

## SECTION XII.

## MINES AND MINING.

## § 1. The Mineral Wealth of Australia.

1. **Place of Mining in Australian Development.**—The value of production from the mineral industry is now considerably less than that returned by the agricultural or the pastoral industry, nevertheless it was the discovery of gold in payable quantities, that first attracted population to Australia, and thus laid the foundation of its nationhood. Prior to 1851, the year when Hargraves' memorable discovery was made, coal and copper had both been mined to some extent, and the existence of deposits of other minerals including gold had been proved. But it was the news of the sensational finds of the precious metal in 1851 and the year immediately following that brought about a constant stream of immigration, and caused an increase in population from 221,000 at the end of 1841 to upwards of 1,168,000 at the end of 1861.

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 the country is, after all, still in its infancy. The presence of considerable deposits of valuable minerals has long been known. Thus, coal was discovered in 1797, and a shipload was exported to Bengal in 1799; silver was discovered by Count Strzelecki as early as 1839, and was worked as early as 1864; copper mining dates back to 1844; lead to about 1848; iron to about 1850; while the discovery of gold in payable quantities dates back to 1851. Cobalt, nickel, manganese, chromium, tungsten, molybdenum, mercury, antimony, bismuth, zinc, 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.

3. **Value of Production during 1910.**—Compared with the returns for 1909 the total mineral production of the Commonwealth shows an increase in 1910 of over £170,000. The largest advance is exhibited in the figures for New South Wales, where the total was over a million in excess of that for the preceding year. Queensland also shows an increase amounting to upwards of £53,000. The improvement in the States mentioned was, however, counterbalanced by more or less heavy decreases in the remaining States, the return for Western Australia shewing a falling-off amounting to nearly £537,000, while there was a decline in the Victorian yield to the extent of £271,000. In Victoria the decline is attributed to the falling-off in the gold yield, due to diminished returns from the lode mines at Bendigo, Ballarat, Maldon, and Berringa, and the deep alluvial workings at Rutherglen, Creswick, and Clunes. In Western Australia, the principal decreases were in gold and tin, gold alone shewing a falling-off of £529,000, through

exhaustion of the available deposits at some of the principal mines, while the diminished yield in tin is attributable to depletion of the more easily accessible stanniferous wash. In South Australia and Tasmania the production of copper was adversely affected by the low prices ruling for the metal in 1910. In common with the rest of Australia, there was also a falling-off in the gold yield for each of these States.

The value of the production of all minerals raised in each State during 1910 is given in the following table :—

## COMMONWEALTH MINERAL PRODUCTION IN 1910.

Minerals.	N.S.W.	Victoria.	Q'land.	S.A.	W.A.	Tas.	N. Ter'y.	C'wealth.
	£	£	£	£	£	£	£	£
Alunite ...	2,840	...	...	...	...	...	...	2,840
Antimony ...	1,450	6,255	...	...	...	...	...	7,705
Asbestos ...	...	...	...	...	...	...	...	...
Bismuth ...	2,004	...	114,572	...	...	4,249	...	20,825
Coal ...	3,009,657	189,254	322,822	...	113,699	48,609	...	3,684,041
Coke ...	189,069	...	...	...	...	...	...	189,069
Copper ...	486,257	450	932,489	306,120	95,928	566,972	1,196	2,389,412
Diamonds ...	2,881	...	...	...	...	...	...	2,881
Diatomaceous earth	242	2,000	...	...	...	...	...	2,242
Gems (unspecified)...	...	...	21,200	...	...	...	...	21,200
Gold ...	802,211	2,422,745	1,874,955	28,000	6,246,848	157,370	21,711	11,553,840
Gypsum ...	...	715	...	9,000	...	...	...	9,715
Iron ...	161,948	...	...	...	...	...	...	161,948
Iron oxide ...	714	...	...	21,945	...	...	...	22,659
Ironstone flux ...	1,321	...	35,429	...	12	...	...	36,762
Kaolin ...	790	202	...	...	...	...	...	992
Lead (pig, etc.) ...	248,561	...	30,401	260	...	...	...	279,222
Limestone flux ...	16,946	...	34,144	3,720	...	...	...	54,810
Manganese ...	80	142	3,127	...	...	...	...	3,349
Molybdenite ...	5,667	...	12,050	...	...	...	...	17,717
Opal ...	66,200	...	3,000	...	...	...	...	69,200
Platinum ...	1,418	...	...	...	...	...	...	1,418
Salt ...	...	*	...	27,600	...	...	...	27,000
Scheelite ...	15,747	...	286	...	...	...	...	16,033
Shale ...	33,896	...	...	...	...	214	...	34,110
Silver ...	175,775	2,090	92,685	625	18,777	...	...	289,952
Silver-lead bullion	1,685,704	...	...	...	...	...	...	1,934,735
Silver-lead ore ...	...	...	...	22	1,433	247,576	...	...
Tin ...	228,156	3,706	243,271	...	45,129	399,393	31,113	950,768
Wolfram ...	16,258	2,092	88,116	...	190	7,280	6,686	120,622
Zinc ...	1,289,634	...	...	...	147	...	...	1,289,781
Unenumerated ...	4,493	50	...	15,170	100	530	...	20,343
Total ...	8,449,919	2,629,701	3,708,547	411,862	6,522,263	1,432,193	60,706	23,215,191

\* Not available for publication.

† Including some amount of Wolfram.

It may be pointed out in connection with the figures given in the above table that the totals are exclusive of returns relating to certain commodities, such as stone for building and industrial uses, sand, gravel, brick clays, lime, cement, and slates, which might rightly be included under the generic term "mineral." Valuations of the production of some of these may be obtained from the reports of the various Mines Departments, but in regard to others it is impossible to obtain adequate information. In some instances, moreover, the published information is of little value. Thus, the New South Wales Mines Report for 1910 gives £21,000 as the production of building stone to the end of the year named, but it is explained in a note appended to the table that this sum represents exports only. The Victorian Mines Department estimates the production of building stone as £3,831,000, but the returns are incomplete. It has therefore been considered advisable to discard both totals. By restricting the comparison to the items enumerated above, it is believed that a fairly satisfactory estimate of the progress of the mineral industry can be readily obtained.

4. **Total Production to end of 1910.** In the next table will be found the estimated value of the total mineral production in each State up to the end of 1910. The figures given in this table are also exclusive of the same items referred to in connection with the preceding table.

## COMMONWEALTH MINERAL PRODUCTION TO END OF 1910.

Minerals.	N.S.W.	Victoria.	Q'land.	S. Aust.*	W. Aust.	Tas.	C'wealth.
	£	£	£	£	£	£	£
Gold ...	57,991,493	287,523,134	72,099,528	2,889,917	98,027,411	7,113,874	525,645,357
Silver and lead ...	53,823,556	215,600	2,044,036	412,387	636,728	5,696,289	62,828,596
Copper ...	10,614,209	213,673	8,098,768	27,276,490	974,410	9,407,888	56,585,438
Tin ...	8,682,446	773,530	7,438,354	278,997	928,327	10,578,014	28,679,668
Coal ...	62,260,508	1,901,927	4,714,973	...	822,424	522,181	70,223,013
Other ...	13,368,512	370,343	1,671,721	1,272,376	74,122	482,534	17,239,608
Total ...	206,740,724	290,998,207	96,067,390	32,130,167	101,463,422	33,800,780	761,200,680

\* Including Northern Territory.

The "other" minerals in New South Wales include antimony, £302,859; bismuth, £125,527; chrome, £101,108; diamonds, £114,343; opal, £1,237,899; oil shale, £2,251,081; and zinc, £4,358,691. In the Victorian returns antimony ore was responsible for £215,784. Included in "other" in the Queensland production were opal, £166,195; gems, other, £161,793; bismuth and wolfram, £735,742; antimony ore, £50,881; manganese, £59,407; limestone flux, £227,335; and ironstone flux, £182,584. The chief item in South Australian "other" minerals was salt, £734,594. In the Tasmanian returns limestone flux was responsible for nearly £100,000.

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

## (A) METALS.

## § 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 more or less detailed account of the finding of gold in the various States appears under this section in each of the preceding Official Year Books, but considerations of space preclude the retention of this matter in the present issue.

**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 in the Commonwealth 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.

In New South Wales the yield for 1910 was much below the average, the output from the more important centres, with the exception of Cobar and Hillgrove, showing a considerable falling-off. In Victoria the decrease was mainly due to the falling-off in the returns from the lode mines at Bendigo, Ballarat, Maldon, and Berringa, and the deep alluvial mines at Rutherglen, Creswick, and Clunes. The deficiency in Queensland was due to the reduced returns from Charters Towers, Gympie, and Ravenswood. At Gympie, in common with other centres, the gradual depletion of the richer ore renders increasing attention necessary to the problem of profitably dealing with the low grade material. The fall in the gold production in Western Australia is attributable to a decline in the yield for two or three mines, the most marked decreases being in the Peak Hill, East Coolgardie, and East Murchison fields.

