorded subsequently. In Tasmania a small quantity, valued at £21, was raised in 1921 by the S. & M. mine at Middlesex, but there was no production in the last three years.

4. **Cadmium.**—The cadmium contained in the zinc ores mined at Broken Hill is recovered at Risdon, Tasmania, as a by-product in the electrolytic treatment of calcined zinc concentrates. During the three years, 1922 to 1924, amounts of 36 tons, valued at £13,189; 123 tons, valued at £34,776; and 150 tons, valued at £33,478 respectively were so obtained, but, as pointed out previously, credit is not taken for the value of the finished product in the New South Wales returns as the metal is not recovered in the State.

5. **Chromium.**—The output of chromite in New South Wales during 1924 was estimated at 773 tons, valued at £2,082, raised in the Barraba division. Prospecting operations were continued during the year at Attunga in the Tamworth division, but, so far, without discovering payable deposits of the ore. Chrome iron ore is found in Queensland in the Rockhampton district, and about 160 tons were raised in 1920 by the Mount Morgan Company at Glen Geddes, but there was no production during the last four years. Chromite has been discovered at Coobina on the overland route between Peak Hill and Nullagine in Western Australia, but, on account of the difficulties of transport and the low price of the mineral there is no immediate likelihood of production.

6. **Cobalt.**—This metal was found at Carcoar in New South Wales in 1889, and subsequently at Bungonia, Port Macquarie, and various other places. There was no export of cobalt since 1911, and the total produced since 1860 amounted in value to only a little over £10,000. In Queensland a rich deposit was opened up in 1920 at Mount Cobalt in the Cloncurry area, and the production in 1924 amounted to 197 tons, valued at £39,461. Although the product is a valuable one, greater development is hindered by the uncertainty of the demand.

7. **Lead.**—Lead mining *per se* is not practised to any extent in Australia, the supply of the metal being chiefly obtained in conjunction with silver and zinc. In New South Wales the Mines Department took credit in 1922 for 8,113 tons, valued at £194,712, and the production to the end of 1922 was taken as 327,000 tons, valued at £6,442,000. Owing to the closing down of the treatment works at Cockle Creek no production was recorded in 1923 and 1924, the whole of the lead concentrates being forwarded for treatment outside the State. As stated previously, the metallic contents of the major portion of the silver-lead ores are extracted outside New South Wales, and

the figures quoted above refer only to lead values assigned as the produce of the State. In Victoria, oxides, sulphides, and carbonates of lead are found in the reefs on most of the gold-fields. The deposits are not, however, of sufficient extent to repay the cost of working. In Queensland the deposits are worked chiefly for the silver, copper or gold contents of the ore, the lead produced in 1924 amounting to 3,695 tons, valued at £125,263. Of this total the Chillagoe area produced 1,808 tons, valued at £60,785; the Herberton area, 450 tons, valued at £15,162; Etheridge, 353 tons, £11,896; Brisbane, 726 tons, valued at £25,366; and the Cloncurry area 217 tons, valued at £7,307. Lead has been found at many places in South Australia, although, with few exceptions, the lodes are not of great size. The works at Port Pirie in South Australia, controlled by the Associated Company, which includes the chief Broken Hill Mining Companies, constitute the largest and most complete lead smeltery in the British Empire. About 1,400 men are employed, and the fuel used amounts to 150,000 tons yearly. During 1924, lead and silver-lead ore exported from Western Australia amounted to 4,854 tons, valued at £83,095. Tasmanian lead production in 1924 was returned as 4,559 tons, valued at £154,881, of which the Zeehan mines contributed 447 tons, the North Mt. Farrell mines, 1,933 tons, Magnet, 901 tons, and Round Hill mines, 368 tons.

8. **Manganese.**—During 1924 the output of manganese ore in New South Wales amounted to 4,387 tons, valued at £13,281, of which 3,149 tons were raised in the Grenfell division, and 1,118 tons in the Rylstone division. Manganese ores are also found in the Deepwater, Oberon, Parkes, Tamworth, and Trunkey divisions. In Victoria the production in 1922 amounted to 150 tons, valued at £930, raised in the Heathcote division, but none was raised in 1923 and 1924. In Queensland there are extensive deposits of low-grade manganese ores in various places. High grade ore is not available in quantity, but the extensive deposits of medium grade at Kandanga should in future become a valuable asset in the steel industry. Production in 1923 amounted to 74 tons, valued at £332, of which 40 tons were raised in the Stanthorpe division, and 30 tons in the Gympie division, but none was raised in 1924. Extensive deposits of the ore were mined at Boolcunda in South Australia some years ago. Deposits are being actively worked at the present time at Pernatty, Hawker, and Gordon. The production in 1924 was valued at £1,128. The Pernatty ore is of high grade, and being free from deleterious substances is specially suited for use in making high-grade steel. In Western Australia ores of the metal are found widely scattered, the black oxide being especially plentiful in the Kimberley district. Extensive deposits exist in a locality 18 miles north-west from Peak Hill. In the northern part of the Cue district the deposits cannot at present be profitably worked owing to absence of cheap transport fac lities. The export of manganese in 1924 consisted of 20 tons, valued at £160.

9. **Molybdenum.**—The production of molybdenite in New South Wales during the year 1924, amounted to 10½ tons, valued at £2,475, chiefly obtained from mines at Kingsgate and Dundee in the Glen Innes division. The total production of molybdenite since its discovery is stated at 821 tons, valued at £210,111. In Victoria 42 tons of concentrates valued at £4,850, were produced in 1924 at Everton. The production in Queensland for 1924 was 2¾ tons, valued at £441, raised on the Chillagoe field. The Wombah mine near Mount Perry is regarded by geologists as one of the most promising sources of molybdenite in Australia. A small quantity was at one time produced from the mines in the Moonta district in South Australia, and the occurrence of the metal is reported from various other localities, but no production was recorded during the last five years. Molybdenite occurs in small quantities at various localities in Western Australia, the production recorded in 1922 being valued at £500, but none was recorded in 1923 and 1924. In the Northern Territory, molybdenite is found at Yenberrie, where it is stated that the ore increases in richness as the workings become deeper.

10. **Radium.**—Deposits of radio-active ores occur in lode form in South Australia, and are believed to be richer and more extensive than any others so far located. There is an extensive deposit at Radium Hill, Olary, about 12 miles from Cutana railway siding, and another at Mount Painter in the Northern Flinders Ranges. Ores from both localities have yielded radium. Pure radium bromide was produced at a treatment plant in Sydney, and up to the end of 1914, when operations were suspended, 466 milligrammes were extracted. The Radium and Rare Earths Treatment Co. has been

formed to exploit the radio-active ores at Olary, and a syndicate has taken up the workings at Mount Painter. A sample of 11 milligrammes of radium bromide was extracted from 2½ tons of crude ore in 1925 by experts attached to the first named company. Extensive plant and buildings have been erected, and it is hoped that production on a large scale will shortly be possible.

11. **Tungsten.**—Wolfram and scheelite, the principal ores of tungsten, are both mined to some extent in New South Wales, but the low prices obtainable caused a cessation of mining activity in this direction in the last three years. A large proportion of the total production from tungsten ores is obtained from the wolfram worked at Torrington, but the production in 1924 amounted to 9 tons only. The deposits at Hillgrove are the principal source of scheelite. In Victoria the production of wolfram was returned in 1920 as 7½ tons, valued at £355, yields being obtained at Mount Murphy and the Tambo River, but there was no subsequent production. In Queensland, tungsten ores are found in several districts, but, owing to low prices production in 1924 was insignificant. (See also "Bismuth.") A deposit of wolfram was discovered near Yankalilla, in South Australia, as far back as 1893, but the production up to date has been small. It is believed that careful examination will lead to increased production from the deposits at Callawonga Creek. There was no production of tungsten minerals in 1924 in Western Australia. Tungsten ores are commonly met with in the gold reefs, and both wolfram and scheelite have been recorded as occurring in several widely-separated localities. In the Northern Territory wolfram is found at Hatches Creek, Wauchope Creek, Wolfram Creek, Hidden Valley, and Yenberrie. Numerous samples of high grade ore have been obtained at the Frew River in Central Australia. The production in 1923 was, however, trifling, and none was recorded in 1924. Wolfram is mined at various points in Tasmania, the production for 1924 being 54 tons, valued at £2,785, obtained at the Avoca mines. Scheelite has been discovered on King Island in Bass Strait, but there was no production in 1924.

12. **Other Metals.**—In addition to the metals enumerated above there is a large number of others occurring in greater or less degree, while fresh discoveries are being constantly reported.

§ 10. Coal.

1. **Production in each State.**—An account of the discovery of coal in each State will be found in preceding issues of the Year Book. (See No. 3, pp. 515–6.) The quantity and value of the production in each State, and in Australia, during the five years 1920 to 1924, are given in the table hereunder :—

COAL.—PRODUCTION, 1920 TO 1924.

Year.	N.S.W.	(a) Victoria.	Q'land.	S. Aust.	W. Aust.	Tasmania.	Australia.
			QUANTITY.				
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1920 ..	10,715,999	442,241	1,109,913	..	462,021	75,429	12,805,603
1921 ..	10,793,387	514,859	954,763	..	468,817	66,476	12,798,302
1922 ..	10,183,133	559,284	958,519	..	438,443	69,238	12,208,617
1923 ..	10,478,513	476,823	1,060,662	..	420,714	80,718	12,517,430
1924 ..	11,618,216	518,315	1,123,117	..	421,864	75,988	13,757,500
			VALUE.				
	£	£	£	£	£	£	£
1920 ..	7,723,355	464,739	841,551	..	350,346	64,005	9,443,996
1921 ..	9,078,388	603,323	831,483	..	407,117	63,446	10,983,757
1922 ..	8,507,946	664,251	840,472	..	381,555	61,016	10,455,240
1923 ..	8,607,892	525,270	925,227	..	368,949	70,797	10,498,135
1924 ..	9,589,547	569,555	985,542	..	363,255	66,555	11,574,454

(a) Exclusive of brown coal.

