

SECTION XII.

MINES AND MINING.

§ 1. Introduction.

1. **Place of Mining in Australian Development.**—Although Australia is pre-eminently a pastoral and agricultural country, the value of the production from its flocks and herds and from its farming industry far exceeding the return from mining, yet its mines and its mining developments are of great and increasing importance. It may also be said that it was the discovery of its immense stores of mineral wealth that first attracted population to Australia, and thus laid the foundations of its nationhood. Though coal was the first discovered mineral of recent times, it was the discovery of gold, overshadowing in popular estimation the former, which brought about a large influx of population and the formation of various settlements.

That Australia was a gold-producing country was known probably 400 years ago. From the Dauphin chart (1530-1536) preserved in the British Museum, it appears that the north-west coast was called by the Portuguese and Spaniards *Costa d'Ouro*, gold-coast. But the knowledge of Australia as a gold-producing territory was not revived until as late as 1823, when James McBrien, making a survey of the Fish River, between Rydal and Bathurst, in New South Wales, wrote in his field notes—"At this place I found numerous particles of gold in the sand." Reference to subsequent discoveries will be reserved till later.

2. **Extent of Mineral Wealth.**—The large production of gold, silver, copper, and tin, the extent of the coal deposits, the presence of large quantities of iron ore, and the great variety of minerals found in appreciable quantities, suggest that the future history of mining will, in all probability, be more remarkable even than that of the past. For the extent of the total mineral wealth of Australia cannot yet be regarded as well-ascertained, since the mineral exploration of this country is, after all, still in its infancy. The presence of considerable deposits of valuable metals has long been known. Thus, silver was discovered by Count Strzelecki as early as 1839, and was worked as early as 1864; copper mining dates back to 1844; lead to about 1848, and iron to about 1850. Cobalt, nickel, manganese, chromium, tungsten, molybdenum, mercury, antimony, bismuth, zinc, etc., have all been found, some in fairly large quantities.

Among the more valuable non-metalliferous substances may be mentioned coke, kerosene shale, graphite, alunite, asbestos, diatomaceous earth, 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. In general it may be said that the variety of Australian mineral wealth is very great.

It will be convenient in the succeeding pages to treat first of all gold and the various metals, then to deal with non-metallic minerals and precious stones, and finally to furnish some account of the total mineral wealth of Australia, and of the extent of employment in mining generally.

METALS (A.)

§ 2. Gold.

1. **Discovery of Gold 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 reference to the population figures prior and subsequent to the year 1851 amply demonstrates this fact. Thus on 31st December 1841 the population of the Commonwealth was only 220,968¹; at the end of 1851 it was still under half a million, viz., 437,665¹, while by the end of 1861 the total had reached 1,168,149¹ persons, that is the population had quintupled itself in twenty years. A short account of the chief discoveries in each State and in New Zealand is appended:—

(i.) *New South Wales.* The first authentic discovery of the precious metal in this State was made by “Assistant Surveyor” James McBrien, on the 16th February, 1823. Mr. McBrien reported that he had “found numerous particles of gold amongst the sand in the hills convenient to the Fish River,” the locality to which he alludes in his field-book being not far from the scene of Hargraves’ memorable discovery twenty-eight years later. The famous Polish explorer, Count Strzelecki, reported the existence of gold, in the form of auriferous pyrites, in the Vale of Clwydd, near Lithgow, in 1839, but Governor Gipps, to whom he had imparted his discovery, requested him to keep the matter secret, being fearful of the effect that such news might have on the discipline of the infant settlement. The Rev. W. B. Clarke, who, in 1841, discovered gold on the Cox River, and on the Wollondilly in 1842, expressed the belief that a large portion of the newly occupied country would prove auriferous. This opinion was shared by several eminent authorities in England, including Sir Roderick Murchison, and the validity of it was in the first instance amply demonstrated by Hargraves’ world-renowned discovery in 1851. Hargraves, who had gained his experience on the goldfields of California, found payable deposits of alluvial gold at Lewis Ponds and Summer Hill Creek, and on the Macquarie River. The news of these discoveries, amplified and distorted by all sorts of rumours, soon caused an enormous influx of people into Australia. The dates of other important finds were as follows:—Rich alluvial leads at Forbes in 1862, Rocky River, near Uralla, 1856, in beach sands at northern rivers, 1870, Gulgong 1871, Mount Drysdale 1892, Wyalong 1893.

(ii.) *Victoria.* The discovery of gold in the mother colony was quickly followed by discoveries on a larger and more important scale in the neighbouring colony of Victoria. According to the report of the Select Committee of the Legislative Council appointed to inquire into the claims of candidates for the rewards offered, the discoveries took place in the following sequence. The Hon. W. Campbell discovered the precious metal in March, 1850, at Clunes, but concealed the fact temporarily through fear lest the announcement should prove injurious to the squatter on whose run the discovery was made, and the gold-discovery committee was not notified until the 8th July, 1851. On the 5th July, 1851, notification was made of the discovery of gold in the Yarra Ranges by Mr. L. J. Nichel. Mr. James Esmond discovered gold in quartz at the Pyrenees Mountains, the notification being made on the 5th July, and soon after the numerous fields near Mount Alexander were opened up. The chief centres of the gold-mining industry at the present time are in the Bendigo, Ballarat, Beechworth, Castlemaine, Maryborough, Ararat, and Stawell districts. In November, 1906, a remarkable discovery of gold was made near Tarnagulla, where a miner who had prospected the district for years obtained seven ounces of gold from a shaft nineteen feet deep, and some fairly large nuggets being found soon after, the so-called Poseidon rush set in. Several of the nuggets were unearthed

1. Figures for these years were given in “A Statistical Account of Australia and New Zealand for 1903-4” as 206,095; 403,889; 1,153,973 respectively, but those refer presumably to the enumerations in the earlier part of the years mentioned.

within a few inches of the surface. The largest weighed 953 ounces and two others weighed 703 and 675 ounces respectively.

(iii.) *Queensland.* The news of the discoveries in the southern divisions of the continent fired the minds of the few remaining settlers in Queensland, which at this time was still a portion of New South Wales, with the hope that an El Dorado would be discovered in the north. It was not, however, until the year 1858 that payable gold was struck at Canoona by a party under the leadership of Mr. W. C. Capel. Almost immediately a rush set in from all parts of Australia and also from New Zealand—a rush that was attended with disastrous consequences to many that participated in it, for the alluvial deposits were soon worked out, and many of those who reached the diggings suffered great privations through lack of the ordinary necessities of life. In 1863 gold was found at Canal Creek and Gladstone, Crocodile Creek field was discovered in 1865, Ridgeland in 1867, followed shortly afterwards by Rosewood and Gympie, Townsville was opened up in the following year, and the Gilbert River fields in 1869. The Palmer goldfield dates from 1873, while the celebrated Mount Morgan was first worked in 1882, and Croydon in 1884.

(iv.) *South Australia.* It is believed that a German mineralogist named Menge was the first to find gold in South Australia, but the record lacks complete authenticity. In January, 1846, the Victorian Gold Mine, in the neighbourhood of Montacute, was opened by a company, but its career was short, and there is no record of its production. It is reported that the cost of producing a single ounce was as much as £10. The Echunga field was opened in 1852, but the production therefrom in the earlier years of its existence was quite insignificant. At the present time there are 120 ordinary and 40 gold-dredging leases in the State, but, compared with that of the other States, the total yield is small. In the Northern Territory gold was discovered in 1869 by Mr. Burton, of Goyder's survey party. Messrs. McLachlan and Masson, in 1870, found gold at a locality about thirty-five miles east of Pine Creek, and in the following year the same prospectors obtained five-and-a-quarter ounces near the terminus of the northern section of the trans-continental railway. In 1872 a prospecting party found rich auriferous reefs near Yam Creek, about 115 miles from Palmerston. The records of finds in the Northern Territory are in general, however, somewhat indefinite. In recent years the chief find has been at Tarcoola, in the north-western district, discovered in 1893 but developed to a slight extent only before 1900. A rich find was reported at Arltunga in 1902, but the field has since given only small returns.

(v.) *Western Australia.* The discovery of gold in Western Australia took place at a much later date than in the eastern States; nevertheless the present production far exceeds in value that of any other portion of the continent. It appears that the precious metal was first detected in 1848, in specimens sent for assay to Adelaide from the Murchison copper and lead deposits. In 1852-53 rich specimens of gold-bearing stone were found by shepherds and others in the eastern districts, but they were unable afterwards to locate the places where the stone was discovered. The late Hon. A. C. Gregory found traces of gold in quartz at the Bowes River in 1854. In 1861 Mr. Panton found gold near Northam, while shortly afterwards a shepherd brought in rich specimens of auriferous quartz which he had found to the eastward of Northam, but he failed to locate the spot again. Various small finds were made up to 1882, when Mr. A. McRae, riding from Cossack to Roeburne, picked up a nugget weighing fourteen ounces. In 1885 Messrs. Hall, Slaterry, and others found gold on the Elviro, Margaret, and Ord Rivers. The Kimberley goldfield was opened in May, 1886. Next year the precious metal was discovered at Yilgarn, and the field was proclaimed in 1888, in which year rich finds were also made at Mallina and Pilbara Creek, the Pilbara field being proclaimed in October. The Ashburton field was proclaimed in 1890, and the Murchison in 1891. From the cap of a reef on the Yalgoo field, proclaimed in 1890, gold to the value of £15,000 was obtained in a very short time by the simple process known as "dollying." In 1892 Bayley and Ford discovered the Coolgardie field, obtaining over 500 ozs. of gold in one afternoon by the aid of a tomahawk. Alluvial was discovered by Frost and party at Goongarrie

(the ninety-mile) in May, 1893. Kalgoorlie (Hannan's) was discovered in June of the same year by Messrs. Flannigan and Hannan, Bardoc in August by Messrs. Cashman and Lee, Siberia by Frost and Bonner in October. There were numerous rich discoveries in 1894, such as at "Mount Jackson," "the Pinnacles," "Billy Billy," and at the celebrated Kanowna diggings. Rich finds were also made at Bulong, Londonderry, and the Wealth of Nations, Mr. J. G. Dunn, the discoverer of the latter, obtaining £20,000 of gold in a few days. The "Norseman" was discovered in July by Mr. L. Sinclair, as also the "Lady Shenton" at Menzies. The "Niagara" was discovered in January, 1895, also the rich field known as the "Hands Across the Sea," at Kunanalling. "Blackboy Hill" field was proclaimed in 1897, "Donnybrook" in 1898, while there were further rich finds in 1899.

(vi.) *Tasmania*. The first discovery of the precious metal in the island State is reported to have been made by a Mr. Riva, of Launceston, who is stated to have traced gold in slate rocks in the vicinity of Nine Mile Springs in 1849. A valuable discovery was made in 1852 at the Nook, near Fingal, and further small finds were reported during the same year from Tower Hill Creek and the vicinity of Nine Mile Springs (Lefroy). During 1859 the first quartz mine started operations at Fingal. In the same year James Smith found gold at the River Forth, and Mr. Peter Leete at the Calder, a tributary of the Inglis. Reef gold was discovered in 1869 at Nine Mile Springs (Lefroy) by Mr. S. Richards. The first recorded returns from the Mangana goldfields date from 1870; Waterhouse, 1871; Hellyer, Denison, and Brandy Creek, 1872; Lisle, 1878; Gladstone and Cam, 1881; Minnow and River Forth, 1882; Branhholme and Mount Victoria, 1883; and Mount Lyell, 1886.

(vii.) *New Zealand*. Gold was discovered in New Zealand by Mr. C. Ring, of Coromandel, who obtained a small quantity in the creek which now bears his name. Further discoveries were, however, prevented by the hostility of the natives, and it was not until 1862 that the district was proclaimed a goldfield. A small find was made in the Middle Island during 1853 at a place called "The Fortifications," now known as the West Taieri goldfield. The first payable field was at Collingwood, in the Nelson district, opened in 1857, in which year the production was about 10,500 ozs. A find of the precious metal was reported from the Lindis River in 1861, but the yield from the locality was small. In June of the same year a rich discovery was made by a former Victorian digger named Gabriel, at the place named Gabriel's Gully, although in 1858 Mr. Edward Peters had found payable quantities on the Tokamariro River at the locality afterwards known as the Woolshed diggings. Early in 1862 further auriferous deposits were found at Waipori and the Woolshed, while in August of that year Messrs. Hartley and Reilly arrived at Dunedin with over 1000 ozs. of gold obtained from beach sands on the Clutha River, and this discovery was succeeded by other alluvial finds on the tributaries of that stream. The Teviot, Bengier, and Upper Manuherikia fields were opened up in March, 1863. In May a rich find was made at Hogburn, leading to further discoveries at Hill's Creek, Dunstan's Creek, Kyeburn, Hyde, Hamilton's, Macrae's, and Mount Buister. At the last-mentioned place, which is 4000 feet above the level of the sea, the deposits can be worked during only about half the year. The next discoveries were made at Cambrian's, Tinker's, Matakani, Round Hill, Orepuki, and in recent times at Mount Criffel. Rich finds were made at the end of 1863 at Wakamarina, in the Marlborough district. In 1864 deposits were found in the bed of the Greenstone River by Maoris, and at the present time the mining population in the locality is over 30,000. The rush to the West Coast was soon followed by discoveries of auriferous deposits at Waimeri, Kanieri, Blue Spur, and Ross, and these in turn were followed by finds at Grey Valley, No Town, Red Jack's Nobles, Orwell Creek, Antonio's, Maori Gully, Lyell, Charleston, Brighton, and Kumara.

2. Production of Gold at Various Periods.—In the table hereunder will be found the value of the gold raised each year in the several States and New Zealand 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 the remark applies to some extent also to the returns for Western Australia and Tasmania.

The results in the table have been corrected so far as the most recent information will permit, certain systematic errors having been discovered. This will account for any differences from previously published figures.

VALUE OF GOLD RAISED IN AUSTRALIA AND NEW ZEALAND.
1851-1906.