## VALUE OF GOLD RAISED IN AUSTRALIA, 1851 to 1910.

Year.	N.S.W.	Victoria.	Q'sland.	S.A.	W.A.	Tas.	N.T.	C'wealth.
	£	£	£	£	£	£	£	£
1851 ...	468,336	851,596	...	...	...	...	...	1,319,932
1852 ...	2,660,946	9,146,140	...	...	...	...	...	11,807,086
1853 ...	1,781,172	10,976,392	...	...	...	...	...	12,757,564
1854 ...	773,209	8,873,932	...	...	...	...	...	9,647,141
1855 ...	654,594	11,277,152	...	...	...	...	...	11,931,746
1856 ...	689,174	12,214,976	...	8,800	...	...	...	12,912,950
1857 ...	674,477	11,320,852	...	876	...	...	...	11,996,205
1858 ...	1,104,175	10,384,924	...	12,348	...	...	...	11,491,447
1859 ...	1,259,127	9,394,812	...	730	...	...	...	10,654,669
1860 ...	1,465,373	8,896,276	11,631	...	...	...	...	10,373,280
1861 ...	1,806,171	8,140,692	3,137	...	...	...	...	9,950,000
1862 ...	2,467,780	6,920,804	499	12,442	...	...	...	9,401,525
1863 ...	1,796,170	6,779,276	11,820	...	...	...	...	8,587,266
1864 ...	1,304,926	6,489,788	66,513	...	...	...	...	7,861,227
1865 ...	1,231,243	6,446,216	74,216	...	...	...	...	7,751,075
1866 ...	1,116,404	6,187,792	68,325	...	...	...	...	7,372,521
1867 ...	1,053,578	6,005,784	151,125	...	...	4,382	...	7,214,869
1868 ...	994,665	6,739,672	473,956	2,936	...	2,536	...	8,213,765
1869 ...	974,149	6,179,024	417,681	15,593	...	514	...	7,586,961
1870 ...	931,016	5,217,216	390,925	24,217	...	7,475	...	6,570,849
1871 ...	1,250,485	5,475,768	492,635	6,000	...	14,218	...	7,239,106
1872 ...	1,644,177	5,325,508	527,365	6,363	...	16,055	...	7,519,468
1873 ...	1,396,375	4,681,588	572,996	293	...	18,390	...	6,669,642
1874 ...	1,041,614	4,390,572	1,062,899	4,175	...	18,491	...	6,537,751
1875 ...	877,694	4,273,668	1,196,583	7,034	...	11,982	...	6,366,961
1876 ...	613,190	3,855,040	1,140,282	9,888	...	44,923	...	5,663,323
1877 ...	471,448	3,238,612	1,043,780	...	...	23,289	...	4,777,129
1878 ...	430,200	3,092,160	1,149,240	1,225	...	100,000	...	4,712,825
1879 ...	407,219	3,035,788	1,034,216	90	...	230,895	...	4,708,208
1880 ...	444,253	3,316,484	944,869	...	...	201,297	...	4,906,903
1881 ...	573,582	3,933,512	957,570	880	...	216,901	111,945	5,194,390
1882 ...	526,522	3,458,440	785,868	3,080	...	187,337	82,274	5,043,521
1883 ...	458,530	3,121,012	736,810	10,534	...	176,442	77,195	4,580,523
1884 ...	396,059	3,114,472	1,062,471	15,469	...	160,404	77,935	4,826,810
1885 ...	378,665	2,940,872	1,062,514	18,295	...	155,309	70,414	4,626,069
1886 ...	366,294	2,660,784	1,187,189	32,535	1,148	117,250	63,139	4,428,339
1887 ...	394,579	2,471,004	1,481,990	72,003	18,517	158,533	68,774	4,665,400
1888 ...	317,241	2,500,104	1,690,477	34,205	13,273	147,154	34,802	4,737,256
1889 ...	434,784	2,459,352	2,695,629	37,305	58,871	119,703	47,651	5,853,295
1890 ...	460,255	2,354,240	2,182,563	20,808	86,664	75,888	80,769	5,261,217
1891 ...	559,231	2,305,596	2,030,312	27,380	115,182	145,459	98,701	5,281,661
1892 ...	575,299	2,617,824	2,164,391	26,097	226,284	158,917	109,658	5,878,470
1893 ...	651,286	2,684,504	2,167,794	12,561	421,385	141,326	108,130	6,186,986
1894 ...	1,156,717	2,867,816	2,330,282	33,401	877,099	217,024	109,699	7,502,038
1895 ...	1,315,929	2,960,344	2,150,561	26,060	879,748	206,115	102,816	7,641,573
1896 ...	1,073,360	3,220,348	2,132,979	14,350	1,068,808	237,574	81,210	7,828,629
1897 ...	1,104,315	3,251,064	2,552,668	39,020	2,564,977	296,660	81,210	9,889,914
1898 ...	1,201,743	3,349,028	2,750,348	10,676	3,990,698	291,496	84,789	11,678,778
1899 ...	1,623,320	3,418,000	2,838,446	15,582	6,246,732	327,545	63,565	14,533,190
1900 ...	1,070,920	3,229,628	2,871,578	14,494	6,007,610	316,220	67,988	13,578,438
1901 ...	737,164	3,102,753	2,541,764	16,613	7,235,653	295,176	76,609	14,005,732
1902 ...	684,970	3,062,028	2,720,512	24,878	7,947,661	301,573	70,325	14,811,947
1903 ...	1,080,029	3,259,482	2,839,801	28,650	8,770,719	254,403	61,600	16,294,684
1904 ...	1,146,109	3,252,045	2,714,934	76,025	8,424,226	280,015	5,983	15,897,337
1905 ...	1,165,013	3,173,744	2,517,295	45,853	8,305,654	312,380	30,971	15,550,910
1906 ...	1,078,866	3,280,478	2,313,464	27,000	7,622,749	254,963	54,225	14,631,745
1907 ...	1,050,730	2,954,617	1,978,938	20,540	7,210,749	277,607	21,928	13,515,109
1908 ...	954,854	2,849,838	1,975,554	12,300	6,999,882	242,482	23,943	13,058,853
1909 ...	869,546	2,778,956	1,935,178	30,206	6,776,274	190,201	24,148	12,604,509
1910 ...	802,211	2,422,745	1,874,955	28,000	6,246,848	157,370	21,711	11,553,840
Total £	57,991,493	287,523,134	72,099,528	877,810	98,027,411	7,113,874	2,012,107	525,645,357

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

The following table shews the quantity in fine ounces of gold raised in each State and in the Commonwealth during each of the last ten years, the value of one ounce fine being £4 4s. 11½d.

## QUANTITY OF GOLD PRODUCED IN THE COMMONWEALTH, 1901 to 1910.

Year.	N.S.W.	Victoria.	Queensland.	*S. Aust.	W. Aust.	Tasmania.	C'wealth.
	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
1901	173,543	730,450	598,382	21,946	1,703,417	69,490	3,297,228
1902	161,256	720,863	640,463	22,413	1,871,039	70,996	3,487,030
1903	254,260	767,347	668,546	21,247	2,064,803	59,892	3,836,095
1904	269,817	765,596	639,150	18,835	1,983,230	65,921	3,742,549
1905	274,267	747,163	592,622	18,086	1,955,317	73,540	3,660,995
1906	253,987	772,290	544,636	19,122	1,794,548	60,023	3,444,606
1907	247,363	695,576	465,882	9,998	1,697,555	65,354	3,181,728
1908	224,792	670,909	465,085	8,532	1,647,912	57,085	3,074,315
1909	204,708	654,222	455,579	12,796	1,595,270	44,777	2,967,352
1910	188,857	570,362	441,402	11,703	1,470,633	37,048	2,720,005

\* Including Northern Territory—Production in 1910, 5111 ozs.

3. **Changes in Relative Positions of States as Gold Producers.**—A glance at the figures in the table shewing the value of gold raised will sufficiently explain the enormous increase in the population of Victoria during the period 1851 to 1861, when an average of over 40,000 persons reached the State each year. With the exception of the year 1889, when its output was surpassed by that of Queensland, Victoria maintained its position as the chief gold-producer for a period of forty-seven years, or up to 1898, when its production was outstripped by that of Western Australia, the latter State from this year onward contributing practically half the entire yield of the Commonwealth. New South Wales occupied the second place on the list until 1874, 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 (including Northern Territory) 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 ten years the relative positions of each State in regard to the gold production of the Commonwealth were as follows :—

## RELATIVE POSITION OF STATES AS GOLD PRODUCERS, 1902 to 1910.

State.	Annual Average of Gold Production, 1902 to 1910.	Percentage on Commonwealth.	State.	Annual Average of Gold Production, 1902 to 1910.	Percentage on Commonwealth.
	£			£	
Commonwealth ...	14,492,467	100.00	New South Wales	956,949	6.74
Western Australia	7,554,042	53.22	Tasmania ...	256,617	1.81
Victoria ...	3,013,669	21.24	South Australia *	69,951	0.49
Queensland ...	2,341,239	16.50			

\* Including Northern Territory.

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 Tibooburra, 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 8505 ozs. in 1910, the chief yields being—Braidwood, 766 ozs.; Windeyer, 660 ozs.; Rockley, 643 ozs.; Hill End, 587 ozs.; and Uralla, 547 ozs. The quantity obtained by dredging was 31,487 ozs.; the largest returns being obtained at Araluen, 10,520 ozs.; Adelong, with 9322 ozs.; Wellington, 4113 ozs.; Braidwood, 3481 ozs.; Sofala, 1259 ozs.; and Stuart Town, 1181 ozs. The dredges in operation during 1910 numbered 70, of which 26 were of the bucket type and 44 were pumping plants. The value of the plants in operation (including recovery plants) was estimated at £364,255. The quantity of gold won from quartz amounted to 133,974 ozs. At the present time the Cobar district is the chief centre of the production from quartz, the yields from the Cobar and Canbelego fields included therein being respectively 37,101 ozs. and 31,433 ozs. Next comes the Hillgrove field, with 9767 ozs.; Wyalong, 9001 ozs.; Wellington, 8601 ozs.; Peak Hill, 6393 ozs.; and Murrumburrah, 5415 ozs.

The table below shews as far as can be ascertained the yield from alluvial and quartz working in each of the principal districts during 1910. Owing to the circumstance that it was impossible to obtain complete returns from the whole of the mine and battery owners the total for the State necessarily falls short of that given in preceding pages.

#### GOLD WON IN NEW SOUTH WALES, ALLUVIAL AND QUARTZ, 1910.

District.	Alluvial.		Quartz.	Total
	Other than by Dredging.	By Dredging.		
	ozs.	ozs.	ozs.	ozs.
Albert ... ..	350	...	1,852	2,202
Bathurst ... ..	1,229	182	7,399	8,810
Clarence and Richmond ... ..	108	...	564	672
Cobar ... ..	...	...	68,626	68,626
Hunter and Macleay ... ..	11	...	99	110
Lachlan ... ..	220	...	18,948	19,168
Mudgee ... ..	1,440	4,113	15,406	20,959
New England ... ..	120	30	150	300
Peel and Uralla ... ..	1,222	741	10,440	12,403
Southern ... ..	1,295	14,001	7,491	22,787
Tambaroora and Turon ... ..	1,348	2,440	884	4,672
Tumut and Adelong ... ..	1,162	9,980	2,115	13,257
Total ... ..	8,505	31,487	133,974	173,966

(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 the two deepest shafts were at the 31st December, 1910, 4614 and 4318 feet deep respectively. Altogether there were at the close of 1910 no less than fifty-three shafts in this district which had reached a depth of over 2000 feet. A considerable amount of attention is given to dredging and hydraulic sluicing, particularly in the Beechworth, Gippsland, Castlemaine, and Ballarat districts, the number of plants in operation at the end of 1910 being 107. The total quantity of gold won from dredge mining in 1910 was 87,156 ounces, and from sluicing 1163 ounces, the total area treated being 704 acres. The yields from alluvial

workings and quartz reefs as returned (in crude ounces) from the chief mining districts of the State during last year were as follows:—

### GOLD WON IN VICTORIA, ALLUVIAL AND QUARTZ, 1910.\*

District.	Alluvial.	Quartz.	Total.
	ozs.	ozs.	ozs.
Ararat and Stawell ... ..	15,003	4,728	19,731
Ballarat ... ..	27,688	74,437	102,125
Beechworth ... ..	88,661	17,178	105,839
Bendigo ... ..	1,993	177,157	179,150
Castlemaine ... ..	19,534	54,889	74,423
Gippsland ... ..	7,597	31,625	39,222
Maryborough ... ..	43,222	30,265	73,487
Total ... ..	203,698	390,279	593,977

\* As returned in crude ounces from chief mining districts.

The largest output from lode mines in 1910 was furnished by the Long Tunnel, at Walhalla, with 13,877 ozs.; followed by the Lord Nelson, St. Arnaud, with 11,622 ozs.; the Ajax, Daylesford, with 10,659 ozs.; and the Catherine Reef, Bendigo, with 10,541 ozs. Of the deep alluvial mines the Duke and Main Leads Consols, at Maryborough, produced 16,056 ozs., and the Cathcart, at Ararat, 11,055 ozs. In dredging, the Tewkesbury Amalgamated, at Bright, headed the list with a return of 4161 ozs.