The figures for Victoria quoted above are exclusive of brown coal, the quantity and value of which during the last five years were as follows:—

BROWN COAL.—PRODUCTION, VICTORIA, 1920 TO 1924.

Year.	Quantity.	Value.	Year.	Quantity.	Value.
	Tons.	£		Tons.	£
1920	162,682	64,180	1923	116,888	38,019
1921	79,224	31,074	1924	127,490	41,116
1922	90,402	31,179			

2. **Distribution and Production of Coal in each State.**—(i) *New South Wales.*—Estimates of the quantity of coal available in any large area of country are of course, more or less hazardous. Some years ago the Government Geologist estimated that within a depth of 4,000 feet from the surface the coal seams in New South Wales of a thickness exceeding 2½ feet were capable of producing over 78 million tons, allowing for a loss in working of one-fifth. In 1890, Professor David gave a total of between 130 million and 150 million tons, excluding seams under 3 feet in thickness. After a careful review of the position in 1901, the late E. F. Pittman suggested 115 million tons as an approximate figure.

In the following estimate by R. H. Cambage, of actual reserves, no account has been taken of coal below 4,000 feet, and the coal has been classified in three grades—Grade A, including coals of first quality, suitable for steam-raising, gas-making and household purposes; Grade B, including coals with lower calorific value and higher ash content than those in Grade A, but suitable for use as mined; Grade C, including coals from inferior seams generally with high ash content, but suitable for use after washing or flotation.

The approximate tonnage of commercial coal in the various grades in the coal-fields of New South Wales is given hereunder.

NEW SOUTH WALES.—APPROXIMATE TONNAGE OF EXTRACTABLE COMMERCIAL COAL.

Coal-field.	Tonnage.	Grade.
	Tons.	
I. Upper Coal Measures—Northern Coal-field, including Curlewis ..	2,150,400,000	A
	2,630,400,000	B
	4,300,400,000	C
Muswellbrook Coal-field ..	480,000,000	B
Southern Coal-field, including Douglas Park, Berrima	2,162,760,000	A
	573,120,000	B
	1,930,420,000	C
Western Coal-field, including Talbragar ..	720,000,000	A
	720,000,000	B
	1,920,000,000	C
Coorabin (Riverina) Coal-field	14,400,000	B
II. Middle Coal Measures—East Maitland Coal-field, including Rix's Creek	345,600,000	A
	702,700,000	B
III. Lower Coal Measures—Maitland Coal-fields—Lower or Greta Coal Measures ..	1,324,800,000	A
Muswellbrook Coal-field — Lower or Greta Coal Measures	96,000,000	A
Totals	6,799,560,000	A
	5,120,620,000	B
	8,150,820,000	C
Grand Total	20,071,000,000	All Grades

The total given above includes the amount already won, and, after allowing for this, the actual reserves have been set down at 20,000 million tons, while the possible reserves in addition may be taken as 100,000 million tons. Estimating a loss of one-fifth in winning, the actual commercial reserves may be considered to be about 16,000 million tons. The coal from the various districts differs considerably in quality—that from the Newcastle district being especially suitable for gas-making and household purposes, while the product of the Southern (Illawarra) and Western (Lithgow) is an excellent steaming coal. At the present time the Greta coal seams are being extensively worked between West Maitland and Cessnock, and this stretch of country, covering a distance of 15 miles, is now the most important coal-mining district in Australasia. The Permo-Carboniferous measures have in various places been disturbed by intrusions of volcanic rocks, which in some instances have completely cindered the seams in close proximity to the intrusive masses, while in other instances the coal has been turned into a natural coke, portion of which some years ago realized good prices as fuel.

The table hereunder gives the yields in each of the three districts during the five years 1920 to 1924 :—

COAL.—PRODUCTION IN DISTRICTS, NEW SOUTH WALES, 1920 TO 1924.

District.	1920.	1921.	1922.	1923.	1924.
	Tons.	Tons.	Tons.	Tons.	Tons.
Northern	7,320,510	7,493,002	7,156,921	6,861,759	8 077,689
Southern	1,902,889	2,062,958	1,878,594	2,170,699	1,973,855
Western	1,492,600	1,237,427	1,147,618	1,446,055	1,566,672
Total ..	10,715,999	10,793,387	10,183,133	10,478,513	11,618,216

The output in 1924 was the highest yet recorded. The falling-off in 1922 as compared with previous years was due to the closing down of the steel works at Newcastle, while the decline in production shown by the Northern district in 1923 was brought about mainly by stoppage of work on the Maitland coal-field from April to the beginning of August.

(ii) *Victoria.* (*a*) *Black Coal.* The deposits of black coal in Victoria occur in the Jurassic system, the workable seams, of a thickness ranging from two feet three inches to six feet, being all in the Southern Gippsland district. An estimate, by R. H. Cambage, of the tonnage of extractable black coal is given hereunder :—

VICTORIA.—APPROXIMATE TONNAGE OF EXTRACTABLE BLACK COAL.

Districts.	Tonnage.
	Tons.
Korumburra, Jumbunna, and Outtrim	2,000,000
Wonthaggi	20,000,000
Total (including other small areas)	25,000,000

The output of black coal in Victoria during the last five years was as follows :—

BLACK COAL.—PRODUCTION, VICTORIA, 1920 TO 1924.

Year.	State Coal Mine.	Other Coal Mines.	Total Production.	Value.
	Tons.	Tons.	Tons.	£
1920	376,285	65,956	442,241	464,739
1921	451,255	63,604	514,859	603,323
1922	511,174	48,110	559,284	664,251
1923	418,394	58,429	476,823	523,270
1924	452,032	66,283	518,315	569,555

Amongst the other coal mines the chief producers in 1924 were the Sunbeam Colliery at Korumburra, with 17,850 tons; the Jumbunna Coal Pty. Ltd. at Jumbunna, with 11,124 tons; and the Cardiff Colliery at Korumburra, with 10,863 tons.

(*b*) *Brown Coal*:—(1) *General.* Deposits of brown coal and lignite of immense extent occur in gravels, sands, and clays of the Cainozoic period throughout Gippsland, Mornington Peninsula, Werribee Plains, Gellibrand, and Barwon and Moorabool basins. In the Latrobe Valley, the beds reach a thickness of over 800 feet. When dried, the material makes good fuel, but, owing to its excessive combustibility and friability requires to be consumed in specially constructed grates. Its steaming value is equal to about half that of the Wonthaggi coal. Some large factories already have adopted brown coal for firing boilers, and there is also a fair demand for the product by householders. In 1917 an Advisory Committee appointed to report on the brown coal deposits of Victoria recommended the establishment of an open-cut mine at Morwell in connexion with a comprehensive scheme of electrical power generation and transmission, as well as for the supply of brown coal for other requirements. The recommendations of this Committee were incorporated in the "Electricity Commissioners Act" of 1918. The Commission is actively engaged in the work of opening up the Morwell deposits, and the product is being utilized for the generation of electricity, which is transferred to Melbourne and to other towns in Victoria within economic distance. The first generator at the Yallourn power station was brought into operation on the 15th June, 1924, and the works are now assisting in meeting the increasing demands for electric energy in the metropolitan and country areas. At the 30th June, 1925, the consumers connected to the mains numbered 20,230. A township has been established at Yallourn, with provision for an ultimate population of 3,000. On the 30th June, 1925, there were 2,594 employees engaged on the various works of the Commission as follows:—At Yallourn, 1,380; Transmission Lines, 335; Metropolitan Works, 379; Water Power Investigation, 23; District Undertakings, 92; Brown Coal Mine (old open cut), 385. As ascertained by boring, the estimated tonnage of brown coal available, according to a report by the Government Geologist, is as follows:—

VICTORIA.—APPROXIMATE TONNAGE OF EXTRACTABLE BROWN COAL.

District.	Tonnage.
	Tons.
Morwell and District	5,000,000,000
Traralgon and District	5,000,000,000
Welshpool–Gelliondale	250,000,000
Altona	100,000,000
Lal Lal	25,000,000
Wensleydale	3,000,000
Total	10,378,000,000

The brown coal produced in Victoria is raised chiefly at the State Mine at Morwell, where the output in 1924 amounted to 126,028 tons. During the year 600 tons were also raised by the Otway Coal Co., at Bambra, and 862 tons by the Victorian Central Coal and Iron Co. at Lal Lal.

(2) *Production of Briquettes.* The briquetting plant started operations in November, 1924, and the output of briquettes to the 30th June, 1925, was approximately 36,500 tons. It should be noted, however, that the Yallourn plant is what is known as a "half factory", and economic production will necessitate an extension thereof. The present capacity of the plant is about 100,000 tons a year, and the Commission is desirous of increasing this to 300,000 tons. Briquettes were made by a small plant at Morwell as far back as 1894, but the product failed to compete successfully with black coal. According to the Report of the Geological Survey of the United States the world's production of briquettes in 1923 was 37½ million tons, of which over 23 million tons were produced in Germany.

(iii) *Queensland.* According to B. Dunstan, F.G.S., the coal measures of Queensland cover an estimated area of 73,000 square miles, of which 20,000 square miles are made up of recognized coal-fields, i.e., 2,000 square miles of Trias-Jura age, 2,000 Cretaceous, and

16,000 of Permian age. Estimated coal reserves include all seams not less than 1 foot thick situated at depths not greater than 1,000 feet below the surface. The actual and probable reserves are estimated as follows :—

QUEENSLAND.—ACTUAL AND PROBABLE RESERVES OF EXTRACTABLE COAL.

Class of Coal.	Actual Reserves.	Probable Reserves.
	Tons.	Tons.
Semi-anthracite	122,500,000	629,800,000
Bituminous	279,250,000	828,800,000
Semi-bituminous	2,600,000	157,400,000
Gas Coal	7,770,000	4,000,000
Lignite	..	64,000,000
Total	412,120,000	1,684,000,000

The distribution of production during the last three years was as follows :—

COAL PRODUCTION.—QUEENSLAND, 1922 TO 1924.