Year.	N.S.W.	Victoria.	Q'sland.	S.A.	W.A.	Tas.	C'wealth.	N.Z.	Aust'lia.
	£	£	£	£	£	£	£	£	£
1851 ...	468,336	851,596	...	...	...	...	1,319,932	...	1,319,932
1852 ...	2,660,946	9,146,140	...	...	...	...	11,807,086	...	11,807,086
1853 ...	1,781,172	10,976,392	...	...	...	...	12,757,564	...	12,757,564
1854 ...	773,209	8,873,932	...	...	...	...	9,647,141	...	9,647,141
1855 ...	654,594	11,277,152	...	...	...	...	11,931,746	...	11,931,746
1856 ...	689,174	12,214,976	...	8,800	...	...	12,912,950	...	12,912,950
1857 ...	674,477	11,320,852	...	876	...	...	11,996,205	40,422	12,036,627
1858 ...	1,104,175	10,384,924	...	2,348	...	...	11,491,447	52,464	11,543,911
1859 ...	1,259,127	9,394,812	...	730	...	...	10,654,669	28,427	10,683,096
1860 ...	1,465,373	8,896,276	11,631	...	...	...	10,373,280	17,585	10,390,865
1861 ...	1,806,171	8,140,692	3,137	...	...	...	9,950,000	751,873	10,701,873
1862 ...	2,467,780	6,920,804	499	12,442	...	...	9,401,525	1,591,389	10,992,914
1863 ...	1,796,170	6,779,276	11,820	...	...	...	8,587,266	2,431,723	11,018,989
1864 ...	1,304,926	6,489,788	66,513	...	...	...	7,861,227	1,856,837	9,718,064
1865 ...	1,231,243	6,446,216	74,216	...	...	...	7,751,675	2,226,474	9,978,149
1866 ...	1,116,404	6,187,792	68,325	...	...	...	7,372,521	2,844,517	10,217,038
1867 ...	1,053,578	6,005,784	151,125	...	...	4,382	7,214,869	2,698,862	9,913,731
1868 ...	994,665	6,739,672	473,956	2,936	...	2,536	8,213,765	2,504,326	10,718,091
1869 ...	974,149	6,179,024	417,631	15,593	...	514	7,586,961	2,362,995	9,949,956
1870 ...	931,016	5,217,216	390,925	24,217	...	7,475	6,570,849	2,157,585	8,728,434
1871 ...	1,250,485	5,475,768	492,635	6,000	...	14,218	7,239,106	2,787,520	10,026,626
1872 ...	1,644,177	5,325,508	527,365	6,363	...	16,055	7,519,468	1,731,261	9,250,729
1873 ...	1,396,375	4,681,588	572,396	293	...	18,390	6,669,642	1,987,425	8,657,067
1874 ...	1,041,614	4,390,572	1,082,899	4,175	...	18,491	6,537,751	1,505,331	8,043,082
1875 ...	877,694	4,273,668	1,196,583	7,034	...	11,982	6,366,961	1,407,770	7,775,731
1876 ...	613,190	3,855,040	1,140,282	9,888	...	44,923	5,663,323	1,284,328	6,947,651
1877 ...	471,448	3,238,612	1,043,780	...	...	23,289	4,777,129	1,456,080	6,233,209
1878 ...	430,200	3,032,160	1,149,240	1,225	...	100,000	4,712,825	1,240,079	5,952,904
1879 ...	407,219	3,035,788	1,034,216	90	...	230,895	4,708,208	1,148,108	5,856,316
1880 ...	444,253	3,316,484	944,869	...	...	201,297	4,906,903	1,227,252	6,134,155
1881 ...	573,582	3,333,512	957,570	112,825	...	116,901	5,194,390	1,080,790	6,275,180
1882 ...	526,522	3,458,440	785,868	85,354	...	187,337	5,043,521	1,002,720	6,046,241
1883 ...	453,530	3,121,012	736,810	87,729	...	176,442	4,580,523	993,352	5,573,875
1884 ...	396,059	3,114,472	1,062,471	93,404	...	160,404	4,826,810	921,797	5,748,607
1885 ...	378,665	2,940,872	1,062,514	88,709	...	155,309	4,626,069	948,615	5,574,684
1886 ...	366,294	2,660,784	1,187,189	95,674	1,148	117,250	4,428,339	903,569	5,331,908
1887 ...	394,579	2,471,004	1,481,990	140,777	18,517	158,533	4,665,400	811,100	5,476,500
1888 ...	317,241	2,500,104	1,690,477	69,007	13,273	147,154	4,737,256	801,066	5,538,322
1889 ...	434,784	2,459,352	2,695,629	84,956	58,871	119,703	5,853,235	808,549	6,661,844
1890 ...	460,285	2,354,240	2,182,563	101,577	86,664	75,888	5,261,217	773,438	6,034,655
1891 ...	559,231	2,305,596	2,030,312	126,081	115,182	145,459	5,281,861	1,007,488	6,289,349
1892 ...	575,299	2,617,824	2,164,391	135,755	226,284	158,917	5,878,470	954,744	6,833,214
1893 ...	651,286	2,684,504	2,167,794	120,691	421,385	141,326	6,186,986	913,138	7,100,124
1894 ...	1,156,717	2,867,816	2,330,282	143,100	787,069	217,024	7,502,038	887,839	8,389,877
1895 ...	1,315,929	2,963,344	2,150,561	128,876	879,748	206,115	7,641,573	1,162,164	8,803,737
1896 ...	1,073,360	3,220,348	2,132,979	95,560	1,068,808	237,574	7,828,629	1,041,428	8,870,057
1897 ...	1,104,315	3,251,064	2,552,668	120,230	2,564,977	296,660	9,889,914	980,204	10,870,118
1898 ...	1,201,743	3,349,028	2,750,348	95,465	3,990,698	291,496	11,678,778	1,080,691	12,759,469
1899 ...	1,623,320	3,418,000	2,838,446	79,147	6,246,732	327,545	14,533,190	1,513,173	16,046,363
1900 ...	1,070,920	3,229,628	2,871,578	82,482	6,007,610	316,220	13,578,438	1,439,602	15,018,040
1901 ...	737,164	3,102,753	2,541,764	93,222	7,235,653	295,176	14,005,732	1,753,783	15,759,515
1902 ...	684,970	3,062,028	2,720,512	95,203	7,947,662	301,573	14,811,948	1,951,433	16,763,381
1903 ...	1,080,029	3,259,482	2,839,801	90,250	8,770,719	254,043	16,294,684	2,037,831	18,332,515
1904 ...	1,146,109	3,252,045	2,714,934	80,008	8,424,226	280,015	15,897,337	1,987,501	17,884,838
1905 ...	1,165,013	3,173,744	2,517,295	76,824	8,305,654	312,380	15,550,910	2,093,936	17,644,846
1906 ...	1,078,866	3,280,478	2,313,464	81,225	7,622,749	254,963	14,631,745	2,270,904	16,902,649
Total £	54,314,152	276,516,978	64,334,903	2,707,141	70,793,659	6,246,214	474,913,047	69,501,488	544,414,535

Preliminary figures give the production for the year 1907 as £15,535,457, distributed as follows:—New South Wales, £1,050,731; Victoria, £2,981,855; Queensland, £1,943,749; South Australia, £50,421; Western Australia, £7,210,734; Tasmania, £271,855; total for Commonwealth, £13,509,345; New Zealand, £2,026,112.

3. **Changes in Relative Positions of States as Gold Producers.**—A glance at the figures in the preceding table 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 that State each year. Victoria maintained its position as the chief gold-producer for a period of forty-seven years, or up to 1898, when its production was first outstripped by that of Western Australia, the latter State from this year onward contributing practically half the entire yield of the Commonwealth. New South Wales occupied the second place on the list until 1876, when Queensland returns exceeded those of the parent State, a condition of things that has been maintained ever since. Up to the year 1884 Tasmania and South Australia in turn occupied the position of lowest contributor to the total gold yield of the Commonwealth, but from 1894 onwards the returns from the former State have been in excess of those of the latter. Taking the average of the last six years the relative positions of each State and of New Zealand in regard to the gold production of Australasia were as follows:—

RELATIVE POSITIONS OF STATES AS GOLD PRODUCERS, 1901 TO 1906.

State.	Annual Average of Gold Production, 1901 to 1906.	Percentage on Common- wealth.	State.	Annual Average of Gold Production, 1901 to 1906.	Percentage on Common- wealth.
Commonwealth ...	£	100.00	New Zealand ...	2,015,898	13.26*
Western Australia	8,051,110	52.97	New South Wales	982,025	6.46
Victoria ...	3,188,422	20.98	Tasmania ...	283,085	1.86
Queensland ...	2,607,962	17.16	South Australia	86,122	0.57

* Ratio to Commonwealth only; to the total of Australasia the percentage would be 11.71.

4. **Methods of Gold Mining Adopted in Each State.**—The circumstances of gold mining in the various States are not quite identical, for which reason reference is made to that of 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 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 Tibbooburra, and detrital gold has been found in Permo-carboniferous conglomerates at Tallawang. The method of dredging is at present being extensively used for winning gold from the beds of running streams, and also in 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 there are now dredges working on practically all the auriferous rivers of New South Wales. Hydraulic sluicing is also employed 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 25,931 ozs. in 1906, the chief yields being—Braidwood, 2350 ozs.; Adelong, 1126 ozs.; Batlow, 1200 ozs.; Tumbarumba, 1511 ozs.; Gulgong, 1445 ozs.; and Parkes, 1291 ozs. The quantity obtained by dredging was 36,648 ozs., the largest returns being obtained at Araluen, with 14,064 ozs.; Adelong, 7048 ozs.; Stuart Town, 6875 ozs.; Sofala, 3315 ozs.; and Wellington, 2086 ozs. At the present time the Cobar district is the chief centre of the production from quartz, the yields from the Canbelego and Cobar fields included therein being respectively 42,771 ozs. and 25,914 ozs. Next comes the Wyalong field, with 22,936 ozs.; Hillgrove, with 14,643 ozs.; and Wellington, 10,404 ozs.

The table below shews the yield from alluvial and quartz working in each of the principal districts during 1906:—

GOLD WON IN NEW SOUTH WALES, ALLUVIAL AND QUARTZ, 1906.

District.	Alluvial.		Quartz.	Total.
	Other than by Dredging.	By Dredging.		
	ozs.	ozs.	ozs.	ozs.
Bathurst	3,903	417	16,243	20,563
Cobar ... ..	...	...	68,771	68,771
Lachlan	3,475	...	41,823	45,298
Mudgee	3,952	2,086	18,301	24,339
Peel and Uralla	1,276	67	16,016	17,359
Southern	4,016	15,320	9,438	28,774
Tambaroora and Turon	3,436	10,190	992	14,618
Tumut and Adelong	4,839	8,568	1,592	14,999
Other Districts	1,034	...	4,855	5,889

(ii.) *Victoria.* Quartz-reefing predominates in Victoria, although a considerable amount of gold is obtained from alluvial workings, both surface and deep leads. The deepest mines in Australia are found in the Bendigo district, where two shafts are at present over 4000 feet down, while at least nine others descend to between 3000 and 4000 feet. A fair amount of attention is given to dredging and hydraulic sluicing, particularly in the Beechworth and Castlemaine districts. The yields from alluvial and quartz in the chief mining districts of the State during last year were as follows:—

GOLD WON IN VICTORIA, ALLUVIAL AND QUARTZ, 1906.

District.	Alluvial.	Quartz.	Total.
	ozs.	ozs.	ozs.
Ararat and Stawell	8,638	16,261	24,899
Ballarat	51,881	112,184	164,065
Beechworth	103,514	31,298	134,812
Bendigo	9,270	211,917	221,187
Castlemaine	32,990	66,396	99,386
Gippsland	8,778	88,402	97,180
Maryborough	38,595	41,672	80,267

(iii.) *Queensland.* Operations in Queensland are at present chiefly confined to quartz reefing, the yield from alluvial in 1906 being only about 1 per cent. of the total. The celebrated Mount Morgan mine occupies the position of being at the same time the most productive gold mine and the most productive copper mine in the State. The yields from the principal fields are given below.

GOLD WON IN QUEENSLAND, ALLUVIAL AND QUARTZ, 1906.

District.	Alluvial.	Quartz.	Total.
	ozs.	ozs.	ozs.
Charters Towers	402	205,230	205,632
Gympie	481	108,435	108,916
Mount Morgan	342	129,682	130,024
Ravenswood	658	35,369	36,027
Croydon	25	23,938	23,963
Clermont	6,657	535	7,192
Other districts	3,073	29,809	32,882

(iv.) *South Australia.* In South Australia alluvial gold has been worked for many years in the gullies round Adelaide, while a fair amount of gold has been obtained by

this method at Teetulpa, in the northern areas. There are some valuable reefing fields in the Echunga district, at Mt. Grainger, Barossa, Wadnaminga, Mannahill, etc., but they have not been developed to the extent they deserve. Good stone was discovered a few years ago at Tarcoola, but the present returns are comparatively small. The rich finds at Arltunga in the centre of the continent, within the boundaries of the Northern Territory, have not yielded up to expectations. The official returns shew that there were forty-one gold-dredging leases in existence last year. Satisfactory yields were obtained at Bullaparata, and operations are being extended at Jupiter Creek, Echunga, and Long Gully, in the same district. South Australia is not divided into mining districts as is the case in the other States.

(v.) *Western Australia.* In Western Australia the operations are confined principally to quartz reefing, the returns from ordinary alluvial and hydraulic sluicing being comparatively small. The total production of gold from all sources during last year was 1,736,295 ounces, of which only 0.8 per cent. was alluvial. The production from the more important mines was as follows:—

GOLD WON IN WESTERN AUSTRALIA, ALLUVIAL AND QUARTZ, 1906.

District.	Alluvial.	Dolled and Specimens.	Crushed.	Total.
	ozs.	ozs.	ozs.	ozs.
Peak Hill	226	358	1,424	2,008
East Murchison	486	663	94,622	95,771
Murchison	1,733	1,151	179,512	182,396
Mount Margaret	67	959	165,232	166,258
North Coolgardie	135	320	110,502	110,957
North-east Coolgardie	2,562	2,408	39,604	44,574
East Coolgardie	2,580	2,427	984,350	989,357
Coolgardie	89	1,261	62,680	64,030
Yilgarn	32	50	23,465	23,547
Dundas	85	271	20,079	20,435
Broad Arrow	4,329	192	16,989	21,510
Other districts	1,376	137	13,939	15,452

(vi.) *Tasmania.* The yield from Tasmania is also chiefly obtained from quartz reefing, although there is a little alluvial mining carried on in the Lyall district. The yields from the chief centres in 1906 are shewn hereunder:—

	Northern & Southern.	North-eastern.	Eastern.	North-western.	Western.	Total.
	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
Quartz	29,476½	429½	3,696½	—	25,000	58,602½
Alluvial	1,740	48½	—	1½	154	1,944½

The total production equalled 60,023 fine ounces, valued at £254,963.

(vii.) *New Zealand.* The yield of gold in New Zealand during 1906 was £2,270,904, of which quartz mining was responsible for £1,494,087, dredging £501,199, and alluvial £275,618. Of the total yield from quartz the Northern district returned £1,312,720, the West Coast £169,929, and the Southern £11,438. The principal quartz mines are situated in the Ohinemuri and Thames counties. On the Waihi and Karangahake the veins give every indication of permanency. The Waihi is the most productive gold mine in Australasia, and during 1906, from a total of 328,866 tons of quartz, gave a yield valued at £781,553. The company paid in dividends during 1906 the sum of £347,135. In the Thames district the Waiotahi produced 18,002 tons of ore during the year, averaging £12 8s. 6d. per ton, and declared a dividend of £183,000. The Progress mines were the

chief producers in the South Island during 1906, their output of bullion being £91,200. The Keep-it-Dark Company, in the Seine district, has been in existence thirty-three years and still pays handsomely. During the whole period the amount of capital called up was only £6208, or six shillings and twopence per share, against a profit of £7 14s. 8d. per share. New Zealand may be considered as the pioneer of dredge-mining in Australia, although the supply from this source is annually falling off owing to depletion of suitable areas. In the West Coast and Southern districts 167 dredges were at work in 1906, producing, as previously stated, £501,199 worth of gold. The production from alluvial was £275,618, the greater portion being obtained in the Otago and Southland districts. Hydraulic sluicing, or sluicing and elevating, are the methods employed in working the deposits.

5. Remarkable Masses of Gold.—The first "nugget" found in Australia was obtained at Hargraves, in New South Wales, on the 13th May, 1851, and weighed a little over 1 lb. In the same year the Burrandong nugget, found near Orange, weighed 2217 ozs. 16 dwts., and the "Brennan" was sold in Sydney for £1156. During the period 1880-82 nuggets weighing from 59 ozs. to 1393 ozs. were found at Temora. The "Jubilee," which weighed 347 ozs., was found in 1887.

In Victoria a nugget found at Canadian Gully in 1853 weighed 1620 ozs.; the "Welcome," found at Ballarat in 1858, weighed 2217 ozs.; and the "Welcome Stranger," unearthed in 1869 at Mount Moliagul, near Dunolly, weighed 2280 ozs.

In addition to these alluvial nuggets large masses of gold have been found *in situ* in reefs. A mass known as "Kerr's Hundredweight," discovered in 1851 at Hargraves, in New South Wales, yielded 106 lbs. of gold. Probably the largest mass of gold ever found was obtained in Beyer's and Holtermann's claim at Hill End in 1872. The total weight of the specimen, including the small amount of quartz in which it was encased, was 630 lbs. Its dimensions were 4 ft. 9 in. high, 2 ft. 2 in. wide, and about four inches thick, while the value was set down at £13,000.