(iii.) *Queensland.* Operations in Queensland are at present chiefly confined to quartz reefing, the yield from alluvial in 1910 being only 6286 ounces, while the quantity produced from quartz was 301,669 ounces; from copper and other ores 120,103 ounces; and from old tailings 13,342 ounces; making a total production of 441,400 ounces, valued at £1,874,955. The yields from the principal fields are given below:—

### GOLD WON IN QUEENSLAND, ALLUVIAL AND QUARTZ, 1910.

District.	Alluvial.	Quartz.	From Copper and other Ores and old Tailings.	Total.
	fine ozs.	fine ozs.	fine ozs.	fine ozs.
Charters Towers ... ..	631	143,010	3,843	147,484
Gympie ... ..	271	58,903	31	59,205
Mount Morgan ... ..	65	57,713	100,775	158,553
Ravenswood ... ..	424	21,121	...	21,545
Croydon ... ..	4	4,760	2,562	7,326
Clermont ... ..	2,590	...	...	2,590
Etheridge and Woolgar ... ..	1,365	8,779	9,792	19,936
Cloncurry ... ..	44	...	3,622	3,666
Gladstone ... ..	170	2,187	929	3,286
Rockhampton ... ..	73	33	8,176	8,282
Other districts ... ..	649	5,163	3,715	9,527
Total ... ..	6,286	301,669	133,445	441,400

(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, but the field has not been systematically prospected. It is stated that the gold occurs chiefly in vughs, crevices, and cellular quartz, the latter being at times exceedingly rich. The solid stone is low grade and is not worked. Operations are confined to the vein matter, which is passed through screens, and the larger lumps hand picked, the fines and all that contains vughs or cellular quartz being saved for treatment and the balance discarded. South Australia is not divided into mining districts as is the case in the other States. The Macdonnell Ranges, although within the boundaries of the Northern Territory and coming under the operation of the Northern Territory Mining Act, yet geographically belong to South Australia proper. The total output of gold for 1910 from the Northern Territory amounted to 5111 ounces, valued at £21,711.

(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. Estimates give the average value of ore treated in 1910 as 41.5 shillings as compared with 42.6 shillings in 1909. The total production of gold from all sources during last year was 1,470,632 ounces, of which only 0.4 per cent. was alluvial. Although Western Australia shared in the general decline in gold production which characterised the whole of the Commonwealth in 1910, the prospects at the end of that year were more or less encouraging. Rich discoveries at the Yilgarn field caused an inflow of fresh capital, and this was added to by finds in the Meekatharra, Black Range, Youanmi, and Ora Banda districts. Encouraging results attended deep sinking at the Great Fingall mine, and it is believed that energetic prospecting will be undertaken in the deep levels in the Kalgoorlie district. The production of gold on the various gold-fields during the year 1910 was as follows :—

#### GOLD WON IN WESTERN AUSTRALIA, ALLUVIAL AND QUARTZ, 1910.

Goldfields.				Alluvial.	Dollied and Spechnens.	Crushed.	Total.
				Fine ozs.	Fine ozs.	Fine ozs.	Fine ozs.
East Coolgardie	...	...	...	901	757	776,822	778,480
East Murchison	...	...	...	347	1,597	128,427	130,371
Mount Margaret	...	...	...	558	1,052	158,671	160,281
Murchison	...	...	...	476	1,199	122,676	124,351
North Coolgardie	...	...	...	246	287	72,215	72,748
Coolgardie	...	...	...	796	74	37,041	37,911
Dundas	...	...	...	58	342	29,227	29,627
North-east Coolgardie	...	...	...	259	1,248	21,520	23,027
Yilgarn	...	...	...	...	72	27,786	27,858
Broad Arrow	...	...	...	351	602	14,529	15,482
Peak Hill	...	...	...	89	723	3,515	4,327
Pilbara	...	...	...	885	297	4,188	5,370
Phillips River	...	...	...	18	48	8,129	8,195
Yalgoo	...	...	...	26	34	1,272	1,332
West Pilbara	...	...	...	175	...	1,309	1,484
Ashburton	...	...	...	248	...	...	248
Kimberley	...	...	...	266	...	...	266
Other goldfields	...	...	...	27	...	846	873
Total	...	...	...	5,726	8,332	1,408,173	1,422,231



The figures in the above table are compiled from returns from the individual mines and are somewhat incomplete ; the total is therefore less than the total shewn on page 487 from mint and export returns.

(vi.) *Tasmania.* The yield from Tasmania is also chiefly obtained from quartz reefing, although there is a little alluvial mining carried on in the Lisle district. The yields as returned from the chief centres in 1910 are shewn hereunder :—

#### GOLD WON IN TASMANIA, ALLUVIAL AND QUARTZ, 1910.

Description.			Northern & Southern.	North-eastern.	Eastern.	Western.	Total.
			ozs.	ozs.	ozs.	ozs.	ozs.
Quartz	...	...	23,473	...	1,434	11,851*	36,758
Alluvial	...	...	199	118	...	127	444

\* Gold contained in blister copper and silver-lead bullion.

The total production equalled 37,048 fine ounces, valued at £157,370.

5. **Remarkable Masses of Gold.**—Allusion has already been made in preceding Year Books to the discovery of “nuggets” and other remarkable masses of gold, but it is not proposed to repeat this information in the present issue.

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

7. **Place of Commonwealth in the World's Gold Production.**—In the table given below will be found the estimated value of the world's gold production, and the share of the Commonwealth therein during the fourteen years 1897 to 1910. The figures given in the table have been compiled chiefly from returns obtained direct by the Commonwealth Bureau of Census and Statistics from the gold-producing countries of the world.

#### WORLD'S GOLD PRODUCTION, 1897 to 1910.

Year.				World's Production of Gold.	Gold produced in Commonwealth.	Percentage of C'wealth on Total.
				£	£	%
1897	...	...	...	48,196,000	9,890,000	20.52
1898	...	...	...	58,136,000	11,679,000	20.09
1899	...	...	...	63,015,000	14,533,000	23.06
1900	...	...	...	52,086,000	13,578,000	26.07
1901	...	...	...	53,339,000	14,006,000	26.26
1902	...	...	...	60,619,000	14,812,000	24.43
1903	...	...	...	66,761,000	16,295,000	24.41
1904	...	...	...	70,554,000	15,897,000	22.53
1905	...	...	...	76,839,000	15,551,000	20.24
1906	...	...	...	83,180,000	14,632,000	17.59
1907	...	...	...	84,770,000	13,515,000	15.94
1908	...	...	...	90,370,000	13,059,000	14.45
1909	...	...	...	91,910,000	12,605,000	13.71
1910	...	...	...	94,193,000	11,554,000	12.27

While the production of gold in the Commonwealth rose by about 17 per cent. in the fourteen years from 1897 to 1910, the world's total increased by about 95 per cent. in the same period. The following table will be found interesting, as shewing the various foreign countries where the chief increases have taken place during the interval in question:—

#### INCREASE IN GOLD YIELD, VARIOUS COUNTRIES, 1897 to 1910.

Country.	1897.	1900.	1908.	1909	1910.
	£	£	£	£	£
United States ...	11,787,000	16,269,000	19,566,000	20,418,000	19,764,000
Canada ...	1,240,000	5,742,000	2,025,000	1,930,000	2,098,000
Mexico ...	2,045,000	1,884,000	4,137,000	4,582,000	4,930,000
Transvaal ...	11,654,000	1,481,000	29,973,000	30,988,000	31,973,000
Rhodesia ...	800	308,000	2,526,000	2,624,000	2,568,000
Gold Coast ...	85,000	38,000	1,195,000	979,000	780,000
Madagascar ...	8,500	142,000	345,000	434,000	434,000
India ...	1,571,000	1,893,000	2,178,000	2,070,000	2,203,000
Korea ...	208,000	371,000	480,000	390,000	522,750
Japan ...	142,000	290,000	457,000	520,000	518,000
Java ...	24,000	112,000	610,000	630,000	723,000
Costa Rica ...	2,000	31,000	122,000	116,000	96,000

The largest increase was recorded in the Transvaal, where the production nearly trebled itself in the fourteen years 1897 to 1910.

8. **Employment in Gold Mining.**—The number of persons engaged in gold mining in each State during the last ten years is shewn in the following table:—

#### PERSONS EMPLOYED IN GOLD MINING, 1901 to 1910.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	C'w'lth.
	No.	No.	No.	No.	No.	No.	No.
1901 ...	12,064	27,387	9,438	1,000	19,771	1,112	70,772
1902 ...	10,610	26,151	9,045	1,000	20,476	1,038	68,320
1903 ...	11,247	25,208	9,229	1,000	20,716	973	68,373
1904 ...	10,648	24,331	9,620	1,000	18,804	1,076	65,479
1905 ...	10,309	25,369	10,041	900	18,382	1,207	66,808
1906 ...	8,816	25,304	9,842	900	17,926	988	63,776
1907 ...	7,468	23,291	8,883	914	17,237	953	58,746
1908 ...	6,363	20,853	7,736	1,213	16,075	843	53,083
1909 ...	5,585	18,671	7,150	1,177	17,027	713	50,323
1910 ...	5,247	16,553	6,115	*1,256	16,279	682	46,132

\* Including 306 miners in Northern Territory.

### § 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 in 1910 was small, amounting to only 332 ozs., valued at £1418, while the total production recorded to the end of 1910 amounted to 11,910 ozs., valued at £22,131.

Operations were somewhat retarded in 1910 owing to the low average rainfall; nevertheless the production was smaller than might reasonably have been expected in view of the rise in price of the metal.

In Victoria the metal has been found in association with copper at the Walhalla Copper Mine in Gippsland. The mine was worked extensively from 1874 to 1881 and then abandoned, but was reopened in 1910. It is stated that there are 70,000 tons of ore in sight, assaying three to four per cent. copper, and containing also platinum and silver.

**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. Occurrence in Each State.**—(a) *New South Wales.* The occurrence of silver in New South Wales was first mentioned by Count Strzelecki in a letter addressed to Captain King, R.N., dated the 26th October, 1839. In his work, "The Southern Gold-fields," 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 State. The Broken Hill field, the chief lode of which was discovered in 1882 by Mr. Charles Rasp, constitutes one of the richest and most productive mining centres in the world. 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, originally worked for gold in 1875; Emmaville, 1884; Rivertree, on the Clarence River, 1887; Borah Creek, near Inverell, 1870; Rockvale, 1895.

(b) *Victoria.* 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.

(c) *Queensland.* In Queensland most of the important gold mines yield also supplies of silver, but the credit of establishing the silver mining industry *per se* belongs to the Ravenswood field, where in 1879 the recovery of a parcel of 40 tons of galena assaying 130 ozs. of silver to the ton, marked the opening of the industry. At Chillagoe in 1884 there were thirty-two silver-lead shows being worked, while during the decade 1885-1895 over 1½ million ozs. were raised at the Mount Albion mine. The Mungana mines are the mainstay of the Chillagoe district, and large deposits of silver and copper are still available in the Lady Jane and Girofla mines. On the Etheridge field silver-lead constitutes a fair proportion of the production, and a group of mines at Mosquito Creek, about twelve miles from Charleston, will considerably aid the output. In 1910 the total quantity of silver produced in Queensland was 861,202 ozs., valued at £92,685.

(d) *South Australia.* In South Australia silver-lead is found in the main range, south of Adelaide. The Wheal Gawl mine, near Glen Osmond, opened in 1841, was probably the first mine worked in the Commonwealth. Silver-lead deposits have also been noted north-east from Farina and west from Beltana. A small amount of silver-lead is also obtained in the Northern Territory.

(e) *Tasmania.* Tasmania is the only State in the Commonwealth besides New South Wales 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.