Districts.	1922.	1923.	1924.
	Tons.	Tons.	Tons.
Ipswich	579,184	607,983	596,720
Darling Downs	93,524	94,760	93,252
Wide Bay and Maryborough	79,305	74,215	105,181
Rockhampton (Central)	68,075	108,890	123,781
Clermont	104,141	50,553	55,799
Bowen	11,806	91,643	103,987
Mount Mulligan (Chillagoe)	22,484	32,618	44,397
Total	958,519	1,060,662	1,123,117

The output in 1924 was the highest recorded. There were 35 collieries operating in the Ipswich district, 5 in the Darling Downs, 5 in the Maryborough area, 12 in the Central district, 1 at Mount Mulligan in the Chillagoe district, and 2 in the Bowen district. State coal mines are in operation at Collinsville in the Bowen field, at Mount Mulligan in the Chillagoe field, at Baralaba in the Dawson Valley area, and at Hartley and Bowman in the Rockhampton area.

(iv) *South Australia.* Thin seams of black coal similar to the Jurassic coal of Victoria have been proved by a bore at Robe, but the depth at which the seams were located, i.e., between 2,830 feet and 3,950 feet, renders exploitation thereof unlikely. The seams of sub-bituminous coal at Kuntha Hill, 110 miles north of Marree, and at Lake Phillipson, are of good quality, but too far away from existing means of transport. At Leigh Creek there is a very large deposit, only partly explored, of sub-bituminous coal, but it is 170 miles distant from the nearest port. The chief hope for its utilization lies in its employment in pulverized form for railway purposes. At Noarlunga, 25 miles by rail from Adelaide, the proved lignite deposits contain 1,438,000 tons. The deposits at Moorlands, 87 miles by rail from the capital, contain an estimated quantity of 8,175,000 tons. At Clinton, 55 miles by sea from Port Adelaide, boring has proved the existence of 32,384,000 tons. Bores at Inkerman, 58 miles by rail from Adelaide, have revealed an estimated deposit of 10,701,000 tons. The mineral has also been located at Hope Valley, 8 miles by road from Adelaide, but no estimate has been made of tonnage. Altogether, the total reserves of lignitic fuel exceed 50 million tons, and further research will undoubtedly considerably increase this figure. South Australian lignite has a high sulphur content, and the effect of this constituent as regards the method of utilizing the deposits will need special investigation.

(v) *Western Australia.* The coal seams in Western Australia belong to the Carboniferous, Mesozoic, and Post-tertiary ages. Most of the coal contains a large proportion of moisture, and belongs partly to the hydrous bituminous and partly to the lignite class. The only coal-field at present worked is at Collie, in the Permo-Carboniferous beds. The area occupied by the coal measures is approximately 50 square miles, and the beds attain a thickness of over 2,000 feet, the coal seams totalling 137 feet. Two distinct

types of coal, designated respectively the Proprietary and Collie Burn, have been recognized. The former is dull and porous, with a thinly-banded structure and much "mother of coal," and is characterized by a tendency to crumble on exposure, by its free burning, and lack of smoke. The Collie-Burn type is bright and compact, less laminated, almost free from mother of coal, clear and firm, and, while burning less freely, gives off an appreciable amount of smoke.

Estimates place the amount of available coal on the field to a depth not exceeding 2,000 feet at 3,500 million tons. About 5½ miles north-east of Wilga, on the Donnybrook-Preston Valley Railway, a deposit of coal occurs which is apparently an extension of the Collie fields. Its area, however, has not yet been determined, but boring is in progress and good seams have been located.

Beds of Permo-Carboniferous coal are found in the Irwin River area, and a seam believed to be a northern prolongation of the Irwin River measures has been located in the valley of the Greenough River. Coal has also been found at Fly Brook, one of the branches of the Donnelly River, on the South Coast, and in the neighbourhood of the Vasse River, which flows into Geographe Bay.

Other discoveries have been made at Millbrook on the Blackwood River, and in the valley of the Fitzroy River in the Kimberley area.

The production from the five collieries situated at Collie amounted in 1924 to 421,864 tons. If the demand for coal warranted it, the output from any of the collieries could be considerably increased.

(vi) *Tasmania.* The commercial value of the Tasmanian coals varies according to their age, the oldest, i.e., the Permo-Carboniferous, being of much greater value than the youngest, i.e., the Tertiary. At present there are not sufficient data available regarding the extent and distribution of the Tertiary deposits, although it is known that they occur in all quarters of the island, and that some of them contain workable seams. Both the Trias-Jura and Permo-Carboniferous coals are valuable for domestic purposes, but the Trias-Jura seams are thicker and more extensive, and hence more largely worked. Permo-Carboniferous coals have been mined for many years for domestic purposes at Mersey, and the Preolenna and Barn Bluff fields contain coals of high potential value. The total quantity of coal available for payable extraction has been estimated at approximately 135 million tons, or on the basis laid down by the International Geological Congress, 125 million tons actual reserve, and 123 millions probable reserve.

Of the total output in 1924, amounting to 75,988 tons, the Cornwall and Mt. Nicholas Collieries in the North-Eastern division raised 40,707 and 29,077 tons respectively. About 3,700 tons were produced from the Cardiff-Jubilee Colliery, 900 tons from York Plains, 700 tons from Illamatha, 500 tons from Preolenna, and smaller quantities from Seymour, Allison, and Fingal.

(vii) *Australia.* A summary of the information available in regard to estimated actual and possible reserves of coal for Australia as a whole is given in the appended table.

AUSTRALIA.—TONNAGES OF ACTUAL AND PROBABLE COAL RESERVES.

State.	Actual Reserves.	Probable Additional Reserves.
	Million tons.	Million tons.
New South Wales	20,000	100,000
Victoria	10,400 (Brown) 25 (Black)	Apparently not large
Queensland	412	13,000
South Australia	50 (Brown)	Fairly large, no estimate
Western Australia	(a) 3,500	..
Tasmania	125	123
Northern Territory	(b)	(b)
Total	34,512	..

(a) Combined reserves and probable reserves. (b) No estimate.

3. Production in Various Countries.—The total known coal production of the world in 1924 amounted to about 1,328 million tons, towards which Australia contributed nearly 14 million tons, or about 1 per cent. The following table shows the production of the British Empire and the chief foreign countries in units of 1,000 tons during each of the five years from 1920 to 1924 where the returns are available. The production of lignite is included in those countries in which it is raised :—

COAL PRODUCTION.—BRITISH EMPIRE, 1920 TO 1924.

Year.	United Kingdom.	British India.	Canada.	Australia.	New Zealand.	Union of S. Africa.
	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.
1920	229,500	18,000	15,100	12,968	1,844	10,200
1921	163,300	19,300	13,400	12,879	1,809	10,200
1922	249,600	19,000	13,500	12,299	1,858	8,700
1923	276,000	19,700	15,200	12,634	1,970	10,600
1924	267,100	20,200	12,200	13,885	2,000	11,200

COAL PRODUCTION.—FOREIGN COUNTRIES, 1920 TO 1924.

Year.	Germany. (a)	Belgium.	France. (b)	Czecho-Slovakia.	Poland.	Netherlands.	Russia. (c)	Japan.	United States.
	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.	1,000 tons.
1920 ..	129,245	22,000	33,200	30,300	30,547	3,900	7,450	28,800	587,700
1921 ..	134,062	21,400	37,200	32,600	29,343	3,900	8,567	25,800	452,100
1922 ..	129,420	20,900	41,700	28,400	34,267	4,800	9,462	27,300	425,800
1923 ..	61,225	22,600	46,100	28,600	35,518	5,600	10,759	28,500	587,000
1924 ..	116,919	23,000	57,100	34,309	31,707	6,100	13,606	30,000	512,000

(a) Exclusive of Alsace-Lorraine since 1919, Saar and Palatinate since 1920, and Polish Upper Silesia from June, 1922.

(b) Including Saar and Alsace-Lorraine.

(c) Union of Soviet Republic.

More than half the production in Germany and Czecho-Slovakia was represented by lignite.

4. Exports.—The exports of coal from Australia are chiefly confined to New South Wales.

The total quantity of coal of Australian production (exclusive of bunker coal) exported to other countries in 1924–5 was 978,083 tons, valued at £1,079,584, of which 975,000 tons were exported from New South Wales.

In the following table will be found the quantity and value of the exports from New South Wales, during the last five years. The figures are given on the authority of the Mines Department of that State, and include both bunker coal and coal exported from New South Wales to other States.

COAL.—EXPORTS, NEW SOUTH WALES, 1920 TO 1924.

Year	1920.	1921.	1922.	1923.	1924.
Quantity, 1,000 tons	4,987	5,525	5,239	4,900	5,414
Value, £1,000	4,591	5,794	5,929	5,481	4,469

Arranged in order of importance the principal oversea countries to which coal was exported from New South Wales during the year 1924–25 are shown hereunder. The quantity and value refer strictly to exports, and exclude bunker coal:—

COAL.—DESTINATION OF OVERSEA EXPORTS, NEW SOUTH WALES, 1924–25.

Country.	Quantity.	Value.	Country.	Quantity.	Value.
	Tons.	£		Tons.	£
New Zealand ..	579,087	645,402	India	20,949	21,997
Philippine Islands	93,137	104,046	Hawaiian Islands	18,292	19,499
Netherlands East Indies ..	81,668	88,637	United States ..	15,839	16,749
Malaya	40,316	43,206	Solomon Islands	5,113	5,913
Chile	31,288	32,801	Gilbert and Ellice Islands ..	4,857	4,828
New Caledonia ..	27,711	30,367	Nauru	4,493	4,193
Fiji	28,752	29,563	New Guinea ..	2,553	3,294
Peru	20,325	22,708			

The quantity of bunker coal taken from Australia by oversea vessels in 1924–25 was about 1,120,000 tons, of which 953,000 tons were supplied by New South Wales.

The distribution of the total output from New South Wales collieries during the last five years was as follows, the particulars given of quantity exported including coal shipped as bunker coal:—

COAL.—DISTRIBUTION OF OUTPUT, NEW SOUTH WALES, 1920 TO 1924.