6. Modes of Occurrence of Gold in Australia.—(i.) *New South Wales.* The principal gold deposits worked with profit in New South Wales are classified by the Government Geologist of that State as follows:—1. Alluvial or detrital gold. 2. Auriferous reefs or lodes. 3. Impregnations in stratified deposits, such as slate, quartzite, and volcanic tuff. 4. Impregnations in igneous rocks, such as granite, serpentine, felsite, etc. 5. Irregular deposits, such as bunches of auriferous ironstone. The detrital gold is found chiefly in Recent and Pleistocene alluvials, in beach sands along the coast, in Tertiary alluvial leads, in Cretaceous alluvial leads, and in Permo-carboniferous conglomerates. In the beach sands the gold is found in association with platinum and tin. In reefs the gangue is principally composed of quartz; calcite is often present, and barytes and fluor-spar are also met with. At Hill End gold was found associated with muscovite. In the oxidised portions of auriferous reefs, limonite, malachite, azurite, and cuprite are found, while below the water-line the veins are impregnated with iron pyrites, galena, copper pyrites, zinc blende, pyrrhotine, and stibnite. The auriferous quartz veins fall into three categories—fissure veins, bedded veins, and contact veins. Large masses of gold have occasionally been found in lodes, such as "Kerr's Hundredweight," alluded to in a preceding paragraph. The so-called saddle reefs in the Hargraves district are identical with those worked so profitably and at such great depths round Bendigo, in Victoria. Altogether gold has been found in association with over forty minerals in New South Wales, one of the most peculiar products being known as "mustard" gold, resultant on the decomposition of tellurides. The substance has the appearance of dull yellow clay, but it readily burnishes when pressed with a knife blade. Native gold has never been found in an absolutely pure state in New South Wales, being always alloyed with silver and also traces of other metals.

(ii.) *Victoria.* In Victoria the occurrence of gold is noted under two main headings—1. Matrix gold. 2. Redistributed gold. The so-called matrix gold occurs in quartz reefs of various kinds, in Ordovician, Silurian, and Lower Devonian Sedimentary, metamorphic, and granitoid and porphyritic rocks; in reefs, veins, and lenticular deposits in

dykes of granitoid, porphyritic, dioritic, and felspathic rocks, or between dykes and walls of intruded rocks; or in fracture planes or joints in granitoid rocks. Under the above conditions the gold is either free or in combination with iron, arsenic and iron, copper and iron, zinc, lead, antimony, silver, etc.

The redistributed gold is found in sands and gravels of existing streams, in deep leads, in littoral gravels and sands, and in cleavage and joint planes of rocks underlying the deep leads.

(iii.) *Queensland.* The most remarkable mode of occurrence in Queensland is that at the Mount Morgan mine, which presents so many novel features as to demand special reference. At this mine the siliceous material forming the ore body was found enclosed in igneous rock, which continued to the surface, except for a funnel-shaped mass of sandy beds and secondary ore outcropping near the summit of the mount. In a crevice of these sandy beds was deposited a plug of desert sandstone nearly 100 feet deep at its thickest part, with a surface area of three-fifths of an acre, quite distinct from and unconformable to, the beds of loose sand which underlay and surrounded it, and more ferruginous towards the outside than in the centre of its area. A ferruginous belt extended outside the plug, attaining a depth of 150 feet from the surface. It was hard and extremely rich in gold, which was disseminated through the stone in microscopic particles. Beneath the iron-stone there was a band of loose sand or soft bed, in some places many feet in thickness, also extremely rich in gold. Underlying and almost surrounding the secondary ores, a great mass of siliceous and kaolin ore was found, denuded of its gold, which is supposed to have been leached out and conveyed in solution and again deposited in the enriched zone. The impoverishment prevails between the depths of 180 and 300 feet, the friable silica being cellular from the removal of the pyrites. The evidences of the oxidisation and leaching action are greater towards the centre than along the walls of the mass. Below the skeleton ore an unaltered zone of copper sulphide ore was found, in which gold was irregularly distributed, the copper increasing with the depth. Outside both sulphide and skeleton ore are walls of crystalline igneous rocks. Dykes, later than the massive igneous rocks but older than the enriched zone, traverse the siliceous sulphides in various directions.

(iv.) *Western Australia.* The Government Geologist of Western Australia classifies the conditions under which gold is found in that State as follows:—(a) Native metals.

(b) Compounds with tellurium and other elements. (c) Associated with other minerals.

Native gold occurs in several different forms, to which popular names descriptive of their appearance have been given, such as crystalline, dendritic, rough, flake, mustard, and sponge gold. Tellurides of gold abound at Kalgoorlie and Mulgabbie. Calaverite is the most frequently occurring mineral, but petzite, goldschmidtite, and the minerals termed Kalgoorlite and Coolgardite are also found. Of the metallic minerals, iron in the form of iron pyrites and oxides is widely distributed. Galena comes next, whilst amongst other minerals found in association with the precious metal may be mentioned zinc blende, arsenopyrite, vanadinite, bismuth, pyrrhotite, chalcopyrite, bournonite, copper, scheelite. Quartz is of course the commonest of the earthy secondary minerals, but calcite, chalcodony, gypsum, actinolite, chlorite, and others are also found in association with gold. Some of the native gold is found to be remarkably pure, specimens of sponge gold from lodes at Boulder, Kalgoorlie, and East Coolgardie being found to contain 99.91 per cent. of the precious metal with but 0.09 per cent. of silver.

7. Place of Commonwealth in the World's Gold Production.—In the table on the next page will be found the estimated value of the world's gold production, and the share of the Commonwealth therein during the last six years.

The share of the Commonwealth in the world's gold production is considerably less than it was six years ago. As the table shews, the world's total has advanced annually at the rate of between five and six million pounds sterling, the bulk of the increase being contributed by the South African mines, the production from the Transvaal being nearly £25,000,000 in 1906 as against £7,000,000 in 1902.

WORLD'S GOLD PRODUCTION. 1901-6.

Year.	World's production of gold.*	Gold produced in Australia.	Percentage of Australian on Total.*
	£	£	%
1901	52,738,000	14,006,000	26.56
1902	60,196,000	14,812,000	24.61
1903	66,933,000	16,295,000	24.35
1904	71,230,000	15,897,000	22.32
1905	77,267,000	15,551,000	20.13
1906	83,090,000	14,632,000	17.61

* These figures are subject to small corrections.

The number of persons engaged in gold mining in each State and New Zealand during the last six years is shewn in the following table:—

PERSONS EMPLOYED IN GOLD MINING, 1901 TO 1906.

State.	Persons Employed in Gold Mining.					
	1901.	1902.	1903	1904.	1905.	1906.
	No.	No.	No.	No.	No.	No.
New South Wales ...	12,064	10,610	11,247	10,648	10,309	8,816
Victoria ...	27,777	26,151	25,208	24,331	25,369	25,304
Queensland ...	9,438	9,045	9,229	9,620	10,641	9,842
South Australia ...	1,000	1,000	1,000	1,000	900	900
Western Australia ...	19,771	20,476	20,716	18,804	18,382	17,926
Tasmania ...	1,112	1,038	973	1,076	1,207	988
Commonwealth ...	71,162	68,320	68,373	65,479	66,808	63,776
New Zealand ...	12,732	11,398	10,210	10,898	9,362	9,039

§ 3. Platinum and the Platinoid Metals.

1. **Platinum.**—The existence of platinum was first noted in New South Wales in 1851 by Mr. S. Stutchbury, who found a small quantity near Orange. Since the year 1878, small quantities of the metal have been obtained from beach sands in the northern coastal district. Platiniferous ore was noted in 1889 at Broken Hill. The chief deposits at present worked in the State are situated at Fifield, near Parkes, but the entire production last year was small, amounting to only 205 ozs., valued at £623.

In Victoria the metal has been found in association with copper at the Walhalla Copper Mine in Gippsland, but the mine is not at present being worked. The metal has also been found in small quantities in black sand beaches in the Otago district of New Zealand, and is present in the alluvial wash at Takaka, Nelson. Up to the present, however, the production has been trifling.

2. **Osmium, Iridium, etc.**—Small quantities of osmium, iridium, and rhodium, are also found in various localities. As far back as 1860, the Rev. W. B. Clarke states that he found native iridium. 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.

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

§ 4. Silver.

1. Discovery in Each State.—The famous Polish explorer, Count Strzelecki, was the first to note the occurrence of silver in New South Wales. In a letter addressed to Captain King, R.N., bearing date 26th October, 1839, he speaks of a "specimen of native silver in hornblende rock." In his work, "The Southern Goldfields," published in 1860, the Rev. W. B. Clarke also mentions a discovery of the metal. Since that date silver has been found in a large number of localities throughout the entire State. The Broken Hill field, discovered in 1882 by Mr. Charles Rasp, constitutes one of the richest and most productive mines in the world. In illustration of the value of the mine it may be stated that one of the original fourteenth shares, bought for £110, increased in value within a year to £30,000, while six years later, with dividends and bonuses added, it was reputed to be worth £1,250,000 sterling. Further reference to the production from the Broken Hill district will be made on a subsequent page. Amongst other important finds in New South Wales may be mentioned Boorook, near Tenterfield, discovered in 1878; Sunny Corner, opened in 1886; Emmaville, 1884; Rivertree, on the Clarence River, 1887; Borah Creek, near Inverell, 1870; Rockvale, 1895.

Mining for silver is not carried on to any extent in Victoria, the production recorded in the mining returns being chiefly obtained in the process of refining gold, and the same applies in the case of the production from Western Australia. Tasmania is the only other State in the Commonwealth which produces any considerable quantity of silver. The famous Zeehan mine, on the west coast, was discovered in 1885, and the deposits at Heazlewood River in 1887. Both districts are still opening up rich deposits of ore. In New Zealand, and particularly in the North Island, the gold generally contains a large proportion of silver, but the rich deposits of argentiferous ores at Puhupuhi, Collingwood, Mount Rangitoto, and other places have not yet been systematically exploited.

2. Development of Silver Mining.—In illustration of the great development of silver mining in Australia the following table has been compiled, shewing the production of silver, silver lead and ore, and lead from each State during the years 1881, 1891, and 1901 to 1906:—

PRODUCTION OF SILVER AND LEAD, AUSTRALASIA, 1881 TO 1906.

State.	Silver, Silver Lead Ore, Lead, etc., raised during							
	1881.	1891.	1901.	1902.	1903.	1904.	1905.	1906.
	£	£	£	£	£	£	£	£
New South Wales ...	...	3,621,614	1,954,964	1,487,837	1,539,989	2,131,504	2,496,709	2,564,057
Victoria ...	5,239	6,017	6,550	4,900	4,898	4,990	4,100	4,980
Queensland ...	13,494	21,879	69,234	72,851	109,177	96,418	102,388	151,577
South Australia ...	1,182	5,927	3,886	42,063	10,870	1,387	3,244	12,982
Western Australia	11,224	250	7,718	9,467	19,153	45,912	44,278	37,612
Tasmania ...	...	62,138	325,335	387,024	425,125	318,971	415,248	552,704
Commonwealth ...	...	3,717,525	2,367,687	2,004,142	2,112,212	2,599,182	3,065,967	3,623,912
New Zealand ...	4,236	5,151	65,258	71,975	91,497	112,875	120,542	143,573

3. Chief Centres of Silver Production.—Broken Hill, in New South Wales, and Zeehan, in Tasmania, are the great centres of silver production in Australasia.

(i.) *Broken Hill.* The bulk of the production is, of course, from New South Wales, being contributed mainly by the mines in the celebrated Broken Hill district. The

wonderful productiveness of this area is well illustrated by the following table, compiled by the Department of Mines in New South Wales. The particulars refer to the chief mines on the field:—

RETURNS OF BROKEN HILL SILVER MINES, 1906.

Mine.	Authorised Capital.	Value of Output to End of 1906.	Dividends and Bonuses Paid to End of 1906.
	£	£	£
Broken Hill Proprietary Co. Ltd. ...	384,000	29,174,287	9,152,000
Broken Hill Proprietary Block 14 Co. ...	155,000	2,874,988	357,827
British Broken Hill Proprietary Co. ...	264,000	1,767,698	270,000
Broken Hill Proprietary Block 10 Co. ...	1,000,000	2,979,923	1,050,000
Sulphide Corporation Ltd. (Central Mine) ...	1,100,000	6,103,908	446,875
Broken Hill South Silver Mining Co. ...	200,000	2,377,000	425,000
North Broken Hill Mining Co. ...	140,000	392,708	95,440
Broken Hill Junction Mining Co. ...	100,000	706,646	85,000
Broken Hill Junction North Silver Mining Co. ...	180,000	244,273	25,793
Broken Hill South Blocks Ltd. ...	200,000	26,929	...
New Australian Broken Hill Consols Ltd. ...	600,000	150,240	50,000
Totals ...	4,323,000	46,798,600	11,957,935

The marvellous wealth of this field may well be seen by comparing the production therefrom with the total mineral production of the Commonwealth, viz., £660,000,000, the Broken Hill district contributing, therefore, about 7 per cent. of the entire mineral yield of Australia.

At Broken Hill a considerable quantity of high grade ore has been found at or near the surface, while shafts and drives have been put in along the lode to intersect ore bodies at greater depths. The deepest shaft on the field is on Block 10, where a depth of 1400 ft. has been reached, while shafts at the Proprietary and Junction North have been put down to a depth of 1300 and 1200 ft. respectively. Broken Hill itself consists of a low range about two miles in length, composed of crystalline gneisses passing into banded quartzites, micaceous and hornblendic schists, and garnetiferous sandstones. The rocks are bent into an anticlinal fold, the axis being coincident with the crown of the range, and the strata dipping away on each side almost parallel to the surface of the slope. The lode occupies the saddle-shaped cavity formed by the contortion of the strata, and its outcrop is coincident with the highest part of the range for about a mile and a half in length. Practically the whole of this outcrop has been removed in an open cut varying in width from 20 to 100 ft. The outcrop was composed of massive manganiferous limonite associated with siliceous and aluminous material, and containing numerous vugs bearing cerussite, chloride, iodide, and bromide of silver and stalactites of psilomelane. The iron ore contained from 2 to 30 ozs. of silver to the ton and from 10 to 25 per cent. of lead, and was extremely useful in fluxing the siliceous ores beneath it. Underneath the ironstone were found (1) deposits of carbonate of lead and a gangue composed of siliceous and aluminous material containing manganiferous iron oxide; (2) other high-grade ores containing kaolin, garnets, quartz with native silver, and also chlorides, chloro-bromides, and iodides, and yielding 4 to 300 ozs. of silver to the ton and a small quantity of lead; (3) a dry low-grade ore yielding from 5 to 40 ozs. to the ton. Below these so-called oxidised ores the lode consisted of rich sulphides containing galena, zinc blende, quartz, garnet, rhodonite, feldspar, iron and copper pyrites, and small quantities of mispickel, wulfenite, and fluor spar. The sulphide ore contains from 6 to 36 ozs. of silver and 2 to 3 dwts. of gold to the ton, from 5 to 50 per cent. of lead, and 14 to 30 per cent. of zinc.

(ii.) *Zeehan.* During the past year the principal silver-producing centres of Tasmania shewed marked increases in production. Large quantities of high-grade galena were raised from the Mt. Zeehan mines. The Zeehan Western shaft is now down to

800 ft., and a similar depth has been reached at the Zeehan Montana. At Mount Read developmental work has been carried on, the zinc-lead sulphide ore body carrying ore worth £5 or £6 a ton gross. Rich galena is being raised in the Farrell district, the product of the North Farrell Mining Company being worth £11 and £12 per ton at the mill. During 1906 the Magnet mine raised 7787 tons of ore valued at £51,147. The ore-shoot in this mine has been proved to exceed 1300 ft. in length, and it is improving in solidity as it descends. In the Heazlewood district work at the Long Tunnel Silver-Lead mine is being resumed, and other properties are being obtained both for copper and lead.