2. **Development of Silver Mining.**—In illustration of the 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 1910:—

**PRODUCTION OF SILVER AND LEAD, AUSTRALIA, 1881 to 1910.**

Year.	N.S.W.	Vic.	Q'land.	S. Aust.	W. Aust.	Tasmania.	C'wealth.
	£	£	£	£	£	£	£
1881 ...	...	5,239	13,494	1,182	11,224	...	31,139
1891 ...	3,621,614	6,017	21,879	5,927	250	62,138	3,717,825
1901 ...	1,954,964	6,550	69,234	3,886	7,718	325,335	2,367,687
1902 ...	1,487,837	4,900	72,851	42,063	9,467	387,024	2,004,142
1903 ...	1,539,989	4,898	109,177	10,870	19,153	428,125	2,112,212
1904 ...	2,131,504	4,990	96,418	1,387	45,912	318,971	2,599,182
1905 ...	2,496,709	4,100	102,388	3,244	44,278	415,248	3,065,967
1906 ...	2,864,057	4,980	151,577	12,982	37,612	552,704	3,623,912
1907 ...	4,290,128	4,355	187,870	13,873	26,674	572,560	5,095,460
1908 ...	2,346,941	2,835	206,716	9,030	23,883	322,007	2,911,412
1909 ...	1,839,688	2,310	167,636	673	19,977	298,880	2,329,164
1910 ...	2,110,040	2,090	123,086	907*	20,210	247,576	2,503,909

\* No production in 1910 in Northern Territory.

The figures quoted for New South Wales in the above table represent the *net* value of the product (excluding zinc) of the silver-lead mines of the State. In explanation of the values thus given, it must be noted that the metallic contents of the larger portion of the output from the silver-lead mines in the State are extracted outside New South Wales, and it is considered, therefore, that the State should not take full credit for the finished product. Hence the *net* value referred to above relates to that of the ore, concentrates, and bullion, as declared by the several companies to the Customs Department at date of export. The real importance of the State as a producer of silver, lead, and zinc is thus to some extent lost sight of. The next table, however, which indicates the quantity and value of these metals locally produced, and the quantity and value of concentrates exported during the last seven years, will shew the estimated total value of the yield:—

**VALUE OF PRODUCTION FROM SILVER-LEAD MINES OF NEW SOUTH WALES,  
1904 TO 1910.**

Year.	Value of Silver, Lead, and Spelter produced within the C'wealth.	Value of Concentrates Exported.	Total.
	£	£	£
1904 ...	2,088,784	642,125	2,730,909
1905 ...	2,131,317	1,181,720	3,313,037
1906 ...	2,112,977	1,876,834	3,989,811
1907 ...	2,228,420	3,574,775	5,803,195
1908 ...	2,008,410	2,400,997	4,409,407
1909 ...	1,176,394	2,707,630	3,884,074
1910 ...	1,755,220	3,180,850	4,936,070

As regards silver alone, the following table, which has been prepared on a basis similar to that on which the preceding table was compiled, shews the estimated total quantity and value of that metal yielded by the mines of New South Wales up to the end of 1903 and during the last seven years:—

**ESTIMATED QUANTITY AND VALUE OF SILVER YIELDED BY MINES OF NEW SOUTH WALES, TO END OF 1910.**

Period.	Produced in Australia.		Contained in Concentrates, etc., Exported.		Total Production.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Fine ozs.	£	Fine ozs.	£	Fine ozs.	£
To the end of 1903 ...	82,947,404	13,807,421	104,659,834	18,330,147	187,607,238	32,137,568
1904 ...	7,751,667	920,947	2,945,058	349,891	10,696,725	1,270,838
1905 ...	6,804,934	852,533	3,480,561	436,050	10,285,495	1,288,583
1906 ...	5,575,410	775,409	3,111,013	432,669	8,686,423	1,208,078
1907 ...	5,921,457	795,982	6,228,225	845,845	12,149,682	1,641,827
1908 ...	6,484,288	693,034	5,499,381	587,768	11,983,669	1,280,802
1909 ...	3,717,016	382,605	6,867,775	732,563	10,584,791	1,115,168
1910 ...	5,196,323	561,280	7,608,336	843,257	12,804,659	1,404,537
Total ...	124,398,499	18,789,211	140,400,183	22,558,190	264,798,682	41,347,401

Although no developmental work was done at the Proprietary Mine, which was practically idle throughout the year, the returns from the Broken Hill field for 1910 were considerably in advance of those for the two preceding years. Operations at the Proprietary were confined to retreatment of the surface dumps, but the smelters at Port Pirie were kept busily engaged, large quantities of ore and concentrates having been purchased from other mines and treated. The ore raised from the mines on the Broken Hill field amounted in 1910 to 1,243,684 tons, while the value of the output from all sources was £3,842,630.

In Tasmania the decrease was principally owing to the temporary stoppage of the Tasmanian Smelting Company's works, followed by the closing down of the Magnet and Hercules mines. The output of the Yerranderie field in New South Wales was not so large as in the previous year, operations being restricted owing to transport difficulties.

**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. The production in Queensland has, however, considerably expanded during the last few years.

(i.) *New South Wales.* (a) *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. A description of the silver-bearing area in this district is given in preceding issues of the Year Book.

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

**RETURNS OF BROKEN HILL SILVER MINES, 1910.**

Mine.	Authorised Capital.	Value of Output to end of 1910.	Dividends and Bonuses Paid to end of 1910.
	£	£	£
Broken Hill Proprietary Co. Ltd. ...	384,000	33,051,904*	9,848,000†
Broken Hill Proprietary Block 14 Co. ...	155,000	3,283,136	459,827
British Broken Hill Proprietary Co. ...	264,000	2,071,243	337,500
Broken Hill Proprietary Block 10 Co. ...	1,000,000	3,685,729	1,235,000
Sulphide Corporation Ltd. (Central Mine) ...	1,100,000	11,142,907†	797,500
Broken Hill South Silver Mining Co. ...	200,000	3,620,500	755,000
North Broken Hill Mining Co. ...	175,000	1,469,487†	291,440
Broken Hill Junction Mining Co. ...	100,000	813,055†	85,000
Broken Hill Junction North Silver Mining Co. ...	180,000	960,401†	43,793
Broken Hill South Blocks Ltd. ...	200,000	525,176	...
Broken Hill South Extended Ltd. ...	337,500	150,344	50,000
Totals ...	4,095,500	60,773,882†	13,903,060

\* The value of the ores purchased during 1908, 1909, and 1910 is not included. † Incomplete.  
† Excluding nominal value of shares (£1,744,000) in Block 14, British, allotted to shareholders of Broken Hill Proprietary.

(b) *Yerranderie*. The mines on the Yerranderie field in the Southern Mining District produced 783,295 ozs. of silver in 1910, besides small quantities of gold and lead, the total production being valued at £113,071. It is stated that mining operations are carried on under considerable difficulties owing to the heavy cost of transport, and that the advent of a railway (the construction of which is proposed) would completely change the outlook.

(c) *Kangiarra*. The yield from the Kangiarra field, in the Yass district, consisted of 133,777 ozs. of silver, besides small quantities of other metals, the total production being valued at £69,000.

(d) *Conrad*. The ore raised by the Conrad Mines Ltd., at Howell, in the Tingha division, amounted in 1910 to 23,429 tons, valued at £40,483, of which lead concentrates accounted for £15,220; and copper matte, £22,420.

(ii.) *Tasmania, West Coast*. The silver-lead mines on the west coast are now well established. Amongst the most important are the Mt. Zeehan, Zeehan-Montana, Zeehan-Western, Oonah, Comet, Hercules, Adelaide, North Mt. Farrell, and Tasmanian Copper. The total production of silver-lead ore in 1910 was 51,227 tons, valued at £247,576, the continued decrease since 1907 being due to interruption of work at the Tasmanian Smelting Company's works. The difficulties between the smelters and the producers have now been arranged, and it is hoped that normal conditions will be regained.

(iii.) *Queensland*. The yield for the chief silver-producing centres in 1910 was as follows:—Chillagoe, £37,000; Charters Towers, £12,470; Stanthorpe, £10,000; Etheridge, £9000; and Herberton, £6000.

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

#### WORLD'S PRODUCTION OF SILVER, 1902 to 1910.

Year ... ..	1902.	1903.	1904.	1905.	1906.	1907.	1908.	1909.	1910.
World's production* in 1000 fine ozs. ...	163,937	173,222	176,840	181,338	184,552	183,386	212,570	227,291	233,650

\* Add 000 to figures for fine ounces.

Australasia's share in the world's silver production in 1910 was estimated at 14,422,000 ounces, or about  $6\frac{1}{2}$  per cent. on the total production.

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.

#### PRICE OF SILVER, 1871 to 1910.

Year ... ..	1871.	1881.	1891.	1901.	1904.	1906.	1907.	1908.	1909.	1910.
Pence per standard oz....	60 $\frac{1}{2}$	51 $\frac{1}{8}$	45 $\frac{1}{8}$	27 $\frac{3}{16}$	26 $\frac{3}{8}$	30 $\frac{7}{8}$	28 $\frac{5}{16}$	24 $\frac{1}{2}$	23 $\frac{11}{16}$	24 $\frac{11}{16}$

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 $\frac{3}{4}$ d., the highest realised since 1893, when the average stood at 36 $\frac{5}{16}$ d.

6. **Employment in Silver Mining.**—The number of persons employed in silver mining during each year of the period 1901 to 1910 is given below:—

## NUMBER OF PERSONS EMPLOYED IN SILVER MINING, 1901 to 1910.

Year.	N S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tasmania.	C'wealth.
	No.	No.	No.	No.	No.	No.	No.
1901 ..	6,298	...	40	150	...	2,414†	8,902§
1902 ...	5,382	...	100	150	...	2,893†	8,525§
1903 ...	6,035	...	458	150	...	1,681†	8,324§
1904 ...	7,071	...	45	50	...	1,101	8,267
1905 ...	7,887	...	293	50	...	1,512	9,742
1906 ...	9,414	13	282	50	...	1,745	11,504
1907 ...	10,021	10	785	86	8	1,908	12,818
1908 ...	7,560	3	496	51	5	1,740	9,855
1909 ...	6,207	...	354	40	5	1,516	8,122
1910 ...	7,999	...	590	125*	21	1,173	9,908

\* Including 60 miners in Northern Territory. † Including copper miners. § Including copper miners in Tasmania.

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. **Production of Copper.**—The production of copper in the various States of the Commonwealth has been influenced considerably by the ruling prices, which have undergone extraordinary fluctuations. The quantity and value of the production in earlier years and for 1906 to 1910 is shewn in the following tables :—

## PRODUCTION OF COPPER, AUSTRALIA, 1881 to 1910.

State.	1881.	1891.	1901.	1906.	1907.	1908.	1909.	1910.
QUANTITY.								
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
N.S.W. { Copper	*	*	6,087	8,964	8,963	8,679	6,857	8,435
{ Ore			645	791	1,135	392	109	4,455
Victoria... { Copper			...	...	38	983	17	150
{ & Ore	*	*	...	...	...	...	...	...
Q'land ... { Copper	330	85	3,061	10,077	12,756	14,961	14,494	†16,387
{ Ore	3,824	3,551	6,736	8,406	8,763	6,152	5,776	5,199
S. Aust. ... { Copper	21,638	13,239	2,353	527	...	...	1,345	...
{ Ore	...	...	...	...	1,602	479	833	1,281
W. Aust. ... { Copper	...	*	10,157	7,430	3,727	2,503	6,959	6,309
{ Ore	...	...	9,730	8,613	9,035	8,833	8,638	8,864
Tasmania { Copper	...	...	10,029	2,235	...	1,185	1,588	...
{ Ore	...	...	...	...	...	...	...	...
C'wealth { Copper	...	...	25,614	36,060	46,019	44,167	36,598	40,166
{ Ore	...	...	23,184	10,983	...	...	10,018	10,914

\* Not available. † Including 97 tons of copper, Northern Territory.