Year.	Exports to Australian Ports.	Exports to Foreign Ports.	Local Consumption.	Total.
	Tons.	Tons.	Tons.	Tons.
1920	2,270,556	2,716,235	5,729,208	10,715,999
1921	2,752,810	2,771,949	5,268,628	10,793,387
1922	2,841,253	2,398,144	4,943,736	10,183.133
1923	2,518,579	2,381,549	5,578,385	10,478,513
1924	3,096,881	2,317,063	6,204,272	11,618,216

Of the total coal exports from New South Wales, amounting in 1924 to 5,414,000 tons, about 4,688,000 tons were shipped from the port of Newcastle.

The figures quoted are given on the authority of the New South Wales Mines Department.

5. **Consumption in Australia.**—An estimate of the consumption of coal in Australia may be arrived at by adding the imports to the home production, and deducting the exports (including bunker coal taken by oversea vessels). The following table shows the consumption computed in the manner specified, for the last five years:—

COAL.—CONSUMPTION, AUSTRALIA, 1920 TO 1924.

Year.	Quantity of Coal Consumed.		
	Home Produce.	Produce of Other Countries.	Total.
	Tons.	Tons.	Tons.
1920	10,132,442	26,828	10,159,270
1921	9,776,978	9,457	9,786,435
1922	9,531,274	46,620	9,577,894
1923	10,022,228	32,660	10,084,888
1924	11,395,631	9,234	11,404,865

The bunker coal taken away in 1924 was estimated at 1,197,000 tons.

6. **Prices.**—(i) *New South Wales.* The price of New South Wales coal depends on the district from which it is obtained, the northern district coal always realizing a much higher rate than the southern or western product. The average price on the mine in each district and for the State as a whole during the last five years was as follows :—

COAL.—PRICES, NEW SOUTH WALES, 1920 TO 1924.

Year.	Northern District.	Southern District.	Western District.	Average for State.
	Per ton.	Per ton.	Per ton.	Per ton.
	s. d.	s. d.	s. d.	s. d.
1920	15 3	13 4	11 8	14 5
1921	17 7	16 6	12 10	16 10
1922	17 6	16 3	12 8	16 9
1923	17 7	16 1	11 5	16 5
1924	17 8	16 2	11 2	16 7

(ii) *Victoria.* In Victoria the average price of coal in 1920 was 21s.; in 1921, 23s. 5d.; in 1922, 23s. 9d.; in 1923, 22s.; and in 1924, 21s. per ton. These averages are exclusive of brown coal, the production of which in 1924 was valued at 6s. 5d. per ton.

(iii) *Queensland.* Prices in the principal coal-producing districts during the last five years were as follows :—

COAL.—PRICES, QUEENSLAND, 1920 TO 1924.

District.	Value at Pit's Mouth.				
	1920.	1921.	1922.	1923.	1924.
	Per ton.	Per ton.	Per ton.	Per ton.	Per ton.
	s. d.	s. d.	s. d.	s. d.	s. d.
Ipswich	14 7	16 6	16 8	16 11	16 8
Darling Downs	16 7	18 10	18 11	19 1	18 10
Wide Bay and Maryborough	23 3	27 3	27 2	25 0	24 3
Rockhampton	16 1	15 6	16 5	15 5	15 0
Clermont	13 0	14 4	13 10	12 10	11 0
Bowen (State Coal Mine) ..	15 10	16 3	16 1	16 0	16 5
Mount Mulligan (Chillagoe)	19 0	19 10	20 0	22 6	29 6
Average for State ..	15 2	17 5	17 6	17 5	17 8

The readjustment of prices and wages in the industry was responsible for the increases in the averages during the last four years.

(iv) *Western Australia.* The average price of the Collie (Western Australia) coal during the last five years was as follows :—In 1920, 15s. 2d.; in 1921, 17s. 4d.; in 1922, 17s. 5d.; in 1923, 17s. 6d.; and in 1924, 17s. 3d. per ton.

(v) *Tasmania.* The average price per ton of coal at the pit's mouth in Tasmania for the five years 1920 to 1924 was :—In 1920, 16s. 11½d.; in 1921, 19s. 1d.; in 1922, 17s. 7d.; in 1923, 17s. 6d.; and in 1924, 17s. 6d. per ton.

7. **Prices in the United Kingdom.**—During the five years 1920 to 1924 the average value of coal at the pit's mouth in the United Kingdom was :—In 1920, 34s. 7d.; in 1921, 26s. 2d.; in 1922, 17s. 7d.; in 1923, 18s. 9¾d.; and in 1924, 18s. 10d. per ton.

8. **Employment and Accidents in Coal Mining.**—The number of persons employed in coal mining in each of the States during the year 1924 is shown below. The table also gives the number of persons killed and injured, with the proportion per 1,000

employed, while further columns are added showing the quantity of coal raised for each person killed and injured, this being a factor which must be reckoned with in any consideration of the degree of risk attending mining operations. A further table gives the rate of fatalities during the last five years.

According to the report of the Chief Inspector of Mines for Great Britain, the average death-rate per 1,000 miners from accidents in coal mines during the quinquennium 1920–24 was 0.91, the rates varying between 1.06 in 1923, and 0.66 in 1921, while, as shown in the table following, the rate for Australia for the same period was 1.53. In the United States the fatality rate per 1,000 employees averaged 4.41 during the five years 1920–24, the rates varying from 3.78 in 1920 to 4.88 in 1922.

COAL MINING.—EMPLOYMENT AND ACCIDENTS, 1924.

State.	Persons Employed in Coal Mining.	No. of Persons.		Proportion per 1,000 Employed.		Tons of Coal raised for each Person.	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
New South Wales ..	23,030	27	80	1.17	3.47	430,300	145,200
Victoria	2,289	3	17	1.31	7.43	215,300	38,000
Queensland ..	2,828	1	73	0.35	25.81	1,123,000	15,400
Western Australia ..	673	1	70	1.49	104.00	421,900	6,000
Tasmania	269	..	5	..	18.59	..	15,200
Total ..	29,089	32	245	1.10	8.42	433,900	56,700

The figures for New South Wales include 6 shale miners. Owing to lack of uniformity in the definition of "injury," the figures relating to persons injured possess little value.

The next table shows the average number of miners employed, number of fatalities, and rate per 1,000 during the quinquennium 1920–24 :—

COAL MINING.—FATALITIES, 1920 TO 1924.

State.	Average No. of Coal Miners.	Average No. of Fatal Accidents.	Rate per 1,000 Employed
New South Wales	21,777	21.8	1.00
Victoria	2,077	2.0	0.96
Queensland	2,590	17.4	6.72
South Australia	4	..	..
Western Australia	766	0.6	0.78
Tasmania	253	0.2	0.79
Total	27,467	42.0	1.53

Figures for coal miners in South Australia appear for the first time in 1922, the miners being engaged chiefly on work in connexion with the brown coal deposits.

The abnormally heavy rate in Queensland is due to the inclusion of the 75 deaths in 1921 caused by the disastrous explosion of coal-dust at Mount Mulligan. For the quinquennium 1916–20 the Queensland rate was 1.79, and for the whole of Australia 1.14.

§ 11. Coke.

1. **Production.**—Notwithstanding the large deposits of excellent coal in Australia, there was, prior to the war, a fairly considerable amount of coke imported from abroad. During recent years, however, a high standard of excellence has been attained in the local product, and the necessity for import has to a large extent disappeared. During the year 1924–5 the coke imported amounted to 29,000 tons, chiefly obtained from the

United Kingdom, the bulk of the product being taken by South Australia. The table hereunder gives the production in New South Wales during the last five years :—

COKE.—PRODUCTION, NEW SOUTH WALES, 1920 TO 1924.

Year	1920.	1921.	1922.	1923.	1924.
Quantity .. tons	567,569	592,097	240,229	580,374	564,372
Value, total .. £	844,191	1,029,694	382,926	941,323	932,926
Value, per ton	29s. 9d.	34s. 9d.	31s. 10d.	32s. 5d.	33s.

During recent years the industry has made considerable progress, and with the development of local iron and steel works, as well as metal refineries and smelting establishments, its future prospects ought to be assured. The heavy decline in quantity and value of coke made in 1922 was due to the lessened demand consequent on the closing down of the steel works at Newcastle, while the improvement manifested in 1923 was resultant on the recommencement of operations.

A small quantity of coke is made in Queensland, the quantity returned in 1924 being 7,116 tons, but the bulk of that used in ore reduction is imported, mainly from New South Wales. The following table shows the amount manufactured locally during the last five years :—

COKE.—PRODUCTION, QUEENSLAND, 1920 TO 1924.

Year	1920.	1921.	1922.	1923.	1924.
Quantity .. tons	19,653	7,557	6,748	5,244	7,116

Information regarding the exact quantity of coke imported from New South Wales and elsewhere is not available.

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

§ 12. Oil Shale and Mineral Oil.

1. **Production.**—(i) *New South Wales.* The production of kerosene shale amounted during 1924 to 642 tons, valued at £962, as compared with 32,489 tons valued at £77,380 in 1921, the reduction being due to the closing down of the shale mines at Newnes. The Murrurundi shale mine has been taken up by a company which is experimenting with the Bronder retort. It is estimated that the total quantity of shale in the State amounts to 40 million tons, but its profitable exploitation depends on economic methods of production. Up to date there has been no production of petroleum in the State, but boring operations were continued in the Tamworth division, and several areas have been taken up for the purpose of boring in the Picton division. The prospects of striking flow oil in the area known as the Belford Dome in the Hunter River district are regarded as encouraging, and a grant of £22,500 in aid of boring has been allocated by the Federal Government for expenditure in this area.

(ii) *Victoria.* Up to the present no extensive deposit of oil shale has been located in Victoria. Bores in search of oil have been put down from time to time, but so far without result, and the State geological authorities take an unfavourable view of the prospects of obtaining it.

(iii) *Queensland.* Operations were vigorously carried on in 1924 by the Lander Oil Co. at Orallo. The original bore was deepened to 2,700 feet, but, owing to an accident with the boring tools, was abandoned, and a new bore started on the 23rd October had penetrated to 1,350 feet at the close of the year. Prospecting was continued in the

Beaudesert, Tewantin, and Wolston districts. (See also Official Year Book No. 18, p. 801.) It is stated that one of the causes of the delay in the discovery of petroleum is the absence of signs which would strike the eye of the bushworker, the soil mantle, and the superposed cretaceo-tertiary obscuring the earth structure in the underlying beds. Bores in the vicinity of Longreach have yielded petroliferous gas and wax, and there seems to be evidence that the Mesozoic strata are oil-bearing. The Commonwealth Government proposes to allot a sum of £5,000 to assist in geological survey work in the Longreach, Blackall, and Ruthven areas.