The effect of the improved treatment of refractory ores is seen particularly in the returns for the Broken Hill district of New South Wales, where the export of zinc spelter and concentrates has increased from 97 tons valued at £988 in 1889, to 3666 tons valued at £292,806 in 1906. In addition to the numerous plants for dealing with refractory ores on the fields itself, the Broken Hill Company possesses extensive smelting works at Port Pirie in South Australia. At Dapto and Cockle Creek in New South Wales there are also smelting establishments capable of dealing with considerable bodies of ore of various classes. The Tasmanian silver and lead ores are principally dealt with by the Tasmanian Smelting Company's works at Zeehan.

4. World's Production of Silver.—The world's production of silver during the last six years is estimated to have been as follows:—

WORLD'S PRODUCTION OF SILVER, 1901 TO 1906.

Year ...	1901.	1902.	1903.	1904.	1905.	1906.
World's Production* in 1000 fine ozs.	174,851	163,987	173,222	176,840	181,338	185,035

* Add 000 to figures for fine ounces.

The Commonwealth's share in the world's silver production averages about 13 per cent.

5. Prices of Silver.—As the production of silver is dependent to a very large extent on the price realised, a statement of the average price per standard ounce paid by the London Mint at various periods and during the last six years is given below.

PRICES OF SILVER, 1871 TO 1906.

Year ...	1871.	1881.	1891.	1901.	1902.	1903.	1904.	1905.	1906.
Pence per Standard oz.	60 $\frac{7}{8}$	51 $\frac{1}{2}$	45 $\frac{5}{8}$	27 $\frac{1}{2}$	24 $\frac{5}{8}$	23 $\frac{1}{2}$	26 $\frac{1}{2}$	27 $\frac{7}{8}$	31 $\frac{1}{2}$

During the month of November, 1906, owing to the small sales in New York, and also to the fact that the Indian, American, and Mexican Governments were all buying silver, the price rose to 33 $\frac{1}{2}$ d., the highest realised since 1893, when the average stood at 36 $\frac{5}{8}$ d.

6. Employment in Silver Mining.—The number of persons employed in silver mining during each year of the period 1901-6 is given below:—

PERSONS EMPLOYED IN SILVER MINING, 1901 TO 1906.

State.	1901.	1902.	1903.	1904.	1905.	1906.
New South Wales ...	6,298	5,382	6,035	7,071	7,887	9,414
Victoria... ..	...	...	...	...	...	13
Queensland ...	40	100	458	45	293	282
South Australia ...	150	150	150	50	50	50
Western Australia ...	...	...	...	...	...	...
Tasmania ...	2,414	2,893	1,681	1,101	1,512	1,745
Commonwealth ...	8,902	8,525	8,324	8,267	9,742	11,504

As the table shews, the bulk of the employment was in New South Wales and Tasmania, the quantity of silver raised in the other States, excepting Queensland, being unimportant.

§ 5. Copper.

1. **History.**—(i.) *New South Wales.* It is believed that copper was the first metal mined for in New South Wales, the earliest attempts at working taking place about the year 1844. The deposits at Copper Hill, near Molong, were worked in 1845, as well as those in the neighbourhood of Canowindra. In 1847 mining for copper was commenced at the Summerhill Estate, near Rockley. The Rev. W. B. Clarke reported the discovery of copper ores near Marulan in 1851, and at Quidong, in the Snowy River district, in 1852. The principal seat of the copper-mining industry at the present date is in the Cobar district, the value of the deposits there being first recognised in 1869. The Mount Hope field was opened in 1878, Nymagee 1880, and Lake George in 1882.

(ii.) *Victoria.* In Victoria copper has been found at Bethanga, Sandy Creek, near Bogong, Walhalla on the Thomson River, and on the Snowy River and at Mount Lara near Buchan, but there are no mines at present being worked for their copper contents.

(iii.) *Queensland.* The first important discovery of copper in Queensland was made in the year 1862, when a rich lode was found near Clermont, on the Peak Downs. A further discovery was made during the same year at Mount Perry. Copper, tin, silver, and gold were found on the Herberton, Walsh, and Tinaroo mineral fields in 1879. The famous Mount Morgan, discovered in 1882, also produces a considerable amount of copper, the production therefrom in 1906 exceeding that from any other district.

(iv.) *South Australia.* In South Australia the first rich copper lode was discovered at Kapunda in 1842, and about 2000 tons of metal were produced each year up to the year 1879 when the mine closed down. At the present time the deposits are being worked on the tribute system, but arrangements are in progress which are expected to result in the mine being fully worked again. The Burra Burra mine was discovered in 1845 by a shepherd named Pickett, and it proved a veritable cornucopia for the fortunate investors in its original stock. The capital consisted of £12,320 in £5 shares and no subsequent call was made on the shareholders, while the dividends paid amounted to £800,000. During the twenty-nine and a half years in which the mine was working the copper produced reached a value of £4,749,224. Operations were discontinued at this mine in 1877, but recent prospecting between surface and water-level has disclosed the existence of considerable bodies of low-grade ores. Yorke's Peninsula, between Spencer's Gulf and Gulf of St. Vincent, contains a very large area of copper bearing country, the principal fields being at Wallaroo and Moonta. The Wallaroo mine was discovered in 1860, and during the first twenty-six years of its existence produced over £2,000,000 worth of copper. The Moonta mine, discovered in 1861, has proved to be one of the richest mines in the State. Its production during the first twenty-six years of its working was no less than £4,580,000. Some years ago the Wallaroo and Moonta mines amalgamated. The production from the united fields for the year ended June 1906, was valued at £275,390. The Blinman mine in the Flinders Range was discovered in 1861, and by the year 1874 had produced copper to the value of £250,000. This mine is at present held by the Tasmanian Copper Company Limited. Its production last year reached a value of £74,000.

(v.) *Western Australia.* The inception of active mining operations in Western Australia dates from the year 1842, when lead and copper mines were discovered in the Northampton district, but working was carried on in a most perfunctory manner in the early days, sinking being discontinued as soon as the lodes shewed signs of contraction. Rich ores of copper have been located at Whim Creek, in the Pilbara district, about fifty miles eastward of Roeburne, the copper ore being removed by quarrying. Promising lodes have also been struck at the Irwin mines, between Arrino Springs and the Irwin River. The Kimberley district is intersected in places by copper and lead deposits in association with gold, and a rich lode has been located at Mount Barren, about 120 miles to the eastward of Albany, while various quartz reefs in the Wongan Hills contain copper in association with gold and iron.

(vi.) *Tasmania.* Tasmania at the present time occupies the position of the largest producer of copper in Australia, the bulk of its production coming from the celebrated Mount Lyell mines, discovered in 1886. The copper-bearing country in this district stretches from Mount Lyell, Mount Tyndall, Mount Read, and Mount Murchison, to some distance north of the Pieman River. Copper mining has also been started on the North-west Coast, notably in the Stowport and Blythe River districts, and some attention has been given to the deposits at Rocky Cape and Boat Harbour.

(vii.) *New Zealand.* Copper ore has been found and worked in different localities in New Zealand, but in a desultory fashion only, the production to the end of 1906 being 1421 tons, valued at £18,228.

2. **Production of Copper.**—The production of copper during the years 1901 to 1906 in the various States of the Commonwealth has been influenced considerably by the ruling prices, which have fluctuated in an extraordinary way. The value of the production in earlier years and for 1901-1906 is shown in the following tables :—

VALUE OF PRODUCTION OF COPPER, AUSTRALASIA, 1881 TO 1906.

State.	1881.	1891.	1901.	1902.	1903.	1904.	1905.	1906.
	£	£	£	£	£	£	£	£
New South Wales ...	267,884	119,195	412,292	307,806	462,640	406,001	527,403	789,527
Victoria ...	8,186	216	...	...	500	...	...	...
Queensland ...	19,637	865	194,227	189,200	285,122	257,896	503,547	916,546
South Australia ...	418,296	239,436	500,077	432,525	472,093	438,960	483,431	743,671
Western Australia ...	...	4,463	75,246	8,090	56,541	25,180	16,266	50,337
Tasmania ...	...	...	1,026,748	710,146	511,801	569,053	563,275	844,663
Commonwealth ...	714,003	364,175	2,208,590	1,647,767	1,788,697	1,697,090	2,093,923	3,344,744
New Zealand ...	86	4	105	...	123	...	17	...

3. **Price of Copper.**—The great variation in price that the metal has undergone is shewn in the following table of prices realised for standard and best selected copper since 1896 :—

FLUCTUATION IN THE VALUE OF COPPER, 1896 TO 1907.

Year.	Average Price of Copper per Ton.		Year.	Average Price of Copper per Ton.	
	Standard.	Best Selected.		Standard.	Best Selected.
	£ s. d.	£ s. d.		£ s. d.	£ s. d.
1896 ...	46 18 2	50 13 5	1903 ...	58 3 2	62 13 8
1897 ...	49 2 6	52 5 6	1904 ...	59 0 7	62 13 0
1898 ...	51 16 7	55 8 3	1905—Jan. to June	67 2 1	71 3 9
1899 ...	73 13 9	78 2 3	July to Dec.	72 1 11	77 7 11
1900 ...	73 2 5	78 9 1	1906—Jan. to June	82 2 8	86 18 11
1901 ...	66 19 1	73 8 2	July to Dec.	92 15 1	97 11 1
1902 ...	52 8 3	56 12 7	1907—Jan. to June	103 4 4	111 8 4

4. **Relationship to World's Production.**—The world's production of copper during the last six years is estimated to have been as follows :—

WORLD'S PRODUCTION OF COPPER, 1901 TO 1906.

Year ...	1901.	1902.	1903.	1904.	1905.	1906.
World's Production (in tons) ...	516,628	541,295	574,775	644,000	682,125	711,675

Of the total production last year the share of the Commonwealth amounted to about 5 per cent.

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

PERSONS ENGAGED IN COPPER MINING, 1901 TO 1906.

State.	Persons Engaged in Copper Mining.					
	1901.	1902.	1903.	1904.	1905.	1906.
New South Wales ...	2,964	1,699	1,816	1,850	2,171	3,047
Victoria	4	...	...	...	...	3
Queensland ...	814	666	1,418	1,094	1,435	2,598
South Australia ...	4,000	4,000	4,000	4,000	4,500	5,000
Western Australia ...	321	113	193	169	125	296
Tasmania ...	*	*	*	925	2,269	2,391
Commonwealth ...	8,103	6,478	7,427	8,038	10,500	13,335

* Included with silver miners.

§ 6. Tin.

1. **History.**—(i.) *New South Wales.* The probable occurrence of tin in New South Wales was first referred to by the Rev. W. B. Clarke as early as 1849, while the same author notes having obtained a specimen in the Kosciusko district in 1851 and in the New England district in 1853. He also reported the discovery of stanniferous deposits at different localities in the Darling Downs, Queensland. In 1872 the Messrs. Fearby discovered tinstone near Inverell, and the present Elsmore mine was opened near the spot. The news of the discovery of tin in the New England district attracted a mild rush, and in March, 1872, valuable deposits of stream tin were found at Vegetable Creek. It is interesting to note that native tin, which is extremely rare, was discovered at Oban, in this district. At Cope's Creek stanniferous gravels occur in the channel of the stream and in the slopes adjacent to it. Post-tertiary deposits of tin-bearing ore have been found at Emmaville, where mining was commenced soon after the opening of the district. In the southern portion of the State deposits have been discovered at Dora Dora, near Albury, and Pulletop, near Wagga, in the central-western district at Burra Burra, near Parkes, and in the far west at Poolamacca and Euriowie. The bulk of the yield, however, still comes from the Tingha-Inverell district, the production last year being £170,000 out of a total for the whole State of £256,000.

(ii.) *Victoria.* In Victoria lode tin has been discovered at Mt. Wills, Beechworth, Eldorado, Chiltern, Stanley, and other places in the north-eastern district; and stream tin has been found in a large number of places, including those just mentioned in the north-eastern district. The bulk of the production last year was obtained by dredging and hydraulic sluicing, the chief yields being 39 tons of ore, valued at £4395, raised by the Cock's Pioneer Dredging Company at Beechworth, and 23½ tons, valued at £2597, raised by the Franklin River Hydraulic Sluicing Company at Toora.

(iii.) *Queensland.* The first notable discovery of the metal in Queensland occurred in 1872, when rich deposits of stream tin were found in the country to the south of Warwick and on the borders of New South Wales. This district proved to be surprisingly rich, the value of the metal raised there during the five years subsequent to its discovery being £715,000. The alluvial deposits, however, soon became exhausted, and the district at present contributes only a very small proportion of the total production. In 1879 important discoveries were made in the Herbert River district, and the rich Herberton, Walsh, and Tinaroo mineral fields were opened up, further discoveries being shortly after

reported on the Russell, Mulgrave, Jordan, and Johnstone. The production in 1906 amounted to 4283 tons, valued at £490,283, more than three-fourths of which were produced by the Walsh and Tinaroo mineral field.

(iii.) *Northern Territory.* Valuable lodes of tin are found in the Northern Territory at West Arm and Bynoe Harbour, and at Horseshoe Creek, south of Pine Creek, but the deposits have not yet been exploited to the extent they deserve.

(iv.) *Western Australia.* Tin was first discovered in Western Australia in the year 1888, and since that date has been found in several widely distant localities in the State—at the head of the Bow and Lennard Rivers, in the Kimberley district; on the Thomas River, Gascoyne goldfield; at Brockman's Soak and the Western Shaw, in the Pilbara district; and at Greenbushes, in the south-western portion of the State. The production of tin for the State during 1906 amounted to 1495 tons, valued at £157,644, to which the Greenbushes field contributed 783 tons, valued at £79,195, and Pilbara 712 tons, valued at £78,449. Lode tin has been discovered at Wodgina, in the Pilbara field, and the deposits are being developed.

(v.) *Tasmania.* Tin mining in Tasmania dates from the year 1871, when the celebrated Mount Bischoff mine was discovered by Mr. James Smith. This mine, which is probably the richest in existence, is worked as an open quarry, and a large proportion of the original hill has been removed in the course of developmental operations. Soon after rich deposits were located in the north-east district by Mr. G. B. Bell, while deposits of stream tin were discovered near St. Helens by Messrs. Wintle and Hunt. Further finds were reported from Flinders and Cape Barren Islands, and in 1875 the metal was discovered at Mount Heemskirk. The total production of Tasmania in 1906 was 4472 tons of ore, valued at £557,266, the largest producer being the Briseis Tin Mines Limited, in the North-East Division, with a return of 1117 tons. The Mount Bischoff mine paid dividends amounting to £63,000, making a total to the end of 1906 of £2,088,000. Operations are being pushed forward at the North-East Dundas and at Mount Heemskirk. At Cox's Bight a fair quantity of alluvial is being obtained.

(vi.) *New Zealand.* In New Zealand tin ore has been found widely distributed among the gravel drifts in the neighbourhood of the Remarkables, in Stewart Island, but the deposits have up to the present not proved sufficiently rich to pay for working.

2. Value of Tin Produced.—The development of tin mining is, of course, largely dependent on the price realised for the metal, and, as in the case of copper, the production has been subjected to somewhat violent fluctuations. The table below shews the production in each of the Commonwealth States during the years 1881, 1891, and 1901 to 1906. There is no record of production in New Zealand:—

TIN PRODUCED IN AUSTRALIA, 1881 TO 1906.