## VALUE.

	£	£	£	£	£	£	£	£
New South Wales...	227,667	119,195	412,292	789,527	727,774	502,812	424,737	486,257
Victoria ...	8,186	216	...	...	2,356	3,928	44	450
Queensland ...	19,637	3,554	194,227	916,546	1,028,179	893,535	853,196	932,489
South Australia ...	418,296	235,317	500,077	743,671	705,031	345,968	342,329	*307,316
Western Australia ...	...	4,463	75,246	50,337	203,376	57,091	104,644	95,928
Tasmania ...	...	...	1,026,748	844,663	869,665	609,651	608,038	566,972
Commonwealth ...	673,786	362,745	2,208,590	3,344,744	3,536,382	2,412,985	2,332,988	2,389,412

\* Including £1196, Northern Territory.

2. **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 Mount Hope field was opened in 1878, Nymagee in 1880, and Lake George in 1882. 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 value of the output of the Cobar district in 1910 was £282,348, out of a total for the State of £486,527. Operations at the Great Cobar Mines were to some extent interfered with in the early months of the year by the coal miners' strike, but the shortage in production was more than counterbalanced by the increased output later, the total for 1910 being 6248 tons of copper as compared with 4855 in 1909. Owing chiefly to the low price of copper, and the lack of railway facilities, the Nymagee, Shuttleton, Mount Hope and Burruga Mines remained closed down, while operations were conducted on a limited scale only at Girilambone.

From the Grafton Company's mine at Cangai a considerably augmented output was supplied, the production for the year being valued at £41,477. The Kyloe mine, in the Cooma division, contributed materially to the increased output, the production from this mine being valued at £83,372, as against £29,996 in 1909. The Electrolytic and Refining and Smelting Company of Australia Limited, established at Port Kembla, had a successful year, and in view of the increasing business it has been decided to double the capacity of the works. During 1910 the output of electrolytic copper was 9952 tons, most of which was made from blister copper produced at Mt. Morgan, Queensland.

(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 Tara near Buchan. The production shewn in the table was obtained from the old copper mine at Walhalla, which was reopened in 1910.

(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 gold mine, discovered in 1882, also produces a considerable amount of copper, the production therefrom in 1910 exceeding that from any other district. As compared with the previous year, the increase in production in 1910 was due principally to the activity at the Mount Elliot mine, at Cloncurry, and the Einasleigh mine, on the Etheridge field. The production in 1910 from the more important districts was as follows:—Mount Morgan, £364,933; Mount Perry, £55,290; Cloncurry, £185,162; Rockhampton, £89,993; Chillagoe, £106,632; Etheridge, £76,132; Gladstone, £28,874.

(iv.) *South Australia.* Taking the entire period over which production extended, the yield of copper in South Australia easily outstrips that of any other State in the Commonwealth. In recent years, however, Tasmania, Queensland, and New South Wales have come to the front as copper producers, as the table on the preceding page will shew. Deposits of copper ore are found over a large portion of South Australia. The Kapunda mine, discovered in 1842 by Messrs. Dutton and Bagot, is situated fifty miles north of Adelaide, and is the oldest copper mine in the State. Up to the end of 1879 the production amounted to 70,000 tons, the metal possessing such a high standard of purity that it always obtained the highest prices in the world's markets. During the nine years 1870 to 1878 the production was valued at £157,000. The Burra Burra mine, located in 1845 by a shepherd named Pickett, is situated about 100 miles north of Adelaide. The original capital invested in this mine was £12,320 in £5 shares, on which no call was ever made, while dividends to the amount of £800,000 were paid. For many years this mine produced from 10,000 to 13,000 tons of ore, averaging 22 to 23 per cent.



of copper. During the 29½ years in which the mine was worked the production was valued at £4,749,000. In 1859 as many as 1170 persons were employed on it. The mine has lain practically idle for many years, but recently there have been attempts at reworking.

Yorke's Peninsula, between Spencer's Gulf and St. Vincent's Gulf, contains a large area of copper-bearing country. The principal mines at Wallaroo and Moonta are situated a few miles from Port Wallaroo, and date back to 1860. For about thirty years the Moonta mines were worked independently, selling their ores to the Wallaroo company. During its separate existence the Wallaroo field produced about £2,600,000 worth of copper, while Moonta yielded £5,396,000, and was the first Australian mining field to produce £1,000,000 in dividends. The amalgamation took place in 1889, and since that year the united properties have produced about £4,281,000 worth of copper. The entire yield from the date of first working is estimated at about £12,500,000. The mines just enumerated represent a very small proportion only of those opened on the copper-bearing areas of the State. Owing to the depression in the price of copper in 1910 mining operations were considerably restricted, except at the old and well-established mines. The Paramatta and Yelta mines, in the Moonta district, have now been acquired by the Government for the sum of £6000.

Copper is also obtained in the Northern Territory; the actual output of ore for the year, however, was only £1196 in value. This poor result was entirely due to the low prices and high cartage rates from outlying fields from which, in the main, copper is produced.

(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 lodes 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. The centres of production in 1910 were the Phillips River field, with 25,872 tons copper ore, valued at £96,745, and the West Pilbara field, which yielded 8480 tons, valued at £64,861.

(vi.) *Tasmania.* For a long time Tasmania was the largest producer of copper in the Commonwealth, but during the last four years Queensland has occupied the premier position. The cupriferous area in the island State stretches from Mount Lyell, Mount Tyndall, Mount Read, and Mount Murchison, in the western district, to some distance north of the Pieman River. Copper mining has also been started on the north-west coast, notably in the Stowport and Blyth River districts, and some attention has been given to the deposits at Rocky Cape and Boat Harbour. In 1910 the output of the Mount Lyell Mining and Railway Co. Ltd. was 8,193 tons of blister copper, which contained copper valued at £483,806, silver £70,017, and gold £50,367. This company during the year paid £180,000 in dividends. A new copper field at Mount Balfour is attracting considerable attention. A number of sections have been taken up and are being systematically prospected.

The output for the year 1909 was valued at £608,038, which was £1613 less than the previous year, and £261,628 less than that of 1907. Several of the mines which in past years were large producers remained closed down during the whole of 1909, while, taken generally, work at other mines throughout the Commonwealth was, for a variety of reasons, only conducted on a limited scale.

**3. Price of Copper.**—The great variation in price that the metal has undergone is shewn in the following table, which gives the average price in London and New York

during the last ten years. The figures are given on the authority of "The Mineral Industry." Prices of standard and best selected copper are given in preceding Year Books at various periods since 1897.

### FLUCTUATION IN THE VALUE OF COPPER, 1901 to 1910.

Year.	London Price per Ton Standard Copper.	New York. Price in Cents. per lb.	
		* Lake Copper.	Electrolytic Copper.
	£	Cents.	Cents.
1901 ... ..	66.79	16.55	16.11
1902 ... ..	52.46	11.89	11.63
1903 ... ..	57.97	13.42	13.24
1904 ... ..	58.88	12.99	12.82
1905 ... ..	69.47	15.70	15.59
1906 ... ..	87.28	19.62	19.28
1907 ... ..	87.01	20.66	20.00
1908 ... ..	59.90	13.42	13.21
1909 ... ..	58.73	13.34	12.98
1910 ... ..	57.05	13.04	12.74

\* The term "Lake" copper is used to designate all copper sold in the trade as such, regardless of the process by which it is refined.

There is no doubt that the steady rise in the price of copper from the year 1902 onwards caused a large amount of overtrading with consequent unhealthy inflation of values, while the sudden drop in 1908 was directly due to the financial panic in America. It is believed, however, that the increasing demand for the metal in electrical and other industries will, under ordinary circumstances, tend in time to establish prices on a sounder basis, and at higher rates than those quoted for the last twelve months in the table above.

4. **Relationship to World's Production.**—The world's production of copper in 1901 and during the last five years is estimated to have been as follows:—

### WORLD'S PRODUCTION OF COPPER, 1901 to 1910.

Year ... ..	1901.	1905.	1906.	1907.	1908.	1909.	1910.
World's production— (short tons) ...	583,517	770,221	788,492	798,205	835,623	922,408	955,037

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

### PERSONS ENGAGED IN COPPER MINING, 1901 to 1910.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tasmania.	C'wealth.
	No.	No.	No.	No.	No.	No.	No.
1901 ... ..	2,964	4	814	4,000	321	*	8,103†
1902 ... ..	1,699	...	666	4,000	113	*	6,478†
1903 ... ..	1,816	...	1,418	4,000	193	*	7,427†
1904 ... ..	1,850	...	1,094	4,000	169	925	8,038
1905 ... ..	2,171	...	1,435	4,500	125	2,269	10,500
1906 ... ..	3,047	3	2,598	5,000	296	2,391	13,335
1907 ... ..	3,764	10	3,941	5,254	611	2,614	16,194
1908 ... ..	2,745	9	3,540	4,558	283	2,076	13,211
1909 ... ..	2,024	2	3,241	4,504	497	2,038	12,306
1910 ... ..	2,286	40	2,418	‡4,199	559	2,042	11,544

\* Included with silver miners. † Excluding Tasmania.

‡ Including 49 miners in Northern Territory.

## § 6. Tin.

1. **Production of Tin.**—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, 1901, and 1906 to 1910:—

## TIN PRODUCED IN AUSTRALIA, 1881 to 1910.

State.		1881.	1891.	1901.	1906.	1907.	1908.	1909.	1910.
QUANTITY.									
		Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
New South Wales	{ Ingots	5,824	1,454	648	1,161	1,331	954	951	847
	{ Ore	609	203	11	510	583	841	992	1,021
Victoria ...	Ore	†	†	77	106	104	79	89	41
Queensland*	Ore	†	†	1,661	4,823	5,140	4,885	3,326	2,953
South Australia	Ore	†	†	81	398	436	441	427	364
West Australia	Black tin	†	†	734	1,495	1,502†	1,093†	698†	500†
Tasmania ...	Ore	†	†	1,730	4,473	4,343	4,521	4,511	8,701
Commonwealth	{ Ingots, ore, etc.	†	†	5,002	12,966	13,439	12,814	10,994	14,427
VALUE.									
		£	£	£	£	£	£	£	£
New South Wales...	{ Ingots	531,303	124,320	76,060	205,373	229,697	126,292	127,089	127,700
	{ Ore	37,492	9,643	464	50,371	63,698	79,155	83,940	100,456
Victoria ...	Ore	7,334	5,062	4,181	11,644	10,531	6,070	7,067	3,706
Queensland	Ore	193,609	116,387	93,723	490,283	496,766	341,566	244,927	243,271
South Australia	Ore	...	1,938	5,586	36,907	41,365	35,876	32,741	31,113†
West Australia	Black tin	...	10,200	40,000	157,644	166,139	83,595	65,959	45,129
Tasmania ...	Ore	375,775	293,170	212,542	557,266	501,681	421,580	418,165	399,393
Commonwealth	...	1,145,603	560,750	432,576	1,509,488	1,509,787	1,094,134	979,888	950,768

\* Dressed tin ore, about 70% tin. † Tin ingot and ore. ‡ Not available.  
 † Obtained in Northern Territory.

2. **Sources of Production.**—(i.) *New South Wales.* The bulk of the yield in New South Wales comes from the Tingha-Inverell district, the production last year being £103,267, out of a total for the whole State of £228,156. Of the total production in 1910, £158,467, or about 70 per cent., represents the value obtained by dredging. In the Emmaville division the yield of ore was estimated at 788 tons, valued at £76,034, the increase on the previous years' return being due to the satisfactory results of dredging. The known alluvial deposits are, however, being steadily depleted, while the testing of deep alluvial leads has not given very encouraging results. During the year the Sydney Smelting Company at Woolwich produced 847 tons of tin, valued at £127,700, from ore mined in the State.