(iv) *South Australia.* Bitumen is occasionally washed up on the southern coasts of the continent from Port Davey in Tasmania to Cape Leeuwin in Western Australia. Specimens found on Kangaroo Island at one time led to the belief that they were the product of a terrestrial petroliferous area. Similar occurrences of this mineral have been reported from the coasts of California, South Africa, and New Zealand. In 1920 the finding of accumulations of oily matter on the shores at Encounter Bay and Kangaroo Island was reported, but investigations by the Mines Department into the geological conditions of the surrounding country do not encourage the hope that the matter is of local origin. It is stated, however, that the prospects appear favourable over an area in the desert region near Lake Eyre, and in the Coorong district.

(v) *Western Australia.* In this State the chief interest in the search for oil centres in the Kimberley division. At Mount Wynne, in West Kimberley, the gas which bubbles freely in a hot spring has been found to contain hydrocarbons. Indications of free petroleum have been obtained in bores on Price's Creek, about 100 miles south-east of Mount Wynne, and traces of mineral oil have been detected in a seepage. In East Kimberley a black bitumen, residual from an asphaltic oil, has been found in weathered basalt in two localities 5 miles apart, thus indicating the former circulation of petroleum in the area. Boring operations were in progress during 1924 at "Freney's" in the Northern area, and encouraging indications have been noted. The Commonwealth Government proposes to allot a sum of £22,500 in aid of boring on the Fitzroy River and in the Price's Creek area.

(vi) *Tasmania.* Oil shale has been discovered in the basins of the Mersey, Don, and Minnow Rivers, and elsewhere, and the Government Geologist estimates the probable capacity of the beds at 12,000,000 tons. Production during the last ten years has, however, been small. For 1924 the output was 1,576 tons, valued at £1,526. Successful exploitation of the vast areas available depends on the discovery of an economic method of retorting the shale.

(vii) *Northern Territory.* Considerable activity has been displayed during recent years by speculators in acquiring areas under coal and oil prospecting licences along the north-western boundary of the Territory, and northerly along the western coast to the Daly River, but so far no developments have been recorded, although what are regarded locally as good indications of oil have been discovered. Many of the licences have been forfeited, and, so far, no success has attended the boring operations at Elcho Island.

(viii) *Papua.* In 1911 indications of petroleum were reported near the Vailala River, and, acting on the reports of geologists, an oil expert was despatched by the Commonwealth Government to sink trial bores on the site. Early in 1913 a small quantity of oil was obtained from a shallow bore. Later on, extensive geological surveys were made of the country between Yule Island and the Purari Delta, and oil was encountered in several trial bores. In 1919 the Anglo-Persian Oil Co., under agreement with the British and Commonwealth Governments, and latterly with the Commonwealth Government only, has been engaged in work on the field. A geological survey and examination has been made of the Papuan Gulf Coast north-west from Yule Island to the Kapuri River district, and a re-examination of areas in the Vailala River area.

(ix) *New Guinea.* At Matapau, about 54 miles from Aitape on the north coast of what was formerly German New Guinea, oil has been struck in a shallow bore, and hopes are entertained that the product will be encountered in large volume at a greater depth. In 1924 there were in force 26 licences to prospect for mineral oil and coal, covering an area of about 25,000 square miles.

2. **Expert's Report.**—A report by Dr. Wade presented to the Senate in October, 1924, by the Minister for Home and Territories was generally unfavourable to the prospects of finding commercial supplies of petroleum in the northern portions of Western Australia and the Northern Territory. The report points out that the marginal areas on the Fitzroy apparently offered the best possibilities, and special mention was made of the Price's Creek region, although the structure there was not satisfactory in regard to present geological knowledge. It was recommended that the district should be tested with boring plant capable of penetrating to a depth of between 3,000 and 4,000 feet. Allusion was also made to the possibility of locating oil in the Belford Dome area in New South Wales.

3. **Exports.**—During the last five years the exports of kerosene shale have been trifling, only 11 tons being shipped from New South Wales in 1923–24, and 1 ton in 1924–25.

4. **Mineral Oil Bounties.**—A statement regarding the bounties payable in respect to oil produced in Australia from mined kerosene shale was given in Official Year Book 17, p. 805. The Act was further amended in 1923. Bounty to the amount of £335 was paid in 1924–25, but there were no payments in the year 1925–26. The offer by the Commonwealth Government of a reward up to £50,000 for the discovery of oil in Australia was withdrawn in 1925, and under the Petroleum Prospecting Act of 1926 a sum of £60,000 was allocated for providing aid to persons or companies engaged in the search for oil and to assist in geological survey work. Of the total amount, it is proposed to allocate £22,500 in aid of operations on the Fitzroy River and Price's Creek in Western Australia, £22,500 to the Belford Dome area in New South Wales, £5,000 for geological survey work in the Longreach, Blackall, and Ruthven areas in Queensland, while the balance of £10,000 is reserved by the Commonwealth Government to assist boring operations in other localities where geological evidence justifies expenditure.

§ 13. Other Non-metallic Minerals.

1. **Alunite.**—The production of this mineral in New South Wales amounted during 1924 to 1,008 tons, valued at £4,032, raised in the Bullahdelah division. The mineral is sent to England for treatment, and, to the end of 1924, the exports were 57,000 tons, valued at £204,000.

In South Australia an extensive deposit of the mineral was located in 1913 at Carrickalinga Head, on the coast north of Normanville, and within a short distance of Adelaide. Fresh discoveries were later reported on the western shores of St. Vincent's Gulf. The mineral returns show a production of 95 tons in 1922, but none was recorded in 1923 and 1924.

The exploitation of the alunite deposits in the North-East Coolgardie field in Western Australia has been retarded pending the result of field experiments to determine the suitability or otherwise of the product as a fertilizer in its unroasted state. Deposits of the mineral are also found in the Kalgoorlie area.

2. **Asbestos.**—This substance has been found in various parts of Australia, but up to the present has not been produced in any considerable quantity. In New South Wales there was no production in 1924, the mines at Wood's Reef in the Barraba division having been abandoned towards the end of 1923. In Queensland seams of asbestos have been found over a belt of country extending from Cawarral to Canoona, as well as in other districts. Samples of the fibre proved suitable for the manufacture of fibro-cement sheeting and tiles, but so far the deposits have not been commercially exploited. Deposits of asbestos have been located at various places in South Australia. Production in 1924 amounted to 80 cwt., valued at £80. Chrysotile asbestos of high grade is found in various localities in Western Australia, particularly in the Serpentine rocks between Nullagine and Roeburne, over a distance of 200 miles. The production in 1924 amounted to 74 tons, valued at £2,206, obtained in the Nullagine district of the Pilbara gold-field. In 1918, 2,854 tons of asbestos, valued at £5,008, were produced in Tasmania. A small quantity was raised in 1919, but there was no production during the last five years.

3. **Barytes.**—In New South Wales large quantities of this mineral are available at Kempfield in the Trunkey division, but the production in 1924 amounted to only 150 tons, valued at £300. The production in South Australia during 1924 was given as 1,898 tons, valued at £5,694. In this State there are extensive deposits of the mineral at Noarlunga and Pernatty Lagoon. First class ore is found near Truro in the hundred of Dutton, and the mineral is also worked near Williamstown. High grade natural white barytes is obtained from some of the workings, but a large amount of lower grade ore is discarded or wasted owing to lack of facilities for cleaning and bleaching. Barytes in fair-sized veins occurs at many places in Western Australia, especially at Cranbrook in the south-west division. The export in 1921 was, however, small, being valued at under £20, and none was recorded in 1923 and 1924. About 1,000 tons of barytes, valued at £4,000. were produced in Tasmania in 1920, the greater portion being won from deposits near Queenstown and Mt. Jukes, and the balance from Beulah and elsewhere, but there was no production recorded in the last four years.

4. **Clays and Pigments.**—Valuable deposits of clays and pigments of various sorts are found throughout Australia. There is a considerable local production of earthenware, bricks, and tiles, but the finer clays have not as yet been extensively used. In New South Wales the production of pigments amounted in 1924 to 738 tons, valued at £942. About 300 tons of yellow ochre were raised at Delroy in the Dubbo division, and 328 tons of pigment material were obtained in the Burrabadine area. Small quantities of yellow ochre were raised in the Goulburn division, and of red ochre and umber in the Gulgong division. About 3,000 tons of white clay, valued at £2,900, were raised from various areas during the year, deposits at Lidsdale in the Lithgow division being found very suitable for the making of high grade porcelain ware. In Victoria 1,741 tons of kaolin, valued at £2,683 were produced in 1924 from deposits at Stawell, Mt. Egerton, Bendigo, and Pyalong, and 76 tons of pigment clays, valued at £514, were raised from leases at Ballarat and Warragul. In Queensland, 5,107 tons of fireclay, valued at £1,341, were mined during 1924 in the Mount Morgan district. Deposits of fine white clay have been located near Wondai and Kingaroy. In South Australia ochre is obtained at the Copper King pigment mine near Beltana, and is also raised near Oodnadatta. Production in 1924 amounted to 710 tons, valued at £4,260. Red oxide of suitable quality as well as ochres of various hues have been found in different and widely-separated localities in Western Australia. A paint and distemper factory has been established in Perth, and this, coupled with the demand from the Eastern States, will further stimulate the search for the necessary materials. Investigation has proved the existence of a deposit of a fine white-ware clay about 4 miles from the railway at Wagin. Porcelain and other clays of good quality have been found in Tasmania at Beaconsfield, Sorell, Hagley, etc. Oil and water paints have been made from coloured ochres from Sorell, and deposits of ochre have been located near Mowbray and Beaconsfield. The production of ochre in 1921 was returned at 15 tons, valued at £56, but none was recorded in 1922 and 1923. In 1924 the output was 20 tons, valued at £50.