State.	Value of Tin Produced in							
	1881.	1891.	1901.	1902.	1903.	1904.	1905.	1906.
	£	£	£	£	£	£	£	£
New South Wales ...	568,795	133,963	76,544	59,593	150,208	188,377	226,110	255,744
Victoria ...	7,334	5,092	4,181	500	2,165	5,190	11,159	11,644
Queensland ...	193,639	116,387	93,723	116,171	243,149	270,276	297,454	490,283
South Australia ...	...	1,938	5,586	6,078	10,773	24,179	23,768	36,907
Western Australia ...	...	10,200	40,000	39,783	55,890	58,817	86,840	157,644
Tasmania ...	375,775	293,170	212,542	237,846	308,594	257,256	368,796	557,266
Commonwealth ...	1,145,603	560,750	432,576	459,971	770,779	804,095	1,014,127	1,509,488

3. World's Production of Tin.—According to the "Statist" the world's production of tin during each of the last five years was as follows:—

PRODUCTION OF TIN, VARIOUS COUNTRIES, 1902 TO 1906.

Country.	1902.	1903.	1904.	1905.	1906.
	Tons.	Tons.	Tons.	Tons.	Tons.
Straits Settlements ...	53,697	55,335	60,680	58,324	58,443
Dutch East Indies ...	18,875	18,720	14,578	12,675	11,254
Bolivia ...	9,000	9,200	11,700	12,500	14,700
Cornwall ...	4,392	4,282	4,132	4,468	4,500
Australia ...	3,199	4,934	4,846	5,028	6,482
Total ...	89,163	92,471	95,936	92,995	95,379

The main users of tin are the manufacturers of tin-plates, while it is also required in conjunction with other metals to produce bronze, brass, Britannia metal, pewter, printers' type, and solder. It is stated that the rising tendency of prices during recent years is due to the fact that production has not been commensurate with the demands for consumption, and also in some measure to the fact that for industrial purposes the metal can be replaced by others to a limited extent only.

4. **Prices of Tin.**—The average price of the metal in the London market for years since 1891 was as follows:—

PRICE PER TON OF TIN, 1891 TO 1907.

Year.	Price per Ton.	Year.	Price per Ton.
	£ s. d.		£ s. d.
1891 ...	94 14 7	1904 ...	130 1 5
1901 ...	121 18 8	1905 ...	145 10 6
1902 ...	123 14 2	1906 ...	183 5 0
1903 ...	131 12 11	1907 (Jan. to June)	189 4 7

5. **Employment in Tin Mining.**—The number of persons employed in tin mining during each of the years 1901 to 1906 is shewn below:—

PERSONS ENGAGED IN TIN MINING, 1901 TO 1906:

State.	1901.	1902.	1903.	1904.	1905.	1906.
New South Wales ...	1,428	1,288	2,502	2,745	2,884	3,795
Victoria ...	...	...	...	50	50	95
Queensland ...	1,148	1,467	1,598	2,237	2,936	2,872
South Australia ...	...	...	...	...	...	...
Western Australia ...	413	249	294	284	479	890
Tasmania ...	1,065	1,260	1,331	1,304	1,351	1,659
Commonwealth ...	4,054	4,264	5,725	6,620	7,700	9,311

§ 7. Zinc.

1. **Production of Zinc.**—The production of spelter 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. In the earlier years of the history of the field the whole of the zinc contents of the ores was lost in smelting operations, but

various systems of concentration were devised, until at the present time a considerable proportion of the zinc contents of the ores is saved. The success of the methods adopted is amply borne out by the figures hereunder, which relate to the production at intervals since 1889:—

Year.	Quantity of Zinc Concentrates Produced.	Value.	Year.	Quantity of Zinc Concentrates Produced.	Value.
	Tons.	£		Tons.	£
1889	97	988	1899	49,879	49,207
1891	219	2,622	1906	103,666	292,806

Prices of spelter rose from £20 19s. per ton in 1903 to £27 1s. in 1906, but towards the end of 1907 there was a fall to £20 10s.

§ 8. Iron.

1. **History.**—(i.) *New South Wales.* The existence of large deposits of iron ore in New South Wales has been known since the early years of the history of the State, but up to the present little has been accomplished in the way of utilising these deposits so as to produce any extensive supply of marketable metal. According to a report furnished by the Government Geologist in 1905, the total quantity of ore available for exploitation is 53,000,000 tons, the deposits at Cadia, near Orange, being computed to contain no less than 39,000,000 tons, of which a large proportion consists of ores capable of yielding a high-grade metal. The aluminous ores at Wingello are estimated to contain 3,000,000 tons, the titaniferous magnetic ores on the Williams and Karuah Rivers nearly 2,000,000 tons, the hematite and brown ores at Carcoar, 3,000,000 tons; while several other districts are capable of supplying over 1,000,000 tons. There are extensive supplies of coal and limestone within reasonable distance of some of the more extensive deposits. The increasing demand for iron and steel manufactures and the enhanced price of the metal, will probably enable the State in the near future to take its place amongst the iron-producing countries of the world. Ironworks were established at Fitzroy, near Mittagong, as far back as 1852, and at Eskbank, near Lithgow, in 1875, but the production of pig iron and manufactures was in neither case considerable. In May, 1907, however, works on a much larger scale were opened at Lithgow, and their success for some time seemed practically assured, since the Government has contracted with them for a supply of rails and other ironwork for a period of seven years. The ironstone to be used in this establishment will be obtained at Carcoar, where the deposit is calculated to yield 2000 tons of ore for a period of twenty-five years. Coke is at present being obtained in large quantities from the South Coast district, but the main supply will come from the Oakey Park Coal Company, while the limestone will be furnished by the Portland Cement Company.

(ii.) *Victoria.* Iron ore has been located at various places in Victoria, particularly at Nowa Nowa, in the Gippsland district, and at Dookie. In his report for 1905 the Secretary for Mines states that without special assistance to the industry there does not seem to be any prospect of the deposits being cheaply worked.

(iii.) *Queensland.* Queensland possesses some extensive deposits of iron ore, which is mined chiefly for fluxing purposes in connection with the reduction of gold and copper ores.

(iv.) *South Australia.* In South Australia iron ore is raised for fluxing purposes only, although the State possesses some rich deposits capable of being mined for an indefinite period. The best known deposit is the Iron Knob, a veritable hill of iron of high percentage about fifty miles from the seaboard of Spencer's Gulf. This property has been leased by the Broken Hill Proprietary Company, the ore being transported to the smelting works at Port Pirie. Rich outcrops of ore have also been located at Leigh's Creek, at Beltana, Mount Serle, and Boolyeroo.

(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 Murchison field possesses some extensive deposits of high-grade ore.

(vi.) *Tasmania.* The existence of large quantities of iron ore in Tasmania was noted as far back as 1822, when Surveyor-General Evans alluded to the "surprising abundance of iron within a few miles of Launceston." A company known as the Tasmanian Charcoal Iron Company was formed to work these deposits, and commenced operations in June, 1876. Unfortunately, however, the presence of chromium rendered the pig-iron so hard and brittle that the works had to be abandoned. Extensive deposits of specular iron ore are also found in the neighbourhood of the Blythe and Gawler Rivers.

(vii.) *New Zealand.* The deposits of iron ore in the Auckland, Otago, and Nelson districts have up to the present been little utilised.

§ 9. Other Metals.

1. **Aluminium.**—In the form of bauxite or hydrous sesquioxide, aluminium is found in New South Wales at Emmaville, Inverell, and Wingello, its existence being first recognised in 1889. The metal, however, has not yet been manufactured locally.

2. **Antimony.**—This metal is widely distributed in New South Wales, and has been found native at Lucknow, near Orange. Dyscrasite, a silver antimonide, has been found in masses of up to one ton in weight in the Broken Hill lodes. It has also been found at various places in Victoria, chiefly in association with gold. In New Zealand the metal has been found associated with gold and silver in quartz lodes at Puhupuhi, Thames, and Te Aroha, in the Auckland district, and at Reefton, Langdons, and the west coast of Middle Island, as well as at several localities in the Otago district. An extensive lode was at one time worked at Endeavour Inlet, and a good sulphide lode at Collingwood. Extensive deposits were discovered at Neerdie, in the Wide Bay district of Queensland, during 1872, also at Wolfram Camp on the Hodgkisson field, on the Palmer River, and in the Ravenswood district. In 1906 the yield from the Hodgkisson mines was valued at £5600, while ore to the value of £529 was raised at Ravenswood. In Western Australia good lodes of stibnite, carrying gold, have been found in the Roeburne district.

3. **Arsenic.**—In the form of arsenopyrite, arsenic is of wide distribution in Victoria, but the deposits are worked to a limited extent only. At Ballarat a small quantity of the oxide is obtained from the flues of roasting furnaces.

4. **Bismuth.**—This metal has been found in New South Wales at Kingsgate, near Glen Innes, and Whipstick, near Pambula, its discovery dating from 1877. About twenty-five tons of metal and ore were exported during 1906, the bulk of the product being obtained in the Pambula district. In Queensland the metal is found on the Hodgkisson goldfield, at Ukalunda in the Ravenswood district, and at Biggenden in the Burnett district. In South Australia deposits are found at Balhannah, at Mount MacDonald, and at Winnininnie, on the shores of Spencer's Gulf.

5. **Chromium.**—In New South Wales chromium is found at Bowling Alley Point, on the Peel River, and also near Coolac, but the quantity raised at present is insignificant. The metal is also found in the Nelson district in New Zealand.

6. **Carnotite.**—A discovery of carnotite ore was made twenty miles from the Olary railway station in South Australia, and steps are being taken to test its value commercially.

7. **Cobalt.**—This metal was found at Carcoar in New South Wales in 1888, and subsequently at Bungonia, Port Macquarie, and various other places. Deposits have been noted in South Australia at Blinman, in Western Australia at Norseman and Kanowna, and at various places in Victoria.

8. **Lead.**—This metal was first noted in New South Wales in 1849, when small specimens of native metal were found by the Rev. W. B. Clarke. At present lead-mining *per se* is not practised to any extent in the Commonwealth, the supply of the metal being chiefly obtained in conjunction with silver. In Victoria oxides, sulphides, and carbonates of lead are found in the reefs of most of the goldfields. The deposits are not, however, of sufficient extent to repay the cost of working. In Queensland the deposits are worked chiefly for the silver contents of the ore. Galena is found in several districts in New Zealand, but is not worked to any extent.

9. **Mercury.**—In New South Wales mercury was first recorded by the Rev. W. B. Clarke in 1843. Cinnabar has been found in lodes and impregnations at various places, such as Bingara, Clarence River, etc. Up to the present the production of quicksilver has been small, the total being only a little over 1000 lbs. Lodes of cinnabar have been found in Queensland at Kilkivan, and at Black Snake, in the Wide Bay district, about four tons were produced between 1874 and 1891. In New Zealand cinnabar has been located at Waipori, Waitahuna, Puhipuhi, Te Aroha, and Ohaeawai.

10. **Manganese.**—Ores of this metal occur in considerable quantity in widely separated districts in New South Wales, but the low price of the metal precludes mining to any great extent, and the production to date has been trifling. In Queensland there are extensive deposits at Gladstone, the product being utilised chiefly by the Mount Morgan mine. The production from the Mount Miller mine amounted in 1906 to 113 tons of ore, valued at £4391. Extensive deposits of the ore were mined at Boolcunda in South Australia some years ago, but latterly the production has ceased. In Western Australia ores of the metal are found widely scattered, the black oxide being especially plentiful in the Kimberley district. In New Zealand deposits are found in various localities, but little has been done in the way of exploration.

11. **Tungsten.**—Wolfram and scheelite, the principal ores of tungsten, are both mined to a small extent in New South Wales. During 1906 the export of wolfram was 132 tons, valued at £9000, and of scheelite 109 tons valued at £7600. Wolfram was mined chiefly at Torrington, Emmaville, and Wagga, and scheelite at Hillgrove. In Queensland Wolfram and molybdenum are both obtained on the Hodgkisson goldfield, and at Kangaroo Hills and Port Douglas. Mines in the Townsville district are reputed to have produced twenty-seven tons of wolfram last year. Wolfram is mined in Tasmania at Ben Lomond and in the Middlesex district, the quantity exported in 1906 being twenty tons, valued at £1465. Rich deposits of scheelite have been found in New Zealand, where it is mined principally at Macrae's Flat, Otago, and Top Valley, Marlborough. Over £24,000 worth have been raised at Macrae's Flat alone.

12. **Tantalum.**—Tantalite in small quantities has been found in the Greenbushes tinfield for some time past, but recently a lode of fairly extensive proportions was located at the Wodgina tinfield. Up to the end of 1905 the production of this mineral amounted to 73 tons, valued at about £10,000, but early in 1906 it was found that the supply exceeded the demand and production was temporarily stopped.

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.

NON-METALLIC MINERALS (B).

§. 10 Coal.

1. **Historical.**—Coal was discovered at a very early period in the history of Australia, the first mention of it dating from August, 1797, when its existence was noted in New South Wales by some survivors from the wreck of a vessel, who had walked from the southern portion of Australia up the coast to Sydney. The discovery was shortly afterwards confirmed by Surgeon Bass, who found coal in the cliffs southward of Point Solander, but the locality was at the time looked upon as so inaccessible that no attempt was made to utilise the deposits. During 1906, however, the South Coast district, in which the site of these discoveries occurs, produced over 1,780,000 tons of coal. In 1797 coal was also discovered at the mouth of the Hunter (or Coal) River by Lieutenant Shortland, and in this case, the deposits being more easily worked, it was not long before they were utilised, and a township sprang up which is now the port of one of the greatest coalfields in the world. The production for the northern district, of which Newcastle is the port, amounted in 1906 to 5,336,000 tons, valued at £1,718,000.

The discovery of coal in *Victoria* dates from the year 1825, when the mineral is reported to have been found at Cape Patterson. There is no record of production in the earlier years, but it is stated that the first Victorian coal placed on the Melbourne market came from Kilcunda in the vicinity of the original discovery. Up to 1889, with the exception of a little work by the companies at Moe and Narran, the industry languished, the total production to the beginning of the year named being only about 25,000 tons. Early in 1889 the Government determined to come to the assistance of the industry, and the Coal Creek Company at Korumburra was registered, followed during next year by the Jumbunna Company, and the Outtrim, Howitt, and British Consolidated in 1894. The unfortunate strike of 1903 completely disorganised coal mining in Victoria, and the industry still suffers from its disastrous effects.

The existence of coal in *Queensland* was known soon after the establishment of the first settlement at Moreton Bay, mines near Ipswich, on the banks of the Bremer Creek and Brisbane River, having been worked almost continuously since that date. Seams in the Wide Bay district have been operated on since 1870, while good coal was mined at Clermont shortly after the establishment of the copper mines in that locality.

In *South Australia* a seam of coal was discovered in 1890 at Leigh's Creek, but up to the present the product has not been utilised to any great extent. The discovery of coal in *Western Australia* dates from 1846, when the mineral was found on the Murray River. Since that year coal has been met with in other localities, but production at the present time is confined to the deposits at the Collie River. In *Tasmania* coal was discovered between the Don and Mersey Rivers in 1850. The value of the deposits at Fingal was first proved in 1863, two tons of this coal producing nearly 14,000 feet of gas. The first official record of production in *New Zealand* dates from the year 1878, when about 160,000 tons were raised.

2. **Production of Coal.**—The production of coal in each State and New Zealand at various periods since 1881, and the *value* of such production are shewn in the following table:—

As the table shews, the great bulk of the production is confined to New South Wales, although New Zealand has been steadily increasing its output during the last few years.

PRODUCTION OF COAL, AUSTRALASIA, 1881 TO 1906.