(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 at Toora and Beechworth.

(iii.) *Queensland.* The increased price of the metal in 1910 led to renewed activity in the Herberton district, and several valuable deposits were located. The production from all sources in 1910 amounted to 2953 tons, valued at £243,271, more than half of which was produced at the Herberton mineral field.

(iv.) *Northern Territory.* Valuable lodes of tin are found in the Northern Territory at Mount Wells, 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. In 1909 there were 355 miners engaged in tin mining in the Northern Territory, and the quantity of tin ores and concentrates exported was 427 tons. This production was largely due to the progress at the Mount Wells mine, where, it is stated, there are enormous bodies of payable material awaiting development.

The metal has also been discovered near Earea Dam in South Australia.

(v.) *Western Australia.* The production of tin ore and ingot for the State during 1910 amounted to 500 tons, valued at £45,129, to which the Greenbushes field contributed 318 tons, valued at £27,974. The Pilbara Goldfield (Marble Bar district) was the only other large contributor.

(vi.) *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 1871 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 1910 was 3701 tons of ore, valued at £399,393, the largest producer being the Briseis Tin Mines Limited, in the North-east division, with a return of 646 tons. The Mount Bischoff mine paid dividends amounting to £39,000, making a total to the end of 1910 of £2,235,000.

**3. World's Production of Tin.**—According to "The Mineral Industry" the world's supplies of tin during each of the last five years were obtained as follows:—

#### THE WORLD'S TIN SUPPLIES, 1906 to 1910.

Origin	1906.	1907.	1908.	1909.	1910.
	Tons.	Tons.	Tons.	Tons.	Tons.
English production ... ..	4,522	4,407	5,052	5,198	5,810
Chinese exports ... ..	3,948	3,480	4,558	4,445	4,500
Straits to Europe and America ... ..	57,143	53,520	60,491	58,541	54,625
Straits to India and China ... ..	1,292	2,178	2,187	2,030	2,100
Australia to Europe and America ... ..	6,482	6,612	5,748	5,384	4,563
Banka sales in Holland ... ..	9,286	11,264	11,530	11,973	12,000
Billiton sales in Java and Holland ... ..	1,968	2,229	2,235	2,241	2,250
Bolivian arrivals in Europe ... ..	16,394	15,594	17,032	18,121	18,225
Total (long tons) ... ..	101,035	99,284	108,833	107,933	104,073

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 the year 1897 and from 1901 to 1910 was as follows:—

## PRICE PER TON OF TIN, 1897 to 1910.

Year.	Price per Ton.	Year.	Price per Ton.
	£ s. d.		£ s. d.
1897 ... ..	61 8 0	1906 ... ..	180 12 11
1901 ... ..	118 12 8	1907 ... ..	172 12 9
1902 ... ..	120 14 5	1908 ... ..	133 2 6
1903 ... ..	127 6 5	1909 ... ..	134 15 6
1904 ... ..	126 14 8	1910 ... ..	156 12 8
1905 ... ..	143 1 8		

According to "The Mineral Industry" the maximum price obtained for tin during the period 1897-1910 was reached in December, 1906, when the metal was quoted at £195 19s. 9d. per ton.

Recent advices shew that the price of tin has been steadily rising for some time, and it is expected that good values will be maintained sufficiently long to enable a number of new mines in Australia to be properly opened up.

5. **Employment in Tin Mining.**—The number of persons employed in tin mining during each of the years 1901 to 1910 is shewn below:—

## PERSONS ENGAGED IN TIN MINING, COMMONWEALTH, 1901 to 1910.

Year.	N.S.W.	Victoria.	Qld.	S. Aust.	W. Aust.	Tas.	C'wealth
	No.	No.	No.	No.	No.	No.	No.
1901 ... ..	1,428	...	1,148	...	413	1,065	4,054
1902 ... ..	1,288	...	1,467	...	249	1,260	4,264
1903 ... ..	2,502	...	1,598	...	294	1,331	5,725
1904 ... ..	2,745	50	2,237	...	284	1,304	6,620
1905 ... ..	2,884	50	2,936	...	479	1,351	7,700
1906 ... ..	3,795	95	2,872	...	890	1,659	9,311
1907 ... ..	3,173	87	2,582	554	1,003	1,828	9,227
1908 ... ..	2,456	53	2,140	384	614	1,588	7,235
1909 ... ..	2,037	48	2,158	355	406	1,576	6,580
1910 ... ..	2,028	25	1,932	322	326	1,598	6,231

\* In the Northern Territory.

## § 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.

Gratifying results have been achieved in the work of the profitable extraction of the zinc contents of the large heaps of accumulated tailings and from the ore raised on the Broken Hill field. The year 1909 witnessed the passing of this problem out of the experimental stage, and the practical solution of the difficulty which has confronted the mining companies for many years. At present not only is the zinc being obtained in a marketable form, but the silver and lead contents are being turned to profitable account. In 1899 the exports of zinc amounted to 49,879 tons; in 1909 they totalled 373,906 tons, valued at £1,041,280; and in 1910, 468,627 tons, valued at £1,289,634, the great bulk of the production being obtained from tailings. The following table shews the production of zinc in New South Wales from 1889 to 1910:—

## NEW SOUTH WALES.—PRODUCTION OF ZINC, 1889 to 1910.

Year.	Quantity of Zinc (Spelter and Concentrates) Produced.	Value.	Year.	Quantity of Zinc (Spelter and Concentrates) Produced.	Value.
	Tons.	£		Tons.	£
1889	97	988	1908	276,720	600,883
1891	219	2,622	1909	373,906	1,041,280
1899	49,879	49,207	1910	468,627	1,289,634
1907	237,219	536,620			

The total quantity of zinc (spelter and concentrates) produced in New South Wales to the end of the year 1910 was 1,782,822 tons, valued at £4,358,691. The average price of spelter per ton in the London market during each of the last five years was £27 1s. 5d. in 1906, £23 16s. 9d. in 1907, £20 3s. 5½d. in 1908, £22 3s. 8d. in 1909, and £23 1s. in 1910.

During the year 1910, 12 tons of zinc, valued at £147, were raised in Western Australia.

## § 8. Iron.

1. **General.**—The fact that iron-ore is widely distributed throughout the Commonwealth has long been known, and extensive deposits have been discovered from time to time at various places in New South Wales, Queensland, South Australia, Western Australia, and Tasmania. It will appear, however, from what is stated below, that until quite recently, little has been done in the way of converting these deposits into a marketable commodity.

(i.) *The Manufactures Encouragement Act 1908.* It was hoped that the passing by the Commonwealth Parliament of the Manufactures Encouragement Act, which came into force on the 1st January, 1909, would assist in firmly establishing the iron industry in Australia on a remunerative basis, both in the smelting of pig iron and in the production of bar iron and steel from Australian ore. The Act referred to provides for the payment of a bounty up to the 30th June, 1914, of a total of £150,000 (not exceeding £30,000 per annum) on all pig iron, puddled bar iron and steel, made from Australian ore and pig iron respectively, and for the payment of bounties up to the 30th June, 1912, to a total of £30,000, on galvanised sheet or plate iron or steel, on wire and wire netting, and on iron or steel tubes or pipes, on the following basis :—

## BOUNTIES PAYABLE ON AUSTRALIAN PIG IRON, BAR IRON, STEEL, etc.

Description of Goods.	Rate of Bounty.	Total Amount which may be authorised.	Date of Expiry of Bounty.
CLASS 1.			
Pig iron made from Australian ore ...	12s. per ton	£150,000	30th June, 1914
Puddled bar iron made from Australian pig iron ...	„		
Steel made from Australian pig iron ...	„		
CLASS 2.			
Galvanised sheet or plate iron or steel (whether corrugated or not) made from Australian ore	10 per cent. on value	£30,000	30th June, 1912
Wire netting, not being prison made and being made from Australian ore or from wire manufactured in the United Kingdom	10 per cent. on value		
Wire made from Australian ore			
Iron and steel tubes or pipes (except riveted or cast), not more than six inches internal diameter, made from Australian pig iron or steel	10 per cent. on value		

Particulars of the bounties paid under the above Act during the half-year ended the 30th June, 1909, and during the financial years 1909-10 and 1910-11 are shewn in the following statement:—

**PARTICULARS OF BOUNTIES PAID ON AUSTRALIAN PIG IRON, BAR IRON,  
STEEL, etc., 1909 to 1911.**

Description of Goods.	Steel made from Australian Pig Iron.	Puddled Bar Iron made from Australian Pig Iron.	Pig Iron made from Australian Ore.	Galvanised Sheet Iron made from Ore.	Wire netting made from wire manufactured in the United Kingdom	Total.
	£	£	£	£	£	£
Half-year ended 30th June, 1909	575	568	2,314	191	...	3,648
1909-10 ... ..	1,491	1,254	23,511	286	6,036	32,578
1910-11 ... ..	1,939	2,080	20,462	122	4,824	29,427
Total ... ..	4,005	3,902	46,287	599	10,860	65,653

So far New South Wales is the only State where bounty has been claimed, and the above figures, taken in conjunction with those in the succeeding table, show that production has not been as rapid as might have been expected. The Government of that State proposes to obtain the services of a well-known Scottish expert to inquire into the quality of the ore deposits, conditions of manufacture, &c.

2. **Production of Iron.**—(i.) *New South Wales.* Reference to the extent of the deposits of iron ore in the State, and the events leading up to the establishment of ironworks at Lithgow will be found in preceding issues of the Year Book: During 1910 the following materials were received at the blast furnace:—Iron ore, 72,825 tons; limestone, 31,890 tons; and coke, 54,619 tons. The output was 40,787 tons of pig iron, valued at £161,948, while 7815 tons of steel ingots were also manufactured. The following table shews the quantity and value of finished iron, pig iron, etc., made in New South Wales during the last seven years, chiefly from scrap iron, but partly from the smelting of iron ore:—

**NEW SOUTH WALES—PRODUCTION OF IRON, 1904 to 1910.**

Particulars.	1904.	1905.	1906.	1907.*	1908.†	1909.‡	1910.§
Quantity Tons	6,303	4,447	8,000	29,902	40,207	29,762	40,487
Value ... £	80,504	85,693	112,848	178,632	118,224	106,357	161,948

\* Includes 18,631 tons pig iron, valued at £60,550, produced from 34,500 tons of iron ore raised within the State. † Includes 30,393 tons pig iron, valued at £98,777, from 51,206 tons of ore raised within the State. ‡ Includes 26,762 tons pig iron, valued at £100,357, from 46,740 tons of iron ore raised within the State. § From ore raised within the State.

The bounty paid in 1909 and 1910 on iron and steel made from ores mined in New South Wales was as follows:—

## BOUNTY PAID ON IRON AND STEEL, NEW SOUTH WALES, 1909 and 1910.

Description.	1909.		1910.	
	Tonnage.	Bounty.	Tonnage.	Bounty.
		£		£
Pig iron ... ..	23,179.50	13,908	40,326.5	24,196
Puddled bar iron ... ..	1,938.50	1,163	3,383.5	2,036
Steel ... ..	1,855.25	1,113	3,410.0	2,046
Total ... ..	26,973.25	16,184	47,120.0	28,278

A quantity of iron oxide is purchased by the various gasworks for use in purifying gas, the output in New South Wales being drawn from the deposits at Port Macquarie and Mittagong. During 1910 the quantity raised was 1351 tons, valued at £714, while the total output to the end of that year was 18,353 tons, valued at £23,607. The quantity of ironstone disposed of for flux in New South Wales during 1910 exhibits a decrease, since the requirements of the smelting companies were diminished, owing to suitable ores being obtained. In 1910 the quantity raised was 1648 tons, valued at £1321, as against 4339 tons, valued at £3471, in the preceding year.