5. **Felspar.**—During 1924, the production of this mineral in New South Wales was 15 tons, valued at £15, raised in the Lithgow division. A fairly extensive deposit of felspar has been located at Black Ridge near Williamstown in South Australia, but further development is required to ascertain its economic value. About 60 tons of felspar, valued at £485, were exported during 1922 from Western Australia, but none was recorded in 1923 and 1924. A large deposit of the mineral has been located near Jacob's Siding, and it also occurs in the Coolgardie area.

6. **Fluorspar.**—At Carboona in the Tumbarumba division in New South Wales this mineral is mined with silver and lead, the production in 1924 amounting to 470 tons. In Victoria 196 tons, valued at £625, were raised in 1921 by a company operating at Walwa, but none was recorded in 1923 and 1924. A high grade fluorspar occurs at the Perseverance mine on the Chillagoe railway in Queensland. Production in 1924 amounted to 1,864 tons, valued at £5,240.

7. **Fuller's Earth.**—About 50 tons of this material, valued at £150, were produced in 1924 from deposits in the Boggabri area of the Narrabri division, New South Wales. A large deposit of excellent quality has been located near Jennacubbine in Western Australia.

8. **Graphite.**—Graphite is found in New South Wales near Undercliff Station, in the county of Buller, but none was raised in 1924. In Victoria the mineral occurs in Ordovician slates in several of the gold-fields, but is not worked. In Queensland graphite was raised some years ago by the Graphite Plumbago Company at Mt. Bopple, near Netherby, on the Maryborough-Gympie line. There has been no production in recent years, and it is stated that the prospects are not promising for flake graphite, although encouraging for the amorphous variety. In South Australia deposits are found at various places in Eyre's Peninsula. While a large proportion of the product is not suitable for commercial use, the work so far done shows that flake graphite containing as high as 80 per cent. carbon can be obtained. The Government is offering a bonus of £1 per ton for the production of graphite containing not less than 80 per cent. carbon, and on graphite with a smaller percentage, a bonus proportionate to the carbon content. In Western Australia deposits occur at Munglinup Creek, near the Oldfield River, on the Pallinup River in the Kent District, at Northampton, in the Murchison division, and on the Donnelly River at Kendenup, about 40 miles from Albany. Production in 1920 was small, amounting to 13 tons, valued at £130, but practically none was recorded during the last four years. Several deposits of graphite have been found near the Golden Dyke mine in the Northern Territory, but their value has not yet been determined.

9. **Gypsum.**—The output of gypsum in New South Wales during 1924 was 2,666 tons, valued at £1,236, of which 670 tons were raised in the Hay division, and 1,996 tons in the Hillston division. In Victoria during 1924 there was a production of 13,268 tons, valued at £11,818, of which 1,892 tons were raised from leases at Boort; 703 tons at Cowangie; 4,871 tons at Waitchie; 3,078 tons at Bolton; and 2,724 tons at Lake Boga. Numerous deposits of gypsum are found in Southern Yorke's Peninsula, and on the coast near Fowler's Bay, in South Australia, the quantity available being large and of high quality. The production in 1924 amounted to 65,690 tons, valued at £57,479, the largest yet recorded. A considerable quantity is used in the manufacture of plaster and cement, as well as for agricultural purposes. Gypsum is widely distributed in Western Australia in tertiary and late tertiary deposits associated chiefly with the salt lakes of the arid regions of the interior south of the tropics. Many of these lacustrine deposits are capable of yielding large tonnages. The production in 1924 amounted to 4,237 tons, valued at £5,278, of which 1,518 tons were raised at Woolundra; 1,234 tons at Koorda; 641 tons at Hines Hill; 487 tons at Dukin; and 357 tons at Baandee.

10. **Magnesite.**—Deposits of this mineral have been discovered at several localities in New South Wales. During 1924 the output was 12,496 tons, valued at £12,772, of which about 9,000 tons were raised at Attunga in the Tamworth division, and 2,451 tons in the Fifield division. In addition, small quantities were raised from deposits in the Barraba and Cobar divisions. The mineral is found at Heathcote in Victoria, where 76 tons, valued at £228, were produced in 1924. There are deposits in the neighbourhood of Rockhampton and Bowen in Queensland, and in 1924 an output of 149 tons was recorded from the Rockhampton area. A deposit of exceptional purity has been located in the vicinity of Tumby Bay in South Australia, about five miles from the township of Tumby, and the mineral is also found near Copley. The Broken Hill Co. is working a small deposit near the Beetaloo Waterworks. Production in 1924 amounted to 129 tons, valued at £323. A large area of magnesite-bearing country has been located in Western Australia at Bulong, about 20 miles east of Kalgoorlie, and deposits have also been found at Coolgardie and other places. The mineral is of a high degree of purity, but there has been no production of importance since 1915, and 2 tons only were recorded in 1923 and none in 1924.

11. **Mica.**—Mica is found at various places in Australia, and deposits of considerable extent have been located in the Hartz Range in the Northern Territory. Production from these deposits in 1924 amounted to 5,281 lb., valued at £2,719.

12. **Phosphate Rock.**—During 1924, 107 tons of phosphate, valued at £209, were obtained in New South Wales, of which 50 tons were won in the Molong division, 42 in the Inverell division, and 15 in the Kempsey division. In Victoria 532 tons, valued at £532, were raised at Mansfield. The production in Queensland amounted in 1922 to 65 tons valued at £279, raised by the Holbourne Island Phosphate Company in the Bowen district. Difficulty in finding a market for the product was responsible for the

small output, and none was raised in 1923 and 1924. South Australia possesses deposits scattered over a belt of country 200 miles in length, from Myponga in the south to the district round Carrieton, in the north. Production in 1921 amounted to 5,079 tons, valued at £6,203, in 1922 to 2,715 tons, valued at £3,678, but in 1923 there was a decline to 446 tons, valued at £592, and only 84 tons were raised in 1924. It is stated that the industry is meeting with severe competition in the high grade phosphate imported from Nauru. Deposits of guano and phosphate have been found in caves between 27 and 40 miles to the north-east of Carrieton, but they are not of sufficient value to warrant exploitation. Natural ammonium sulphate and chloride associated with guano have been found in a cave deposit in the Flinders Ranges about 78 miles easterly from Copley. In Western Australia the known phosphate deposits occur principally on the coastal islands, and in portion of the coastal plain between Dongarra and Perth. Some years ago guano digging on the islands was a large and profitable industry.

13. **Salt.**—Salt is obtained from salt lakes in the Western and North-Western districts of Victoria, and from salterns in the neighbourhood of Geelong. Figures regarding production are, however, not available for publication. Large quantities are obtained from the shallow salt lakes of South Australia, chiefly on Yorke Peninsula. Lake Hart, about 60 square miles in area, situated about 120 miles N.W. from Port Augusta, contains immense supplies of salt of good quality, which at present, however, owing to distance from market, possess no economic value. The salt is simply scraped from the beds of the lakes in summer time and carted to the refinery. It is stated that care must be taken not to leave too thin a crust of salt over the underlying mud, as the resultant " crop " after the winter rains will in that case be smaller than usual. During recent years a fair amount has been produced by evaporation of sea water at the heads of Spencer's and St. Vincent's Gulfs. About 63,000 tons of crude salt, valued at £141,000, were produced during 1924. In Western Australia salt is obtained from depressions in the calcareous sandstones of the coast, which are filled to a shallow depth in winter with salt water. In summer the depressions dry up, leaving a layer of salt two or three inches thick, which is collected and refined. Up to the present, the four chief localities producing salt were Rottnest Island, off Fremantle; Middle Island, near Esperance; Yarra Yarra Lakes, near Three Springs; and Lynton, near Port Gregory There is a very large number of salt and brine lakes which may ultimately be used as sources of salt.

14. **Diatomaceous Earth.**—Although this mineral has been found at various localities in New South Wales, the deposits have not been worked commercially on any considerable scale. The output in 1924 was 564 tons, valued at £1,092, of which 500 tons were raised in the Coonabarabran division, and 64 tons in the Barraba division. Part of the product is used as a filtering medium in the manufacture of gelatine, and part for the manufacture of metal polish in powdered and liquid form. In Victoria there is a remarkably pure deposit at Lillicur, near Talbot, while beds of the mineral are also met with at other places in the Loddon Valley, near Ballarat, at various places close to Melbourne, at Craigieburn, Lancefield, Portland, Swan Hill, Bacchus Marsh, etc. During 1920, a production of 1,000 tons, valued at £5,000, was recorded, but no production was returned for 1921 to 1924. Fairly extensive deposits of diatomite exist in Queensland, in the Nerang, Beaudesert, and Canungar areas, but the various outcrops have as yet been only partly examined. In Tasmania a deposit of diatomaceous earth has been located at Oatlands, but its use for the manufacture of explosives is apparently prejudiced by the circumstance that the diatoms are pulverized and contaminated with clay.

§ 14. Gems and Gemstones.

1. **Diamonds.**—It is difficult to secure accurate returns in connexion with the production of precious stones, but the yield of diamonds in 1924 in New South Wales was estimated at 284 carats, valued at £498, while the total production to the end of 1924 is given at 202,000 carats, valued at £144,000. The yield in 1924 was obtained almost entirely by individual miners at Copeton in the Tingha division. A considerable amount of prospecting work has been carried out at Red Hill in the Crookwell division, and some of the diamonds already won have been sent to Amsterdam to be cut and polished in order to ascertain the marketable qualities of the stones. Small quantities

of diamonds are found in Victoria in the gravels of streams running through granite country in the Beechworth district, at Kongbool in the Western District, and near Benalla. The stones are generally small, and the production up to date has been trifling. In 1912, eleven small diamonds, valued at £20, were picked out of the sluice boxes of the Great Southern alluvial mine at Rutherglen. In Queensland a discovery was made in 1924 at Diamond Vale, about 2 miles east of Stanthorpe, the stones being found in alluvial tin wash. A flawless green diamond weighing 1 carat, a slightly smaller green, and a white weighing 1 carat, were recovered. The green diamond is extremely rare, and a specimen weighing 1½ carats, exhibited at Wembley Park, was valued at £1,750. In South Australia diamonds have been found on the Echunga gold-fields, the most notable gem being Glover's diamond. which was sold for £70. A few small diamonds have been found in the Pilbara district in Western Australia. Small diamonds have, from time to time, been found in Tasmania, chiefly while sluicing for gold in the Donaldson district.