State.	1881.	1891.	1901.	1902.	1903.	1904.	1905.	1906.
QUANTITY.								
New South Wales ...	Tons. 1,769,597	Tons. 4,037,929	Tons. 5,968,426	Tons. 5,942,011	Tons. 6,354,846	Tons. 6,019,809	Tons. 6,632,138	Tons. 7,626,362
Victoria ...	...	22,834	209,329	225,164	64,200	121,742	155,136	160,631
Queensland ...	65,612	271,603	539,472	501,531	507,801	512,015	529,326	606,772
South Australia ...	...	...	...	...	...	...	...	...
Western Australia ...	...	...	117,836	140,884	133,427	138,550	127,364	149,755
Tasmania ...	11,163	43,256	45,438	48,863	49,069	61,109	51,993	52,896
Commonwealth ...	1,846,372	4,375,622	6,880,501	6,858,453	7,109,343	6,853,225	7,495,957	8,596,416
New Zealand ...	337,262	668,794	1,227,638	1,362,702	1,420,193	1,537,838	1,585,756	1,729,536

VALUE.								
New South Wales ...	£ 603,248	£ 1,742,796	£ 2,178,929	£ 2,206,598	£ 2,319,660	£ 1,994,952	£ 2,003,461	£ 2,337,227
Victoria ...	...	19,731	147,228	155,850	43,645	70,208	79,060	80,283
Queensland ...	29,033	128,198	189,877	172,286	164,798	166,536	155,477	173,282
South Australia ...	...	...	...	...	...	...	...	...
Western Australia ...	...	...	63,561	86,188	60,128	67,174	55,312	57,998
Tasmania ...	4,465	17,303	18,175	19,546	19,628	24,444	20,797	21,158
Commonwealth ...	636,746	1,908,028	2,602,770	2,640,468	2,616,859	2,323,314	2,314,107	2,669,948
New Zealand ...	* 168,631	* 334,397	676,174	741,759	762,858	826,207	838,531	916,562

* Estimated.

3. **Distribution and Quality of Coal in Each State.**—(i.) *New South Wales.* Estimates have from time to time been made as to the total quantity of coal available for working in the deposits in New South Wales, and while these naturally differ to some extent, they agree in placing the amount at well over a thousand million tons, without taking into consideration the deposits existing below a depth of 4000 feet. According to Mr. E. F. Pittman, the coal-bearing rocks of New South Wales may be classified as follows :—

COAL-BEARING ROCKS OF NEW SOUTH WALES.

Geological Age.	Maximum Thickness of Coal-bearing Strata.	Locality.	Character of Coal.
I. Tertiary—Eocene to Pliocene ...	Approx. 100 ft.	Kiandra, Gulgong, and Chouta Bay	Brown coal or lignite.
II. Mesozoic—Triassic ...	2,500 ..	Clarence and Richmond Rivers	Coal suitable for local use only.
III. Palæozoic—Permo-Carboniferous	13,000 ..	Northern, Southern and Western Coalfields	Good coal, suitable for gas, household and steaming.
IV. Palæozoic—Carboniferous ...	10,000 ..	Stroud	Very inferior.

No serious attempt has been made to use the deposits of brown coal or lignite as a source of fuel. The Triassic deposits in the Clarence and Richmond districts contain numerous seams, but the coal is largely intersected by bands, while its large percentage of ash renders it unfit for use as fuel for industrial purposes. Probably these beds extend under the great western plains, but the presence of artesian water precludes the possibility of their being worked. It is in the Permo-Carboniferous division that the great productive coal seams of the State are found, the area which they cover being estimated at about 25,000 square miles. The coal from the various districts embraced in this division 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. 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, some of which has realised good prices as fuel.

The quantity and value of the coal raised in each district during the years 1881, 1891, and 1906 will be seen in the following table :—

COAL RAISED IN NEW SOUTH WALES, 1881 TO 1906.

District.	1881.		1901.		1906.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£
Northern ...	2,243,792	1,096,720	3,999,252	1,669,519	5,336,188	1,718,178
Southern ...	376,568	170,684	1,544,454	407,196	1,783,395	494,871
Western ...	302,137	79,036	424,720	102,214	506,779	124,178
Total ...	2,922,497	1,346,440	5,968,426	2,178,929	7,626,362	2,337,227

So far back as 1847 the Rev. W. B. Clarke expressed the belief that workable coal would be found in the strata below Sydney, a belief that was also held by subsequent geologists, who based their contentions on stratigraphical and palæontological evidence. The later geologists urged that the Illawarra coal measures of the South Coast district were identical with the Newcastle measures of the Northern district, although it was agreed that the deposits in the neighbourhood of Sydney would probably be found at a considerable depth. Borings were made in several localities close to Sydney, and in 1891 a drill put down at Cremorne Point in Sydney Harbour passed through a seam of coal seven feet four inches thick and at a depth of 2801 feet. Unfortunately the site of the bore happened to be in the vicinity of a volcanic dyke, which had cindered the coal near the locality of its intrusion. A second bore was commenced in July, 1892, and in November, 1893, a seam of excellent coal, ten feet three inches thick, was reached at 2917 feet. The results attained led to the formation of a company which acquired land at Balmain, and expended a considerable sum of money in the purchase of plant suitable for working coal at such a great depth. Sinking operations were commenced in June, 1897, and coal was struck at a depth of 2880 feet on the 21st November, 1901. Up to the present developmental work has not sufficiently advanced to permit of any considerable production.

(ii.) *Victoria.* 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. The coal is of excellent quality for steaming and household purposes. The full exploitation of the Victorian coal deposits has, however, been rather severely hindered by various obstacles. In the Report of the Royal Commission on the Coal Industry, 1906, these have been summarised as follows :—(1) Labour troubles. (2) Difficulties of working arising from faults, displacements, and thin seams. (3) Increased cost of production as the workings extend. (4) The low price ruling for coal.

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. Attempts have been made to manufacture briquettes from the brown coal but so far without any great measure of success.

The output of coal from the chief Victorian collieries during the last six years was as follows :—

PRODUCTION OF COAL IN VICTORIA, 1901 TO 1906.

Year.	Outtrim Howitt Company.	Jumbunna Coal Company.	Coal Creek Proprietary.	Silkstone Co-operative Company.	Other Companies.	Total Production.	Value.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	£
1901	118,168	60,237	30,924	...	...	209,329	147,191
1902	114,686	67,876	39,257	2,257	1,088	225,164	155,850
1903	20,602	18,517	20,727	4,354	5,661	69,861	43,645
1904	57,328	39,364	22,547	2,014	489	121,741	70,208
1905	71,989	49,009	27,710	1,624	4,804	155,136	79,035
1906	74,812	64,222	13,214	3,977	4,406	160,631	80,283

The figures for 1903 include 5661 tons of brown coal.

The coal from Leigh's Creek in South Australia is subject to similar disabilities as the Victorian brown coal, and until some means are devised of overcoming these production will necessarily languish.

(iii.) *Queensland.* In Queensland the coal-bearing strata are of vast extent and wide distribution, being noted under the greater portion of the South-eastern districts, within 200 miles of the sea, as far north as Cooktown, and under portions of the far western interior. The Ipswich beds are estimated to occupy about 12,000 square miles of country, while the Burrum fields occupy a considerably larger area. At Callide, fifty miles west of Gladstone, a seam of coal free from bands has been struck in a shaft only sixty feet deep, and borings have proved the deposit to be of considerable magnitude. Extensive beds occur in the basin of the Fitzroy River, in the Broomsound district, and at the Bowen River. Amongst other places where the mineral is found may be enumerated Clermont, the Palmer River, Tambo, Winton, and the Flinders River. Little of the product has been exported, the Ipswich coal, though excellent for most purposes, being too friable. A bituminous coal is yielded by the Ipswich seams, those of the Darling Downs yield a cannel, while anthracite of good quality is furnished by the Dawson River beds.

The quantity and value of coal raised in Queensland at various periods since 1861 were as shewn below :—

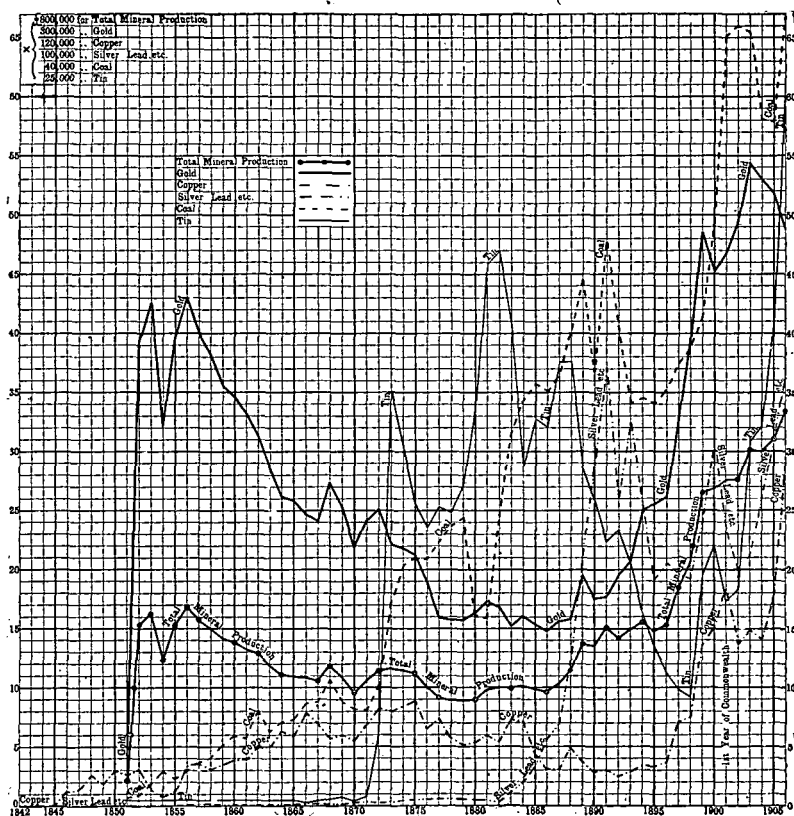
PRODUCTION OF COAL IN QUEENSLAND, 1861 TO 1906.

Year ...	...	...	1861.	1871.	1881.	1891.	1901.	1906.
Quantity	...	Tons	14,212	17,000	65,612	271,603	539,472	606,772
Value	...	£	9,922	9,407	29,033	128,198	189,877	173,282

At present the industry is feeling the effects of contracts entered into some years back during a period of depression, but with the probability of higher prices at no distant date, and the reduction in haulage rates conceded by the railway authorities, it is believed that an era of increasing prosperity will shortly manifest itself.

(iv.) *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 coalfield at present worked is at Collie, in the Mesozoic beds of the south-west. The coal produced is bright and clean, but very fragile when free from moisture. The production from this field during the last six years was as follows :—

GRAPHS SHEWING VALUES OF PRINCIPAL MINERALS PRODUCED IN THE
COMMONWEALTH, 1842-1906.



EXPLANATION OF GRAPHS.—The values shewn in the above diagrams are those of the total Commonwealth production of the most important minerals in successive years from 1842 to 1906.

The base of each small square represents an interval of one year, and the vertical height represents, in the case of gold, £300,000; copper, £120,000; silver, lead, etc., £100,000; coal, £40,000; tin, £25,000; and total mineral production, £800,000.

The names of the various minerals are written on the graphs which respectively represent them, and the distinctive types of line used are exhibited in detail in the upper portion of the diagram.

PRODUCTION OF COAL IN WESTERN AUSTRALIA, 1901 TO 1906.

Year ...	...	1901.	1902.	1903.	1904.	1905.	1906.
Quantity	Tons	117,836	140,884	133,427	138,550	127,364	149,755
Value ...	£	68,561	86,188	69,128	67,174	55,812	57,998

(v.) *Tasmania.* In Tasmania coal occurs in the Carboniferous and Mesozoic systems, the product of the former class being, however, far inferior to that of the latter. Carboniferous seams occur at the Don, Tarleton, Latrobe, Port Cygnet, Tippagory Range, St. Mary's, and Adventure Bay, the seam at Port Cygnet having a thickness of two feet and being of fair quality. The Mesozoic coal measures are well developed in the Fingal basin, the Cornwall coal from this locality being excellent for household purposes. The chief production of recent years has been furnished by the Mt. Nicholas and Cornwall mines, but it is hoped that ere long the production from the Sandfly mine will assume considerable proportions. The quantity of coal raised during the last six years in the various districts was as follows:—

PRODUCTION OF COAL IN TASMANIA, 1901 TO 1906.

District.	1901.	1902.	1903.	1904.	1905.	1906.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
North-western ...	2,952	1,683	1,735	2,282	1,261	1,878
North-eastern (Fingal)...	40,977	42,770	45,893	55,070	45,179	46,802
Midland ...	1,536	725	1,047	940	200	393
South-eastern ...	...	60	30	200	200	1,483
South-western ...	3,711	4,660	3,100	3,120	3,624	2,339
Total ...	49,176	49,898	51,805	61,612	50,464	52,895

(vi.) *New Zealand.* New Zealand possesses coal measures of vast extent and great wealth, but as yet in a comparatively undeveloped state through lack of efficient shipping facilities on the coasts adjacent to the site of the chief deposits. The greater portion of the coal produced is of the bituminous or semi-bituminous character, but considerable quantities of brown coal and lignite are mined, and there is a small production of pitch coal. Bituminous coals are most largely mined on the west coast of the Middle Island, while the Southern district yields the chief production of brown coal, lignite, and pitch coal. Competent judges have pronounced the bituminous coals of the West Coast to be equal, if not superior, to the best description from any part of the world. Large quantities of Westport coal are supplied to the warships on the Australian Naval Station. The output of coal from the chief districts during each of the last six years was as follows:—

PRODUCTION OF COAL IN NEW ZEALAND, 1901 TO 1906.

District.	1901.	1902.	1903.	1904.	1905.	1906.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
Northern ...	175,084	192,045	209,795	242,517	259,876	301,186
West Coast ...	669,535	753,816	781,032	836,950	856,227	962,915
Southern ...	395,067	419,179	429,402	458,371	469,653	465,435
Total ...	1,239,686	1,365,040	1,420,229	1,537,838	1,585,756	1,729,536

Two collieries in New Zealand, situated at Seddonville and Port Elizabeth, are owned by the State. The aggregate amount of coal dealt with during 1906 was 196,509 tons, valued at £158,097. Depôts for the sale and distribution of State coal were opened during the year at Wellington, Christchurch, and Wanganui. For the year ended 31st March, 1907, the profits of the mines amounted to £8461. A briquette factory has been established in connection with the Seddonville State Colliery, and is manufacturing a product of first-rate quality.

6. Production of Coal in Various Countries.—The world's production of coal during the last three years for which figures are available averaged 810 million tons, the output in 1905 being 840 million tons. The following table shows the production of the British Empire and the chief foreign countries in units of 1000 tons during each year of the period 1901-5:—

BRITISH EMPIRE.

Year.	United Kingdom.	British India.	Canada.	Australian C'wealth.	New Zealand.	South Africa.
	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.
1901 ...	219,047	6,636	5,560	6,884	1,228	1,465
1902 ...	227,095	7,424	6,422	6,860	1,363	2,179
1903 ...	230,334	7,438	5,825	7,112	1,420	2,911
1904 ...	232,428	8,217	6,705	6,854	1,538	3,163
1905 ...	236,129	8,425	7,836	7,496	1,586	3,603

FOREIGN COUNTRIES.

Year.	Russian Empire.	Sweden.	German Empire.	Belgium.	France.	Spain.	Austria-Hungary.	Japan.	United States.
	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.
1901 ...	16,215	268	106,795	21,856	31,126	2,639	12,895	8,885	261,875
1902 ...	16,156	300	105,747	23,493	28,593	2,679	12,012	9,589	269,277
1903 ...	17,532	315	114,763	23,415	33,368	2,654	12,526	9,979	319,068
1904 ...	19,007	316	118,874	22,395	32,964	2,974	12,813	10,602	314,563
1905 ...	16,957	317	119,349	21,566	34,778	3,152	13,530	11,630	350,821

Including New Zealand the production from Australasia takes first place amongst the possessions of the British Empire.