(ii.) *Victoria.* Iron ore has been located at various places in Victoria, particularly at Nova Nova, in the Gippsland district, and at Dookie. A blast furnace was erected in 1881 near Lal Lal, on the Moorabool River, and some very fair quality iron was produced, which was used for truck wheels and stamper shoes in the Ballarat mines. The fall in the price of the metal, however, led to the closing of the works. In his report for 1905 the Secretary for Mines 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. During the year 1910, 37,138 tons of ironstone, valued at £35,429, were raised, 33,734 tons of which, valued at £32,876, were procured in the Rockhampton district.

(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, situated about forty miles W.S.W. from Port Augusta. The estimated quantity of iron ore in sight at the Iron Knob and Iron Monarch has been set down at 21,000,000 tons.

(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. There are also deposits on Koolan Island at Yampi Sound.

(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. The total production of iron ore in 1908 was 3600 tons, valued at £1600, and was all raised by the Tasmanian iron mine at Penguin, but owing to the closing down of that mine in 1909, there has been no further production.



(vii.) *World's Production of Iron, 1910.* The quantity of iron produced in Australia is but a very small proportion of the world's production, which in 1910 amounted to 65,860,000 metric tons (pig iron). The leading position for magnitude of production is held by the United States, which in 1910 produced 27,637,000 tons, compared with Germany's 14,793,000 tons, and the United Kingdom 10,380,000 tons. The position of the three countries named is similar to what it has been for several years past.

## § 9. Other Metals.

1. **Aluminium.**—The ores from which aluminium is chiefly made in other countries are widely distributed in great abundance in New South Wales in the form of hydrous silicate of alumina, which occurs in all clays. In the form of bauxite or hydrous sesquioxide, it is found at Emmaville, Inverell, and Wingello, its existence being first recognised in the last named locality in 1889. The metal, however, has not 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 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 1910 the export of antimony metal and ore from New South Wales amounted to £1450. The total quantity of antimony ore raised in New South Wales up to the end of 1910 was 16,426 tons, valued at £302,859. Comparatively little attention was given to mining for antimony in New South Wales during 1910 owing to the low price ruling. The metal occurs in large quantities in the Hillgrove division, and can readily be mined extensively should the price warrant operations. The production of antimony ore in Victoria during 1910 amounted to 1262 tons, valued at £6255. The ore was raised by a syndicate operating at Costerfield. In Queensland extensive deposits were discovered at Neerdie, in the Wide Bay district, during 1872, also at Wolfram Camp on the Hodgkinson field, on the Palmer River, in the Ravenswood district, and on the Mitchell River in the Herberton district. The low price of antimony throughout the year 1910 rendered profitable working impossible. 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. In New South Wales about 200 tons of arsenic were obtained in 1910 by the Conrad Mines Ltd. at Howell.

4. **Barium.**—A valuable lode of barium sulphate has been discovered near Dalwin, on the North Lyell railway, in Tasmania, and the necessary plant is in course of erection to develop the deposit. It is stated that the lode is from  $2\frac{1}{2}$  to 7 feet wide over a length of over 40 chains.

5. **Bismuth.**—This metal has been found in New South Wales, near Glen Innes, and also in the vicinity of Pambula, its discovery dating from 1877. A large body of bismuth-bearing ore has been located near Oberon, and was being prospected during 1910, while several trial parcels were obtained for treatment from a mine at Kirkdale, in the Yass division. About  $6\frac{1}{2}$  tons of metal and ore, valued at £2004, were exported from New South Wales during 1910; the total quantity exported to the end of that year was 528 tons, valued at £125,527. In Queensland wolfram, molybdenite, and bismuth have been found in various parts of the Herberton and Chillagoe districts, but the chief centres of production are at Wolfram Camp, where they have been found in association, and at Mount Carbine, where chiefly wolfram is mined. Highly payable

deposits of the minerals have been found in shallow ground near Bampton. During 1910 an important new find of bismuth was made at the Glen, near Irvinebank. From the Kangaroo Hills field ore to the value of £2100 was produced in 1910, while the yield of bismuth from the Biggenden Bismuth and Gold Mine was valued at £7100. The total production in 1910, including wolfram, was valued at £14,572. In South Australia deposits are found at Balhannah, at Mount Macdonald, and at Winnininnie, on the shores of Spencer's Gulf. In Tasmania 10 tons, valued at £4249, were raised in 1910 at Middlesex.

6. **Chromium.**—In New South Wales chromium is found at Bowling Alley Point, on the Peel River, and also near Colac, but there was no production in 1910. The total exports to the end of 1910 amounted to 30,663 tons, valued at £101,108. Chrome iron ore is found in Queensland in the Rockhampton district, where the Elgalla mine, at Cawarral, produced 773 tons, valued at £581. A small quantity was also produced near Broadmount.

7. **Carnotite.**—A discovery of carnotite ore was made in 1906 twenty miles E.S.E. from the Olary railway station in South Australia, and steps are being taken to test its value commercially. With this object in view, 30 tons of ore have been sent to Europe for assay.

8. **Cobalt.**—This metal was found at Carcoar in New South Wales in 1888, and subsequently at Bungonia, Port Macquarie, and various other places. During 1910, 9 tons of cobalt ore, valued at £55, were exported, while the total quantity exported from New South Wales up to the end of 1910 was 884 tons, valued at £8065. Deposits have been noted in South Australia near Bimbourie, and South Blinman; in Western Australia at Norseman and Kanowna; and at various places in Victoria.

9. **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 New South Wales, in addition to the lead contained in silver-lead, ore, and concentrates, 21,195 tons of pig lead (including lead-carbonate and lead-chloride produced from the leaching plants at Broken Hill), valued at £248,561, were produced in 1910, as against 15,476 tons, valued at £186,073, in 1909. 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, the lead produced amounting to 2392 tons, valued at £30,401, of which 986 tons, valued at £12,508, were produced from the mines in the Chillagoe district, while the Etheridge, Herberton, and Charters Towers districts each produced over £5000 worth. At one time South Australia produced a fair amount of lead, £22,303 being raised in 1902, but the production has rapidly decreased, and in 1910, only 20 tons, valued at £260, were obtained.

10. **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. In the Copmanhurst division a lode yielding encouraging assays is being prospected by the Pulganbar Company. 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 1824 and 1891. Between O.K. and Mungana several shows have been prospected with encouraging results. Small quantities have been found disseminated over a large area near Willunga in South Australia.

**11. 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 Mount Miller, at Gladstone, and Mount Nansen, near Gympie, the product being utilised chiefly by the Mount Morgan mine. The production from the Mount Miller mine amounted in 1910 to 786 tons of ore, valued at £3106. Small quantities of manganese ore were raised in Victoria during 1910, from mines in the vicinity of Heathcote and Buchan. Extensive deposits of the ore were mined at Boolcunda in South Australia some years ago, but latterly the production has ceased. Deposits have also been noted at Kangaroo Island, Quorn, Tumby, and various other parts of the State. In Western Australia ores of the metal are found widely scattered, the black oxide being especially plentiful in the Kimberley district.

**12. Molybdenum.**—In New South Wales molybdenite (associated with bismuth) is obtained at Kingsgate, near Glen Innes, the export in 1910 being 47 tons, valued at £5667, as compared with 28 tons, valued at £3249, in the previous year. The production in Queensland for 1910 was 106 tons, valued at £12,050, the bulk of which was contributed by the mines in the Chillagoe field.

**13. Radium.**—It is reported that there have been several definite discoveries in Australia of the occurrence of minerals containing radium. The discovery at Olary, in South Australia, of carnotite, which is an alteration product of pitchblende, the compound from which radium is obtained, has already been referred to. In 1910 pitchblende was identified in portion of the workings at Olary, and a specimen, exhibiting a high degree of radio-activity, was obtained. This is the first authentic discovery of the mineral pitchblende in Australia. The deposits of radio-active uranium ores found near Mount Painter are now being mined, and it is hoped that they will prove of economic value as a source of radium. In another case a monazite from Pilbara, Western Australia, has been shewn to give off radium emanations. This mineral has been called "pilbarite." Yet another specimen of mineral having the composition of a secondary pitchblende has been discovered by a prospector. The exact place where this specimen was found is uncertain, but it is believed that it came from the New England district of New South Wales. It is stated that its radio-activity is very marked, the mineral being 1 per cent. more active than the Bohemian variety, and that it contains only such elements as were readily separable from one another by the methods used to obtain pure uranium and radium from Bohemian pitchblende. • Lastly, it is stated that the ores obtained at the Moonta mines, South Australia, contain from one-tenth to one-fifteenth of the amount of radium found in high-grade pitchblende, and that a product having a fairly high degree of radio-activity can be extracted therefrom with comparative ease.

**14. Tungsten.**—Wolfram and scheelite, the principal ores of tungsten, are both mined to a small extent in New South Wales. During 1910 the export of wolfram was 166 tons, valued at £16,258, and of scheelite 151 tons, valued at £15,747. Wolfram was mined chiefly in the Deepwater division, and scheelite at Hillgrove. A mine near Omeo, in Victoria, was developed during 1909, and 18½ tons of concentrates, valued at £1954, were produced during 1910. The Mount Bismarck Wolfram Mining Company, from their mine near Marysville, won 7½ tons of ore, valued at £69. In Queensland, tungsten ores are found in several districts, the chief centres of wolfram production in 1910 being Chillagoe £51,400, and Herberton £29,977. The total production of wolfram in 1910 was valued at £88,116. Small quantities of scheelite were also raised in the districts mentioned. A deposit of wolfram was discovered near Yankalilla in South Australia as far back as 1893, but the production up to date has been small.

In Western Australia a deposit of wolfram has recently been discovered in the West Kimberley district, about 70 miles to the north-east of Derby; two tons, valued at £190, were raised during 1910. Wolfram is mined in Tasmania at Ben Lomond and in the Middlesex district, the production for 1910 being 67 tons, valued at £7280. A rich lode of scheelite has been discovered on King Island in Bass Strait.

15. **Tantalum.**—Tantalite in small quantities has been found in the Greenbushes mineral field of Western Australia 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 in Western Australia 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 1908 a small quantity valued at £400 was exported. About £327 worth was reported as having been raised in the Greenbushes and Pilbara fields during 1909, but none was exported owing to the entire absence of any market. Small quantities of the mineral are also produced in the Northern Territory.

16. **Uranium.**—This mineral has been discovered in South Australia in the country between Mount Painter and Mount Pitts, about 80 miles east from Farina. The uranium ores occur most frequently in the form of torbernite and autunite, and are found over a considerable area. The discovery is therefore of considerable importance, since ores of this mineral are found to a very limited extent in other parts of the world, and uranium is the chief source from which radium is derived.

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.

## (B). NON-METALLIC MINERALS.

### § 10. Coal.

1. **Production in each State.**—(i). *Historical.* A historical account of the discovery of coal in each State will be found in preceding issues of the Year Book.