2. **Sapphires.**—The production of sapphires in New South Wales during 1924 was returned as 2,713 ozs., valued at £5,659, obtained at Sapphire and Nullamanna in the Inverell division. It is probable that the output is understated owing to the difficulty of obtaining accurate returns from individual miners and prospectors. A fair quantity of machine stones, zircon and corundum, was also raised, but no sales thereof were effected.

In Queensland, 15,014 ozs. of sapphires to the value of £24,339 were obtained in 1924 on the Anakie mineral field. Fancy stones occasionally bring high prices, and a yellow sapphire weighing 6½ dwt., found in 1923 at Iguana Flat, was purchased for £100. A 14-carat yellow, cut by the local lapidary in 1924, was also valued at £100. Some fine stones were found during this year, including a green weighing 10½ carats, and a pure red ruby weighing 4 carats. There is a lapidary on the Anakie field, but many stones are sent away for cutting.

Sapphires are plentifully found in the tin drifts of the Ringarooma and Portland districts in Tasmania, but the stones are, as a rule, small and not worth saving.

3. **Precious Opal.**—The estimated value of the opal won in New South Wales during the year 1924 was £10,500, the whole of the yield being obtained on the Lightning Ridge field, where there still remains an area of 12,000 acres of opal-bearing country of which little has been prospected. Some very fine stones are at times obtained, one weighing 5 ozs. and valued at £300 being recovered in 1911. Occasionally, black opals of very fine quality are found, one specimen from the Wallangulla field, weighing 6½ carats, being sold in 1910 for £102, while in the early part of 1920 a specimen realized £600. It is stated that this locality is the only place in the world where the "black" variety of the gem has been found. The total value of opal won in New South Wales since the year 1890 is estimated at £1,540,000.

Small quantities of precious opal are found in the Beechworth district in Victoria.

The opaliferous district in Queensland stretches over a considerable area of the western interior of the State, from Kynuna and Opalton as far down as Cunnamulla. The yield in 1924 was estimated at £300, and up to the end of that year at about £181,000. These figures are, however, merely approximations, as large quantities of opal, of which no record is obtained, are disposed of privately. At present the industry, which is not followed by practical miners, suffers from the peculiar disability that in good seasons there is plenty of work available on the pastoral stations, and most men prefer this to the uncertain results obtainable by fossicking, while in dry seasons, when constant work is not obtainable, the search for opal is blocked by the absence of grass and water on the fields.

Owing to difficulty in disposing of the product, little mining was carried on in 1924 at the Stuart's Range opal field in South Australia, the estimated value of the production being £4,000. The field is extremely prolific, and only a small portion of the known opal-bearing area has been tested. A fine collection of gems from this field was dispatched to the British Empire Exhibition.

According to a report a few years ago by the Australian Trade Commissioner in the East there is a good sale for the gems in China. It is stated that there is no difficulty in cutting and polishing, as the Chinese method of dealing with jade, dating back many centuries, can also be applied to opal.

4. **Other Gems.**—Various other gems and precious stones have from time to time been discovered in the different States, the list including agates, amethysts, beryls, chiastolite, emeralds, garnets, olivines, moonstones, rubies, topazes, tourmalines, turquoises, and zircons.

§ 15. Numbers Engaged, Wages Paid, and Accidents in Mining.

1. **Total Employment in Mining.**—The number of persons engaged in the mining industry in Australia fluctuates according to the season, the price of industrial metals, the state of the labour markets, and according also to the permanence of new finds, and the development of the established mines. During the year 1924 the number so employed was as follows :—

NUMBER OF PERSONS ENGAGED IN MINING, 1924.

State.	Number of Persons engaged in Mining for—						Total.
	Gold.	Silver, Lead, and Zinc.	Copper.	Tin.	Coal and Shale.	Other.	
New South Wales ..	1,014	5,468	52	1,004	23,030	2,616	33,184
Victoria..	2,651	..	..	2	2,289	148	5,090
Queensland	452	759	1,017	698	2,828	601	6,355
South Australia	30	12	34	..	..	789	865
Western Australia ..	5,296	141	110	40	673	29	6,289
Tasmania	128	479	532	781	291	400	2,611
Northern Territory ..	18	15	12	115	..	42	202
Australia... ..	9,589	6,874	1,757	2,640	29,111	4,625	54,596

Included in the figures for " other " in South Australia were 411 engaged in mining for iron, 120 gypsum miners, and 154 salt gatherers. The Tasmanian figures include 134 osmiridium miners, and those for the Northern Territory 40 mica miners.

The following table shows the number of persons engaged in mining in Australia during each of the years 1891, 1901, and 1924, together with the proportion of the total population so engaged :—

NUMBER ENGAGED IN MINING PER 100,000 OF POPULATION, 1891, 1901, AND 1924.

State.	1891.		1901.		1924.	
	Miners employed.	No. per 100,000 of Population.	Miners employed.	No. per 100,000 of Population.	Miners employed.	No. per 100,000 of Population.
New South Wales	30,604	2,700	36,615	2,685	33,184	1,487
Victoria	24,649	2,151	28,670	2,381	5,090	310
Queensland	11,627	2,934	13,352	2,664	6,355	770
South Australia	2,683	834	7,007	1,931	865	163
Western Australia	1,269	2,496	20,895	11,087	6,289	1,749
Tasmania	3,988	2,695	6,923	4,017	2,611	1,216
Northern Territory ..	..	..	..	..	202	5,606
Australia	74,820	2,341	113,462	2,992	54,596	940

The general falling-off since 1901 is due to the stagnation caused by the war, the low price of industrial metals, and largely to the decline in the gold-mining industry.

2. **Wages Paid in Mining.**—Information regarding rates of wages paid in the mining industry, which in earlier issues of the Year Book was given in this chapter, is now contained in the Labour Report issued by this Bureau.

3. **Accidents in Mining, 1924.**—The following table gives particulars of the number of men killed and injured in mining accidents during the year 1924 :—

MINING ACCIDENTS, 1924.

Mining for—	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	N.T.	Australia.
			KILLED.					
Coal and shale	27	3	1	..	1	..	..	32
Copper ..	..	..	2	..	..	..	..	2
Gold ..	1	..	..	..	7	..	..	8
Silver, lead, and zinc ..	8	..	..	..	2	..	..	10
Tin	1	..	1	..	..	..	..	2
Other minerals	..	..	..	1	..	..	..	1
Total ..	37	3	4	1	10	...	..	55
			INJURED.					
Coal and shale	80	17	73	..	70	5	..	245
Copper ..	..	..	11	..	..	13	..	24
Gold ..	..	2	..	..	160	..	..	162
Silver, lead, and zinc ..	52	..	2	..	..	12	..	66
Tin	..	..	2	..	..	10	..	12
Other minerals	1	..	..	1	1	2	..	5
Total ..	133	19	88	1	231	42	..	514

The number killed in mining accidents in 1924 was considerably less than that for 1921 when 132 deaths were recorded, the figures for the earlier year being swollen by the 75 fatalities in the Colliery disaster at Mount Mulligan in Queensland.

§ 16. Government Aid to Mining.

1. **Commonwealth.**—Assistance to mining is given by the Commonwealth under the provisions of the *Precious Metals Prospecting Act* 1926, and the *Petroleum Prospecting Act* 1926.

The first-mentioned Act provides for a sum of £40,000, of which £15,000 is to be expended in the Northern Territory, and the balance is to be allocated to the States in such proportions as the Minister determines.

Under the Petroleum Prospecting Act a trust account of £60,000 is established to assist in the search for oil. The Minister may make advances out of the money standing to the credit of this account to persons or companies engaged in the search for oil, and to assist persons, companies, or State Governments to make geological surveys.

2. **New South Wales.**—The chief aid given in this State is in the direction of assistance to prospectors. Up to the end of 1924 the total sum expended in this manner amounted to £552,722, of which £10,673 was advanced in 1924. A sum of £750 was made available during the year for the purpose of assisting in the erection of crushing batteries or reduction plants, but no advances were made therefrom. The reward for the discovery of new mineral fields within the State has been increased from £500 to £1,000, with provision for sums of £200 and £500 in respect of fields not large enough to qualify for the full amount, and the conditions have been made more liberal.

3. **Victoria.**—Since the passage of the Mining Development Act in 1897, the expenditure under its varying provisions has been £1,209,334, of which £287,000 was disbursed in connexion with advances to companies, £326,000 on boring, £247,000 on mining enterprise, £101,000 on advances to miners, £93,000 on maintenance, removal, etc., of batteries, and about £95,000 in connexion with the State brown coal mine. The expenditure for the financial year 1924–1925 amounted to about £30,000, of which £12,000 was spent on boring, £5,600 on advances to companies, £3,600 on testing plants, £3,200 on mining development, and £2,200 on geological surveys.

4. **Queensland.**—State assistance to the mining industry in 1924 amounted to £11,788, of which £1,862 consisted of loans in aid of deep sinking; £7,991 grants in aid of prospecting, and £1,935 in aid of roads and bridges to gold and mineral fields and water supply. In addition, a sum of £2,591 was expended in loans under the Act of 1906, £27,099 on State Coal Mines, and £53,006 on State Smelting Works.

During the year the Chillagoe State Smelters produced 1,853 tons of lead bullion containing 511 ozs. of gold, 158,361 ozs. silver, and 1,808 tons of lead, in addition to 369 tons of blister copper containing 898 ozs. gold, 51,942 ozs. silver, and 356 tons copper. The State Arsenic Works at Jibbinbar produced 379 tons of high-grade arsenic. Four State batteries were in operation during 1924, the works at Irvinebank producing 169 tons of tin concentrates; 1,391 ozs. of gold were extracted by the battery at Kidston: at Charters Towers parcels of ore were treated for miners and prospectors; and at Bamford experimental work and a little tin crushing were done. The State Assay Office at Cloncurry made over 4,000 assays for the public during the year.