7. Export of Coal.—(i.) *New South Wales.* The exports of coal from Australasia are confined to New South Wales and New Zealand, the quantity sent away from the latter being comparatively small. In the following table will be found the quantity and value of the exports at decennial intervals since 1881 and during the last five years, the figures for New South Wales being given on the authority of the Mines Department of that State:—

EXPORTS OF AUSTRALASIAN COAL, 1881-1906.

Year.	Exports from New South Wales.		Exports from New Zealand.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£
1881 ...	1,029,844	417,530	6,621	5,610
1891 ...	2,514,368	1,306,630	91,664	91,173
1901 ...	3,470,985	1,681,824	159,643	142,176
1902 ...	3,261,459	1,625,380	188,677	154,747
1903 ...	3,716,194	1,704,993	152,332	128,927
1904 ...	3,172,867	1,380,839	165,220	139,898
1905 ...	3,718,053	1,483,978	122,817	107,062
1906 ...	4,961,540	2,080,600	141,641	122,614

The principal countries to which coal was exported from New South Wales during the year 1906 were as shewn hereunder:—

DESTINATION OF NEW SOUTH WALES COAL, 1906.

Country.	Quantity.	Value.	Country.	Quantity.	Value.
	Tons.	£		Tons.	£
Victoria	904,161	467,126	New Zealand ...	215,503	91,010
South Australia ...	506,624	281,039	Peru	109,278	47,926
Chile	601,044	266,878	Hawaii... ..	90,635	37,708
Philippine Islands...	312,996	132,984	United States ...	83,511	36,032
Straits Settlements	215,762	96,073	China	71,794	31,652

The quantity of bunker coal taken by oversea vessels exceeded 1,000,000 tons, and was valued at £447,000.

(ii.) *New Zealand.* New Zealand's export consisted principally of bunker coal used on vessels trading to the United Kingdom, the amount so credited in the export returns being 80,013 tons, valued at £78,328. In addition there was an export of 25,000 tons, valued at £19,800, sent to New South Wales, the bulk of this being coal for use in British warships on the Australian station. Of the remainder the South Sea Islands took 7700 tons, valued at £4282, and Fiji 9600 tons, valued at £5659.

8. *Price of Coal.*—(i.) *New South Wales.* The price of coal in New South Wales has been subject to considerable fluctuation since the date of first production. Up to the end of 1857 the average value of the total output was 11s. 10d. per ton. Next year the value had risen to nearly 15s., declining thereafter until in 1871 the price realised was 7s. From 1872 to 1879 there was a rise in value to 12s. Between 1882 and 1891 the price ranged between 8s. and 10s. From 1891 onwards there was a steady decline until 1898, when the average was 5s. 4d. Henceforward prices rose again until 1902, when 7s. 5d. was the average. A further decline then set in until 1905, when the price stood at a little over six shillings followed by a rise of one penny in 1906. The price of New South Wales coal depends on the district from which it is obtained, the northern (Newcastle) coal always realising a much higher rate than the southern or western product. The average rate in each district during the last six years was as follows:—

PRICE OF COAL IN NEW SOUTH WALES (PER TON), 1901 TO 1906.

Year.	Northern District.	Southern District.	Western District.
	s. d.	s. d.	s. d.
1901	8 4.19	5 3.28	4 9.76
1902	8 4.49	5 9.33	5 0.73
1903	8 1.04	5 8.12	5 0.14
1904	7 2.10	5 7.25	5 1.91
1905	6 4.15	5 5.03	5 0.15
1906	6 5.28	5 6.60	4 10.81

(ii.) *Victoria.* In Victoria the average price of coal up to the 31st December, 1890, was nineteen shillings and threepence per ton. In 1895 the price was still as high as twelve shillings and twopence, but in the following five years there was a serious decline, the value in 1900 being quoted at nine shillings and sevenpence per ton. In 1901, however, there was an astonishing rise, the figure being as high as fourteen shillings and sevenpence. Since that year, however, the price again declined, the average for 1905 being ten shillings and twopence, and for 1906, ten shillings.

(iii.) *Queensland.* The average price of coal at the pit's mouth in Queensland during the period 1900-06 ranged from five shillings and eightpence halfpenny in 1906 to seven shillings in 1901. Prices in the principal coal producing districts during the last two years were as follows:—

PRICES OF COAL, QUEENSLAND (PER TON), 1905 TO 1906.

District.	Output—Tons.		Value at Pit's Mouth.	
	1905.	1906.	1905.	1906.
	Tons.	Tons.	s. d.	s. d.
Ipswich and Darling Downs°	422,642	509,989	5 4	5 2½
Wide Bay and Maryborough	98,594	86,634	7 8½	8 0½
Rockhampton and Central	8,090	10,079	12 0	11 2½

(iv.) *Western Australia.* The average price of the Collie (Western Australia) coal up to the end of 1901 was nine shillings and fourpence per ton, the price in 1901 being eleven shillings and sevenpence. In 1902 the average stood at twelve shillings and threepence, but since that time there has been a steady fall, the lowest point being reached in 1906, when the price was seven shillings and sevenpence halfpenny per ton.

(v.) *Tasmania.* The average price per ton of coal at the pit's mouth in Tasmania was eight shillings in 1901. In 1902 it was eight shillings and sevenpence, in 1903 eight shillings and ninepence, in 1904 nine shillings and eightpence, in 1905 nine shillings and eightpence, and in 1906 nine shillings and ninepence per ton.

9. **Price of Coal in Other Countries.**—According to a report published by the Board of Trade the average value of coal at the pit's mouth in the five principal coal-producing countries of the world, for the three years ended 1905, was as follows:—

PRICE OF FOREIGN COAL.

Year.	United Kingdom.	Germany.	France.	Belgium.	United States.
	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.
1903 ...	7 8	8 9	11 5½	10 6½	6 7
1904 ...	7 2½	8 8½	10 10½	10 8	5 10½
1905 ...	6 11½	8 9½	...	...	5 8

A consideration of the above and preceding figures will shew that throughout the world the price of coal has, generally speaking, undergone a considerable decline during the last few years, although the latest returns shew an upward tendency.

10. **Employment in Coal Mining.**—The number of persons employed in coal mining in each of the States and New Zealand during the year 1906 is shewn below. The table also shews the number of persons killed and injured, with the proportion per 1000 employed, while further columns are added shewing 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:—

Returns published by the Board of Trade, England, give the total known number of persons engaged in mining and quarrying throughout the world as about 5,000,000, more than one-half of whom were employed in coal mining, the number in Great Britain being 833,000; the United States, 594,000; Germany, 543,000; France, 171,000; Belgium, 138,000; Austria, 119,000; and India, nearly 93,000.

The latest returns shew the death rate in the United Kingdom as 1.24, and for the British Empire 1.25 per 1000 persons employed in coal mines. For France the rate is given as 1.07, for Germany 1.90, and the United States 3.35. For foreign countries generally the rate is stated at 2.20 per 1000.

EMPLOYMENT AND ACCIDENTS IN COAL MINING, 1906.

State.	Persons Employed in Coal Mining.	No. of Persons		Proportion per 1000 Employed		Tons of Coal Raised for Each Person	
		Killed.	Injured.	Killed.	Injured.	Killed.	Injured.
New South Wales ...	15,199	21	72	1.4	4.7	365,000	106,000
Victoria ...	693	...	5	...	6.9	...	32,000
Queensland ...	1,349	...	25	...	18.6	...	24,000
South Australia ...	...	...	...	...	...	...	...
Western Australia ...	307	...	32	...	100.4	...	5,000
Tasmania ...	209	...	1	...	4.8	...	53,000
Commonwealth ...	17,757	21	135	1.2	7.6	409,000	64,000
New Zealand ...	3,692	6	30	1.6	8.1	288,000	58,000

THE AVERAGE FOR THE LAST SIX YEARS AVAILABLE IS GIVEN BELOW:—

New South Wales ...	16,626	21	90	1.3	5.4	390,000	85,000
Victoria ...	896	2	12	2.2	13.4	94,000	16,000
Queensland ...	1,609	1	20	1.0	12.4	799,000	32,000
South Australia ...	...	...	...	...	...	...	...
Western Australia ¹ ...	433	...	12	...	27.7	808,000	13,000
Tasmania ...	226	...	2	...	8.8	...	44,000
Commonwealth ...	19,790	24	136	1.2	6.8	368,000	65,000
New Zealand ...	3,748	4	18	1.1	4.8	355,000	82,000

1. One man was killed in 1903.

§ 11. Coke.

1. **Production of Coke.**—Notwithstanding the large deposits of excellent coal in Australia there is at the present time a fairly considerable amount of coke imported from abroad, the oversea imports during the three years ended 1906 amounting to about 16,000 tons, valued at £7600, the bulk of which came from the United Kingdom and Germany. Various reasons were adduced to account for the rejection of the local article, such as excessive friability in transport, lack of strength to sustain the weight of large ore bodies in reduction works, excessive amount of ash, etc. It is believed, however, that in a great many instances these disabilities have been overcome, so that succeeding years should see a more extensive local production. The quantity of coke made in New South Wales during the last six years was as follows:—

COKE MADE IN NEW SOUTH WALES.

Year ...	...	1901.	1902.	1903.	1904.	1905.	1906.
Quantity	Tons	128,882	126,872	160,592	171,006	162,961	186,060
Value	£	105,665	89,605	108,764	110,692	100,306	110,607

A small quantity of coke is made in Queensland, but the bulk of that used in ore reduction is imported, mainly from New South Wales. The coke manufactured locally amounted in 1905 to 8650, and in 1906 to 8672 tons, while the imports for the same years came to 9823 and 22,661 tons respectively.

New Zealand formerly produced a fair amount of coke, the records for 1892 showing an export of local produce amounting to over 4000 tons, valued at £5700. The production has, however, dwindled away, and from 1900 to 1906 there was a continuous rise in imports, ranging from 963 tons, valued at £2451, to 3506 tons, valued at £6778.

§ 12. Kerosene Shale and Mineral Oils.

1. **Production of Shale.**—As pointed out by Mr. E. F. Pittman, the name kerosene shale has been rather inaptly applied to a variety of torbanite, cannel, or boghead mineral found at various geological horizons in New South Wales. The mineral does not, as a rule, split in parallel layers, the fracture being rather of a conchoidal type. Pure samples have been found to contain over 89 per cent. of volatile hydro-carbons and over 5 per cent. of fixed carbons. The discovery of the mineral in New South Wales dates probably from 1827, although the first authentic mention by a scientific observer dates from 1845, when its occurrence in the Hartley Vale district was noted by Count Strzelecki. The mineral has been found at several places in the Upper Coal Measures, and in at least two in the Lower Carboniferous. Production on anything like a large scale commenced in 1868, when about 17,000 tons, valued at £48,000, were raised. The production in 1906 amounted to 32,000 tons, valued at £28,470, the whole of it being raised in the mines controlled by the Commonwealth Oil Corporation Limited at Hartley Vale, New Hartley, and Wolgan. Up to the end of 1906 the entire production for the State amounted to 1,280,000 tons, valued at £2,135,000.

2. **Production of Mineral Oil.**—Mineral oil has been known to exist for some years in New Zealand in the locality of New Plymouth, and also near Gisborne and the East Cape, while small quantities are at times noticeable on hot pools in the volcanic district. Bores put down near New Plymouth reached oil at a depth of 2300 ft., but great difficulty has been experienced in keeping the bore hole free from water.

§ 13. Other Non-metallic Minerals.

1. **Alunite.**—Probably the most remarkable deposit of alunite in the world occurs at Bullahdelah, in the county of Gloucester, New South Wales, a large proportion of a low range of mountains in the district being composed of this mineral. The deposits are worked by quarrying, and up to the end of 1906 about 27,000 tons had been raised, valued at £82,600, the production for the year 1906 being 1856 tons, valued at £4637.

2. **Asbestos.**—This substance has been found in various parts of Australia, but up to the present has not been produced in sufficient quantity to warrant special notice. In Western Australia what may prove to be a valuable deposit of the fibrous chrysotile variety has been located at Tambourah, on the West Pilbara goldfield. In 1899 Tasmania raised 200 tons, valued at £363, but there has been no production during the last six years.

3. **Graphite.**—Graphite is found in New South Wales near Undercliff Station, in the county of Buller, but the deposit is not sufficiently pure to prove remunerative. In Victoria the mineral occurs in Ordovician slates in several of the goldfields, but is not worked. In Queensland the mineral is raised by the Graphite Plumbago Company at Mt. Bopple, near Netherby, on the Maryborough-Gympie line. The quantity produced in 1906 was thirty-one tons, valued at £200, and ore valued at £750 was awaiting shipment at the mine. There is an extensive deposit of the mineral at Mt. Bopple, but the quality is rather inferior.

4. **Tripolite, or Diatomaceous Earth.**—Although at Barraba, Cooma, Wyrallah, and in the Warrumbungle Mountains in New South Wales tripolite has been found, the

deposits have not yet been worked commercially. In Victoria there is a remarkably pure deposit at Lillicur, near Talbot, while beds of the mineral are also met with at Clunes and Portland.

5. Salt.—Salt is obtained from salt lakes in the western and north-western districts of Victoria, and from salterns in the neighbourhood of Geelong. In Western Australia supplies are obtained from dried-up shallow lakes and consumed locally or exported. The chief centres of production are Rottnest Island, near Fremantle, and Middle Island, near Esperance, the product from the former being a remarkably pure chloride. Large quantities are also obtained from the shallow salt lakes of South Australia.

6. Natural Manures.—In Victoria large quantities of "copi," an impure hydrous sulphate of lime, are obtained in the North-western district. South Australia possesses fairly extensive deposits of rock phosphate in the neighbourhood of Kapunda and Angaston. Although it can hardly be considered a mineral product, mention may be made here of the large accumulations of guano on the Abrolhos Islands, off the coast of Western Australia, in the neighbourhood of Geraldton. The deposits vary in thickness from four to twenty-seven inches. During the years 1876-80 over 36,000 tons were raised, no figures being available shewing the production of recent years.

In New Zealand, fairly extensive deposits of phosphates have been located at Clarendon in the Otago district, but the production has not up to the present reached any magnitude.

§ 14. Gems and Gemstones.

1. Diamonds.—Diamonds were first noted in New South Wales by E. J. Hargraves in 1851, and in October of the same year by Geological Surveyor Stutchbury. The Cudgong field was discovered in 1867, and shortly afterwards the Bingara diamantiferous deposits were located. None of the diamonds so far discovered has proved of any considerable size, the largest weighing about $6\frac{1}{4}$ carats. Stones of small size are also found at Cope's Creek and other places in the Inverell district. It is difficult to obtain accurate returns in connection with the production of precious stones, but the yield of diamonds in 1906 was estimated at 2827 carats, valued at £2120, while the total production to the end of 1906 is given as 157,000 carats, valued at £104,000. 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. A few small diamonds have been found in the Pilbara district in Western Australia.

2. Sapphires.—These gems were discovered in New South Wales in 1851, near Burrandong. The gems have also been found in small quantities near Inverell, and at a few other localities in the State. There is no record of production. Specimens of sapphire have been found in Victoria, but the stones of commercial size are generally of little value owing to flaws.

In Queensland sapphires are found in the gravel of creek beds, between Withersfield and Anakie on the Rockhampton-Winton railway line. The gems show excellent fire and lustre, but the colour is darker blue than the Oriental sapphire. Hyacinths are occasionally found in association with the gems. The production of all gems in Queensland last year was valued at £18,110, and up to the end of 1906 the total was £62,000.

3. Precious Opal.—This stone was first discovered in New South Wales at Rocky Bridge Creek on the Abercrombie River, in the year 1877, and later a most important discovery was made at White Cliffs in the Wilcannia district, which is now the centre of production. The total value of opal raised last year was estimated at £56,500, of which £50,000 worth was raised in the White Cliffs district, and the balance at the Wallangulla field in the Walgett division. Since the year 1890 the total value of opal won is estimated at £989,000.

Small quantities of precious opal are also found in the Beechworth district in Victoria. In Queensland, the first recorded discovery of the gem dates from 1890. The opaliferous district stretches over a considerable area of the western interior of the State, from Kynuna and Opalton as far down as Cunnamulla. The yield in 1906 was estimated at £3000, and up to the end of that year at £156,000. These figures are, however, merely approximations, as large quantities of opal are disposed of privately to buyers on the fields, no record of which is obtained.

4. **Other Gems.**—Emeralds were found in New South Wales in the year 1890, near the township of Emmaville, the largest specimen found in the district weighing twenty-three carats in the rough. Altogether 2225 carats were sent to London during that year, some of the gems bringing £4 a carat, but the production has since dwindled, there being no record of any yield in 1906. Amongst other gems found in New South Wales at various times may be mentioned *turquoises*, discovered in 1894, near Bodalla, *topazes*, fine specimens of which have been obtained in the New England district, and *zircons* and *garnets*. Turquoises are also found in thin veins in Victoria, but the deposit is not rich enough to pay for expenses of working. Fine *agates* are found in many places in Victoria, but have not been made use of to any extent. Garnets are found in Western Australia, and beautiful specimens of *crocidalite* have been obtained at Yarra Creek in the Murchison district. *Rubies* have been found at various places in New South Wales and Queensland, and in the Westland district of Middle Island, New Zealand.

§ 15. The Mineral Wealth of Australia.

1. **Total Production.**—The value of the production from all minerals raised in Australia during 1906 is given in the following table:—

MINERAL PRODUCTION IN 1906.

Minerals.	N.S.W.	Victoria.	Q'land.	S.A.	W.A.	Tas.	C'w'lth.
	£	£	£	£	£	£	£
Alunite	4,637	...	...	...	...	...	4,637
Antimony	52,645	3,075	6,917	...	...	...	62,637
Bismuth	5,700	...	1,882	...	...	24	7,606
Chrome	15	...	...	...	...	...	15
Coal	2,337,227	80,283	173,282	...	57,998	21,158	2,669,948
Coke	110,607	...	...	...	...	...	110,607
Copper	789,527	...	916,546	743,671	50,337	844,663	3,344,744
Diamonds	2,120	...	...	...	...	...	2,120
Diatomaceous Earth	...	1,120	...	...	...	...	1,120
Gems (unspecified) ...	...	...	18,110	...	...	...	18,110
Gold	1,078,866	3,280,478	2,313,464	81,225	7,622,749	254,963	14,631,745
Graphite ... ..	...	...	200	...	...	...	200
Gypsum ... ..	...	348	...	1,953	...	...	2,301
Iron ... ..	...	...	...	...	...	1,100	1,100
Iron Oxide	336	...	...	...	...	...	336
Ironstone Flux	723	...	14,114	33,852	512	...	49,201
Kaolin ... ..	...	383	...	...	...	...	383
Lead	1,084	...	49,884	...	...	...	50,968
Limestone Flux	7,463	...	23,364	4,791	1,691	...	37,309
Manganese ... ..	...	...	4,391	...	...	...	4,391
Molybdenite	4,798	...	17,034	...	...	...	21,832
Opal	56,500	...	3,000	...	...	...	59,500
Platinum	623	...	...	...	...	...	623
Salt ... ..	...	9,273	...	27,500	...	...	36,773
Scheelite	7,647	...	347	...	...	...	7,994
Shale	28,470	...	...	...	...	...	28,470
Silver	36,431	4,980	101,693	10,410	37,612	90,261	281,387
Silver-Lead Bullion ...	2,826,542	...	...	...	...	462,443	3,291,557
Silver-Lead Ore ... ..	...	...	...	2,572	...	...	2,784
Tantalite ... ..	...	...	...	140	2,644	...	1,509,488
Tin	255,744	11,644	490,283	36,907	157,644	557,266	1,509,488
Wolfram	9,057	...	64,136	6,981	...	1,465	81,639
Zinc	292,806	...	...	...	...	...	292,806
Unenumerated	22,392	...	...	6,575	...	...	25,967
Total	7,931,960	3,391,584	4,198,647	956,577	7,931,187	2,233,343	26,643,298

In the next table will be found the estimated value of the total mineral production in each State up to the end of 1906. The figures do not in all cases coincide with those published by the Mines Departments, as they are exclusive of certain items such as building stones, clay, cement, and lime, which appear in some of the mining returns. The New South Wales Mining report gives the production of building stone up to the end of 1906 as £17,682 (this figure, however, representing exports alone), while the production in Victoria during the same period is given in the Victorian Mines Report as £3,226,755. For comparative purposes the figures are therefore valueless, the utility of export figures for such a commodity as building stone being more or less dubious.

COMMONWEALTH MINERAL PRODUCTION TO END OF 1906.

Minerals.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tas.	C'wealth.
	£	£	£	£	£	£	£
Gold ...	54,314,152	276,516,979	64,334,903	2,707,141	70,793,659	6,246,214	474,913,048
Silver and Lead ...	43,236,759	207,784	1,352,316	387,904	545,796	4,255,266	49,985,825
Copper ...	8,472,629	123,454	4,402,003	25,575,846	478,129	6,753,561	45,805,622
Tin ...	7,744,509	441,530	6,111,199	137,902	597,173	9,175,180	24,207,493
Coal ...	50,356,742	1,477,275	3,654,368	...	486,908	399,125	56,374,418
Other ...	6,683,364	257,185	873,828	936,650	53,860	120,814	8,925,701
Total ...	170,808,155	279,024,207	80,728,617	29,745,443	72,955,525	26,950,160	660,212,107

The "other" minerals in New South Wales include antimony, £253,279; bismuth, £114,614; chrome, £101,003; diamonds, £104,039; opal, £989,099; oil shale, £2,135,445; and zinc, £890,274. In the Victorian returns antimony ore was responsible for £180,811, and salt £34,210. Included in "other" in the Queensland production were opal, £155,695; gems, other, £61,777; bismuth, £78,889; wolfram, £356,538; antimony ore, £42,549; and manganese, £44,168. The chief item in South Australian "other" minerals was salt, £607,000. In the Tasmanian returns limestone flux was responsible for nearly £100,000.

(i.) *New Zealand.* The production of minerals in New Zealand during 1906 and up to the end of that year is given below :—

MINERAL PRODUCTION OF NEW ZEALAND, 1906, AND TOTAL TO 1906.

Minerals.	During 1906.	To end of 1906.	Minerals.	During 1906.	To end of 1906.
	£	£		£	£
Gold ...	2,270,904	69,501,488	Coal ...	916,562	12,526,704
Silver ...	143,572	921,267	Kauri Gum ...	522,486	13,443,017
Copper ...	...	18,228	Other ...	18,247	184,116
Chrome ...	...	38,002			
Antimony ...	...	52,598			
Manganese ...	40	61,831	Total ...	3,871,811	96,747,251

The so-called kauri gum—which is really a resin—has contributed about 14 per cent. of the total mineral production of New Zealand. The substance is the solidified turpentine of the kauri pine, and is used as the base of the best oil varnishes. It is obtained chiefly in the Auckland provincial district of the North Island, being found alike in the driest fern banks and the deepest swamps. A certain amount is also got from the forks of standing trees.

2. Total Employment in Mining.—The number of persons engaged in the mining industry in each State and New Zealand is an index of the significance of the mineral wealth of a country. During the year 1906 this was as follows :—

EMPLOYMENT IN MINING, 1906.

State.	Number of Persons Engaged in Mining for						Total.
	Gold.	Silver, Lead, and Zinc.	Copper.	Tin.	Coal and Slate.	Other.	
New South Wales ...	8,816	9,414	3,047	3,795	15,199	2,275	42,546
Victoria	25,304	13	3	95	693	130	26,238
Queensland	9,842	282	2,598	2,872	1,349	1,237	18,180
South Australia ...	900	50	5,000	...	...	1,000	6,950
Western Australia ...	17,926	...	296	890	307	10	19,429
Tasmania	988	1,745	2,391	1,659	208	14	7,005
Commonwealth ...	63,776	11,504	13,335	9,311	17,756	4,666	120,348
New Zealand ...	9,039	...	...	...	3,692	165	12,896

The following table shews the number of persons engaged in mining in the Commonwealth and New Zealand during each of the years 1891, 1901, and 1906, together with the proportion of the total population so engaged :—

PROPORTION OF PERSONS ENGAGED IN MINING, AUSTRALASIA,
1891, 1901, 1906.

State	1891.		1901.		1906.	
	Miners Employed.	No. per 100,000 of Popu- lation.	Miners Employed.	No. per 100,000 of Popu- lation.	Miners Employed.	No. per 100,000 of Popu- lation.
New South Wales ...	30,604	2,700	36,615	2,685	42,546	2,817
Victoria	24,649	2,151	28,670	2,381	26,238	2,144
Queensland	11,627	2,934	13,352	2,664	18,180	3,412
South Australia ...	2,688	834	7,007	1,931	6,950	1,829
Western Australia ...	1,269	2,496	20,895	11,087	19,429	7,473
Tasmania	3,988	2,695	6,923	4,017	7,005	3,917
Commonwealth ...	74,820	2,341	113,462	2,992	120,348	2,946
New Zealand ...	16,929	2,688	12,732	1,637	12,896	1,440

3. Wages Paid in Mining.—In the next table will be found a statement of the average wages earned by employes in the chief branches of the mining industry in Australia. The value of the figures is rather prejudiced by the wide diversity of conditions, not only in the several States but in different districts of the same State.

The figures quoted for New South Wales in gold mining refer to the Hillgrove and Mount Boppy districts. For copper the figures refer to the Cobar district, and represent rates as awarded by the Arbitration Court. The maximum is paid when copper is £115 per ton or over, and the minimum when the metal is £70 per ton and under, a graduated rate prevailing between the extremes. The rates for silver miners are those ruling at Broken Hill. As regards Queensland the rates for hewing in coal mines are for miners not doing their own wheeling. Where own wheeling is done the rate varies from 2s. 3d. to 5s. 6d. No distinction was made as to class of mining in the returns received from South Australia, and the figures have, therefore, been placed with copper mining. Generally speaking, the classification of the labour in the various States does not permit of very satisfactory comparisons.

WAGES PAID IN MINING INDUSTRY IN THE COMMONWEALTH.

Class of Mine.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.
GOLD—	per day.	per week.	per day.			per day.
Labourers ...	8/2	...	...	...	10/- to 11/10	6/- to 7/-
Bracemen ...	7/- to 8/6	£2 2/- to £2 8/-	7/6 to 11/3	...	11/8 to 13/-	7/6 to 8/8
Platmen ...	7/- to 8/6	£1 19/- to £2 2/-	7/9 to 9/6	...	11/8 to 13/-	7/6
Miners ...	8/4 to 9/3	£2 5/- to £2 10/-	8/2 to 11/8	...	...	7/6 to 8/-
Wet ...	10/2	{ £3 10/- to £3	...	...	11/8 to 13/6 {	9/2
Shaft-sinking...	9/-	{ £2 8/- for 6	...	...	...	8/4
Wet ...	...	hr. shifts	...	...	...	9/2
Blacksmiths ...	10/6 to 12/-	...	9/9 to 13/4	...	12/8 to 14/9	8/4 to 9/-
Carpenters ...	10/- to 11/-	...	9/1 to 12/10	...	...	8/- to 8/4
Engine-drivers—	...	...	...	...	...	...
Stationary ...	9/- to 10/-	£2 8/- to £3	7/4 to 13/4	...	14/- to 15/9 {	8/- to 8/4
Winding ...	...	...	...	...	...	8/4 to 9/6
Battery feeders...	...	...	6/6 to 9/5	...	...	5/- to 8/-
Shift bosses ...	10/- to 12/-	...	10/7 to 13/-	...	...	9/2 to 10/-
Machine miners ...	9/- to 10/6	...	9/8 to 11/9	...	...	8 4
Timbermen ...	9/- to 10/-	...	...	...	12/6 to 14/-	...
SILVER-LEAD—			(Note.—The		(The wages	
Labourers ...	7/6	...	above figures	...	above are as	7/- to 8/8
Bracemen ...	8/4	...	refer to aver-	...	paid in the	8/8
Miners ...	9/-	...	ages per shift	...	chief mining	9/- to 10/-
Blacksmiths ...	9/- to 10/6	...	in all metalli-	...	districts and	7/- to 13/-
Carpenters ...	9/- to 10/6	...	ferous mines	...	fixed by the	8/- to 15/-
Engine-drivers—	...	...	in Q'nsland)	...	Court of Ar-	...
Winding ...	10/-	...	...	...	bitration or	9/- to 19/8
Shift bosses ...	14/-	...	...	...	by industrial	10/- to 10/10
Truckers ...	7/6	...	...	...	agreements)	...
Timbermen ...	10/-	...	...	...	...	...
COPPER—						
Labourers ...	...	...	...	...	...	7/- to 9/-
Miners ...	8/4 to 10/2	...	...	8/9	...	9/- to 10/6
Blacksmiths ...	10/- to 13/4	...	...	8/9	...	7/- to 11/6
Carpenters ...	...	...	...	9/3	...	8/- to 10/6
Engine-drivers—	...	...	(see above)	...	...	...
Winding ...	...	...	...	9/-	...	9/- to 9 6
Bracemen ...	8/- to 9/3	...	...	8/-	...	...
Drill sharpeners	9/- to 13/-	...	...	(These fig-	...	...
Timbermen ...	9/2 to 10/8	...	...	ures are aver-	...	...
Machine miners ...	9/2 to 10/6	...	...	ages for all	...	...
Miners in wet	...	...	...	branches of	...	...
[ground	9/4 to 11/-	...	...	mining)	...	...
TIN—		per day.				
Labourers ...	7/6 to 8/-	7/-	...	...	...	7/- to 8/-
Miners ...	...	10/-	...	...	...	8/- to 8/4
Blacksmiths ...	...	10/-	...	...	...	10/-
Carpenters ...	...	8/4	...	...	...	9/6 to 10/-
Engine-drivers—	...	...	(see above)	...	...	...
stationary ...	...	...	...	...	...	9/- to 10/-
Shift bosses ...	...	...	...	...	...	8/6
Nozzlemen ...	Boxmen 8/4	8/- to 8/4	...	...	...	8/- to 9/-
Racemen ...	Sluicemen	7/-	...	...	...	7/6 to 8/6
Face bosses ...	7/6	...	...	...	...	10/-
COAL—		per shift.				
Deputies ...	8/- to 10/-	9/- to 12/-	...	...	...	...
Shot frlers ...	9/- to 10/-	...	...	...	...	...
Shiftmen ...	7/- to 9/-	...	6/6 to 10/-	...	...	...
Wheelers ...	7/-	5/ to 7/6	...	...	...	...
Overmen ...	...	...	...	...	...	...
Miners ...	...	7/6 to 8/4	Hewing rate.	...	...	8/- to 8/4
Machinemen ...	10/- to 11/-	...	1 1/2 to 3/-	...	...	...
Enginemen, wdg.	9/9	...	7/- to 8/-	...	...	...
Enginemen, hlg.	8/9	{ 4/- to 8/4 }	6/- to 10/- {	...	...	...
Enginemen, other	7/9	...	...	...	...	...
Labourers ...	6/- to 7/-	...	6/- to 8/-	...	...	...
Blacksmiths ...	10/-	8/4 to 10/-	7/- to 10/-	...	...	...
Carpenters ...	9/- to 10/-	8/-	6/- to 8/6	...	...	...
Safety lampmen	8/- to 10/-	...	...	...	...	...
Platmen ...	...	5/6 to 7/6	2/6 to 8/-	...	...	...