5. **South Australia.**—Aid is given to the mining industry under the terms of the Mining Act of 1893, and previous measures. Up to the end of 1924 the total amount of subsidy paid was £65,163, of which £13,227 has been repaid, and £2,250 written off, leaving a debit of £49,686. Portion of this amount is represented by machinery that has fallen into the hands of the Government. Repayments must be provided from profits, but in only two instances have the profits enabled a full return to be made. During the year 1924 assays and pan tests numbering 250 were made of small parcels of ore or tailings received from prospectors by State batteries and cyanide works.

6. **Western Australia.**—Under the Mining Development Act of 1902 assistance was granted in 1924 in accordance with the subjoined statement:—Advances in aid of mining work and equipment of mines with machinery, £23,457; aid to prospectors, £5,723; advances in aid of boring, £865; subsidies paid on stone crushed for the public, £174; making a total of £30,219. In addition, a sum of £68,349 was charged against the vote on account of rebates to the Gold-fields Water Supply Branch, and other assistance amounted to £2,908. The receipts under the Act, exclusive of interest payments, came to £2,819, of which £1,958 consisted of refunds of advances.

In 1924 there were 29 State batteries in operation. The amount expended thereon up to the end of 1924 was £91,981 from revenue and £309,605 from loan, giving a total of £401,586. During the year receipts amounted to £22,347, and working expenditure to £32,692. The total value of gold and tin recovered to the end of 1924 at the State plants was £5,862,551, resulting from the treatment of 1,402,000 tons of gold ore and 80,000 tons of tin ore, together with a small amount from residues.

7. **Tasmania.**—During the year 1924, the sum of £1,697 was expended in aid to mining including £475 for salaries, £111 for assay material, £618 assistance to prospectors, and advance of £300 to the Z.L. Prospecting Syndicate. The receipts amounted to £897, of which £670 represented royalty by tributers.

Tributers' assays are made at a nominal charge, and all tribute surveys are carried out free of charge by the Assay and Survey Office at Zeehan. The amount received from ore sales was £6,145, of which £5,424 was paid to tributers, £51 royalty to lessees, and £670 royalty to the State.

8. **Northern Territory.**—During the year 1923–24, with the exception of a subsidy to the Golden Dyke Company amounting to £350 on a £ for £ basis, and the loan of horses and equipment to reliable miners and prospectors, the little assistance rendered was by the Primary Producers Board, and amounted to about £700, of which £460 is recoverable.

The Government maintains a battery at Marranboy, and the Government Assayer makes free assays for prospectors, and arranges for the sampling, storage, and sale of ores,

§ 17. Commonwealth Government Control of Industrial Metals.

The proclamation under the Customs Act prohibiting the exportation of metals without the consent of the Minister for Trade and Customs is still in force, but consent is granted in every case where the contract relating to the sale of the metals has been approved.

§ 18. Metallic Contents of Ores, etc., Produced and Exported.

1. **Local Production.**—According to returns compiled from various sources by the Australiam Mines and Metals Association the quantities of the principal metals (exclusive of gold) extracted in Australia during the five years 1921 to 1925 were as follows:—

REFINED METALS PRODUCED IN AUSTRALIA, 1921 TO 1925.

Metal.		1921.	1922.	1923.	1924.	1925.
Silver	ozs.	4,572,878	7,896,052	7,645,689	7,631,213	8,573,506
Lead, pig ..	tons	55,749	105,528	118,513	126,625	146,129
Zinc	tons	1,681	23,724	41,153	46,372	45,698
Copper	tons	18,690	11,524	17,825	14,100	10,984
Tin	tons	2,985	2,657	3,053	3,167	3,171

The local production of pig iron during the last five years ranged between 84,000 tons in 1922, and 439,000 tons in 1925.

2. **Metallic Contents of Ores, Concentrates, etc., Exported.**—The estimated metallic contents of ores, concentrates, etc., exported during the five years 1921 to 1925 are given in the following table:—

METALLIC CONTENTS OF ORES, CONCENTRATES, ETC., EXPORTED, 1921 TO 1925.

Metal.		Contained in—	1921.	1922.	1923.	1924.	1925.
Silver	ozs.	Lead—Silver—Gold Bullion	64,811	165,290	283,453	158,361	189,223
		Lead Concentrates and Ores	210,944	281,728	1,298,750	90,360	850,552
		Zinc Concentrates and Ores	456,317	3,390,964	3,526,774	1,941,507	1,270,166
		Copper Ores	..	12,261	1,378	51,942	..
		Total	732,072	3,850,243	5,110,355	2,242,170	2,309,941
Lead	tons	Lead—Silver—Gold Bullion	580	1,790	3,564	1,808	2,751
		Lead Concentrates and Ores	3,950	2,959	18,572	4,852	19,651
		Zinc Concentrates and Ores	2,498	19,910	425	19,859	12,423
		Total	7,028	24,659	22,561	26,519	34,825
Zinc	tons	Lead Concentrates ond Ores	435	..	..	384	366
		Zinc Concentrates and Ores	19,181	135,690	146,693	122,305	79,996
		Total	19,616	135,690	146,693	122,689	80,362
Copper	tons	Ores, Matte, etc. ..	34	326	2,182	875	864
Tin	tons	Concentrates and Ores ..	5	..	..	4	..

§ 19. Oversea Exports of Ores, Metals, etc.

The following table shows the quantity and value of the principal oversea exports of ores, concentrates, and metals, the produce of Australia, together with the countries to which the respective products were forwarded, for the year 1924–25 :—

OVERSEA EXPORTS OF AUSTRALIAN ORES, METALS, ETC., 1924-25.

Article.	Total Exports.	Exports to—						
		United Kingdom.	United States.	Belgium.	Germany.	Japan.	New Zealand.	Other Countries.
QUANTITY.								
Ores—	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.	cwt.
Alunite	1,140	1,140	..	..	..	..	..	..
Antimony ..	12,106	10,597	..	1,509	..	..	..	..
Cobalt	15,482	14,881	600	..	..	..	..	(b) 1
Silver and Silver-lead Concentrates—	164,910	1,906	..	106,111	56,893	..	..	..
Silver and Silver-lead	362,616	..	..	237,307	125,309	..	..	..
Zinc	4,489,005	1,748,907	..	2,206,286	99,466	..	..	(a)434,346
Cadmium—Blocks, Ingots, etc... ..	3,479	2,098	..	..	86	..	..	(c)1,295
Copper—								
Matte	8,026	..	..	..	8,026	..	..	..
Ingot	67,893	57,913	..	..	..	..	541	(d)9,439
Tin—Ingot ..	32,558	15,100	10,670	..	200	..	4,844	(h)1,744
Lead—								
Matte	43,922	43,922	..	..	..	..	..	..
Pig	2,311,153	1,880,119	..	710	60,044	235,158	45,345	(e)89,777
Zinc—Bars, Blocks, etc.	646,860	194,036	..	26,004	110,013	297,963	341	(g)18,503
	oz.	oz.	oz.	oz.	oz.	oz.	oz.	oz.
Platinum, Osmium, etc.	1,407	852	505	..	..	..	..	(f)50
Gold—								
Matte	584	584	..	..	..	..	..	..
Bar, Dust, etc. ..	37,167	823	..	..	..	..	240	(i)36,104
Silver—								
Matte	158,662	158,662	..	..	..	..	..	..
Bar, Ingot, &c. ..	7,289,290	1,704	..	..	..	..	..	(j)7,287,586
VALUE—£.								
Ores—								
Alunite	228	228	..	..	..	..	..	..
Antimony ..	15,868	14,370	..	1,498	..	..	..	..
Cobalt	40,108	39,498	600	..	..	..	..	(b)10
Silver and Silver-lead Concentrates—	201,950	982	..	124,736	76,232	..	..	..
Silver and Silver-lead	345,132	..	..	235,681	109,451	..	..	..
Zinc	1,050,386	400,045	..	510,822	39,205	..	..	(a)100,314
Cadmium—Blocks, Ingots, etc... ..	41,617	26,561	..	..	900	..	..	(c)14,156
Copper—								
Matte	12,910	..	..	..	12,910	..	..	..
Ingot	222,708	192,566	..	..	..	..	2,072	(d)28,070
Tin—Ingot ..	406,000	189,098	132,167	..	2,600	..	60,204	(h)21,931
Lead—								
Matte	73,351	73,351	..	..	..	..	..	..
Pig	4,081,097	3,313,227	..	110	121,500	404,146	81,474	(e)160,640
Zinc—Bars, Blocks, etc.	1,146,261	347,950	..	45,500	194,000	527,055	714	(g)31,042
Platinum, Osmium, etc.	23,406	4,852	16,430	..	..	..	..	(f)2,124
Gold—								
Matte	2,562	2,562	..	..	..	..	..	..
Bar, Dust, etc. ..	157,233	3,620	..	..	..	..	1,020	(i)152,593
Silver—								
Matte	23,007	23,007	..	..	..	..	..	..
Bar, Ingot, etc ..	1,084,825	246	..	..	..	..	..	(j)1,084,579

(a) France, 434.346 cwts., £100,314. (b) New Zealand. (c) France, 980 cwts., £10,353 ; and small quantities to Japan and Norway and Sweden. (d) India, 5,439 cwts., £14,170 : Sweden, 4,000 cwts., £13,900. (e) China 47,773 cwts., £84,512 ; Hong Kong, 35,813 cwts., £65,424 ; South Africa, 6,019 cwts., £10,322 ; and small quantities to Pacific Islands. (f) France. (g) France, 10,000 cwts., £16,000 ; Italy, 6,000 cwts., £10,500 ; China, 2,498 cwts., £4,530 ; and small quantities to Pacific Islands. (h) France, 1,700 cwts., £21,303 ; and small quantities to Pacific Islands. (i) Ceylon and India. (j) Ceylon, 84,740 ozs., £11,284 ; India, 6,773,576 ozs., £1,002,880 ; Fiji, 4,550 ozs., £781 ; China, 424,720 ozs., £69,684.