(ii). *New South Wales.*—In the early portion of the year 1910 the coal trade was in a very unsettled state owing to the continuance of labour troubles. The southern collieries did not resume operations till the middle of February, while those in the northern district were idle till March. Under these circumstances, therefore, the total coal production for the year, which amounted to 8,173,508 tons, valued at £3,009,657, may be considered as fairly satisfactory.

(iii). *Victoria.*—During 1910, 369,709 tons of coal were raised, an increase of 241,036 tons on the previous year. A State coal mine was established at Powlett River towards the end of 1909, and its contribution to the total production in 1910 was 201,053 tons. A railway, 27 miles in length, has been constructed from Nyora to the coal-field. There are six shafts at the mine from 30 to 170 feet deep and coal is being raised from five of them. Over 1100 men are employed at the mine and surface works. The township—under the name of Wonthaggi—has been laid out on modern lines, and elaborate arrangements have been made for its lighting and water supply, while State brickworks and quarries have been established. The population of Wonthaggi was given in 1910 as 8000, and the valuation of the borough as £330,000. Other payable seams in this district outcrop about five miles away, near Cape Patterson, and it is believed that the coal-bearing area has an extent of from twelve to fifteen square miles.

(iv.) *Queensland.* The number of collieries contributing to the output in 1910 was 37, and the quantity of coal raised was 871,166 tons, valued at £322,822, as against 756,577 tons, valued at £270,726, for the preceding year. The industry is at present in a very satisfactory position in the northern State, and owing to the wide area over which the deposits stretch, practically no limit can be set to its possibilities of extension.

(v.) *Western Australia.* Six collieries were in operation on the Collie field during 1910, and the output for the year, viz., 262,166 tons, was the highest ever recorded in the State.

(vi.) *Tasmania.* The principal collieries in Tasmania are the Cornwall and Mount Nicholas, the former producing 33,000 and the latter 37,000 tons out of a total yield in 1910 of 82,455 tons.

The quantity and value of coal produced in each State and in the Commonwealth at various periods since 1881, are shewn in the following table:—

### PRODUCTION OF COAL, AUSTRALIA, 1881 to 1910.

Year.	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	C'w'lth.
QUANTITY.							
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1881	1,769,597	...	65,612	...	...	11,163	1,846,372
1891	4,037,929	22,834	271,603	...	...	43,256	4,375,622
1901	5,968,426	209,329	539,472	...	117,836	45,438	6,890,501
1902	5,942,011	225,164	501,531	...	140,884	48,863	6,858,453
1903	6,354,846	69,861	507,801	...	133,427	49,069	7,115,004
1904	6,019,809	121,742	512,015	...	138,550	61,109	6,853,225
1905	6,632,138	155,136	529,326	...	127,364	51,993	7,485,957
1906	7,626,362	160,631	606,772	...	149,755	52,896	8,596,416
1907	8,657,924	138,635	683,372	...	142,373	58,891	9,681,095
1908	9,147,025	113,962	696,332	...	175,248	61,008	10,193,635
1909	7,019,879	128,873	756,577	...	214,302	66,162	8,185,593
1910	8,173,508	369,709	871,166	...	262,166	82,455	9,759,004
VALUE.							
	£	£	£	£	£	£	£
1881	603,248	...	29,033	...	...	4,465	636,746
1891	1,742,796	19,731	128,198	...	...	17,303	1,908,028
1901	2,178,929	147,228	189,877	...	68,561	18,175	2,602,770
1902	2,206,598	155,850	172,286	...	86,188	19,546	2,440,468
1903	2,319,660	43,645	161,798	...	69,128	19,628	2,616,859
1904	1,994,952	70,208	166,536	...	67,174	24,444	2,323,314
1905	2,003,461	79,060	155,477	...	55,312	20,797	2,314,107
1906	2,337,227	80,283	173,282	...	57,998	21,158	2,669,948
1907	2,922,419	79,706	222,135	...	55,158	23,558	3,302,974
1908	3,353,093	64,778	244,922	...	75,694	24,427	3,762,914
1909	2,618,596	76,945	270,726	...	90,965	26,464	3,083,696
1910	3,009,657	189,254	322,822	...	113,699	48,609	3,684,041

In New South Wales the decrease in the output for 1909, as compared with the previous year, was due to labour troubles, and as pointed out previously, the disturbed industrial conditions prejudicially affected the yield in the early months of 1910.

In Queensland the bulk of the increase in 1910 is accounted for by the larger output in the Ipswich and Darling Downs districts, which produced 729,000 tons of coal in 1910 as compared with 643,000 tons in the preceding year.

**2. Distribution and Quantity 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.

## COAL RAISED IN NEW SOUTH WALES, 1881 to 1910.

District.	1881.		1901.		1905.		1910.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.
	Tons.	£	Tons.	£	Tons.	£	Tons.	£
Northern ...	1,352,472	437,270	3,999,252	1,669,519	4,645,742	1,473,995	5,366,975	2,178,952
Southern ...	253,283	115,505	1,544,454	407,196	1,556,678	421,768	1,875,009	576,261
Western ...	163,842	50,473	424,720	102,214	429,718	107,698	931,524	254,443
Total ...	1,769,597	603,248	5,968,426	2,178,929	6,632,138	2,003,461	8,173,508	3,009,656

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 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. During the year 1910, the colliery passed into other hands, and as the financial conditions have been improved, it is proposed to push on more rapidly with the work of developing the mine.

(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:—(a) Labour troubles. (b) Difficulties of working arising from faults, displacements, and thin seams. (c) Increased cost of production as the workings extend. (d) The low price ruling for coal.

As pointed out in a preceding page, however, the production in 1910 was considerably in advance of that recorded in any preceding year.

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. At the Melbourne and Altona Colliery Company's mine at Altona, twenty-five men were employed winning brown coal at the end of 1910.

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

#### PRODUCTION OF COAL IN VICTORIA, 1902 to 1910.

Year.	State Coal Mine.	Ontrim Howitt Company	Jumbunna Coal Company	Coal Creek Proprietary.	Silkstone Co-operative Company	Austral Coal.	Other Companies.	Total Production.	Value.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	£
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	121,742	70,208
1905	...	71,989	49,009	27,710	1,624	...	4,804	155,136	79,060
1906	...	74,812	64,222	13,214	3,977	...	4,406	160,631	80,283
1907	...	64,083	61,755	3,762	7,565	...	1,470	138,635	79,706
1908	...	47,633	58,552	...	6,967	...	810	113,962	64,778
1909	2,946	44,156	65,945	3,265	...	10,631	1,230	128,673	76,945
1910	201,053	46,832	61,954	10,968	...	36,052	12,200	369,709	189,254

The separate entries for the various companies refer to production of black coal only, but for 1909, 500 tons of brown coal, valued at £75, which were obtained at Morwell, and for 1910, 50 tons, valued at £12, raised at Morwell, and 600 tons, valued at £265, obtained at Altona, have been included in the total production.

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

(iv.) *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. The beds in the Cook district are estimated to comprise rather more than 1000 square miles, but coal measures extend to the south-west far beyond Laura and to the north of the railway. Extensive beds occur in the basin of the Fitzroy River, in the Broadsound district, and at the Bowen River. Amongst other places where the mineral is found may be enumerated Clermont, the Palmer River, Tambo, Winton, Mount Mulligan, and the Flinders River. 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 1910.

Year ... ..	1861.	1871.	1881.	1891.	1901.	1910.
Quantity ... Tons	14,212	17,000	65,612	271,603	539,472	871,166
Value ... £	9,922	9,407	29,033	128,198	189,877	322,822

At present coal mining in Queensland is in a very satisfactory position, the increasing volume of the trade being chiefly due to the action of the Government in granting concessions to vessels coaling at local ports.

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

#### QUEENSLAND COLLIERIES, 1909 and 1910.

Collieries	1909.		1910.	
	Tons Raised.	Average Value at Pit's Mouth.	Tons Raised.	Average Value at Pit's Mouth.
Ipswich and Darling Downs ... ..	642,864	s. d. 6 8½	729,012	s. d. 6 11
Wide Bay ... ..	92,573	9 7½	93,055	10 5½
Rockhampton ... ..	15,538.	11 6	14,392	11 9
Clermont ... ..	5,469	4 6	34,707	8 0
Other (Nundah) ... ..	133	...	...	...
Total ... ..	756,577	7 1½	871,166	7 5

The output in 1910 was distributed approximately as follows:—Bunker and cargo coal, 393,000 tons; Railway and Government Departments, 261,000 tons; factories, works, etc., 217,000 tons.

(v.) *Western Australia.* The coal seams in Western Australia belong to the Carboniferous, Mesozoic, and Post-tertiary ages. Most of the coal contains a large proportion of moisture, and belongs partly to the hydrous bituminous and partly to the lignite class. The only 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 record output in 1909 and 1910 is consequent on the establishment of a bunkering trade at Bunbury and Fremantle, which has developed very satisfactorily. The production from this field since 1901 was as follows :—

#### PRODUCTION OF COAL IN WESTERN AUSTRALIA, 1901 to 1910.

Year ... ..	1901.	1904.	1905.	1906.	1907.	1908.	1909.	1910.
Quantity Tons	117,836	138,550	127,364	149,755	142,373	175,248	214,302	262,166
Value ... £	68,561	67,174	55,312	57,998	55,158	75,694	90,965	113,699



(vi.) *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, the quantity raised by these mines in 1910 being 33,000 and 37,000 tons respectively. The quantity of coal raised during the years 1901 to 1910 in the various districts was as follows:—

#### PRODUCTION OF COAL IN TASMANIA, 1901 to 1910.

District.	1901.	1904.	1905.	1906.	1907.	1908.	1909.	1910.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
North-western ...	2,952	2,282	1,261	1,878	1,045	...	1,543	1,720
Eastern ...	37,239	54,567	46,708	46,803	53,214	55,539	57,227	71,115
Midland ...	1,536	940	200	393	624	...	560	721
South-eastern ...	...	200	200	1,483	4,008	5,529	6,832	8,899
South-western ...	3,711	3,120	3,624	2,339				
Total ...	45,438	61,109	51,993	52,896	58,891	61,068	66,162	82,455

3. *Production of Coal in Various Countries.*—The total known coal production of the world in 1910 amounted to about 1140 million tons (exclusive of brown coal or lignite), towards which the Commonwealth contributed 10 million tons, or less than 1 per cent. 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 to 1910:—

#### COAL PRODUCTION, BRITISH EMPIRE, 1901-10.

Year.	United Kingdom.	British India.	Canada.	Australian C'wealth.	New Zealand.	Transvaal.
	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.	1000 tons.
1901 ...	219,047	6,636	5,791	6,881	1,228	712
1902 ...	227,095	7,424	6,667	6,858	1,363	1,420
1903 ...	230,334	7,438	7,107	7,115	1,420	2,012
1904 ...	232,428	8,216	7,370	6,853	1,538	2,151
1905 ...	236,129	8,418	7,739	7,496	1,586	2,327
1906 ...	251,058	9,783	8,717	8,596	1,730	2,583
1907 ...	267,831	11,147	9,385	9,681	1,831	2,574
1908 ...	261,529	12,770	9,720	10,194	1,861	2,690
1909 ...	263,774	11,870	9,376	8,186	1,911	3,235
1910 ...	264,433	12,047	11,425	9,759	2,197	3,549

#### COAL PRODUCTION, FOREIGN COUNTRIES, 1901-10.

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	2,609	12,895	8,885	261,875
1902 ...	16,156	300	105,747	23,493	28,893	2,679	12,012	9,589	269,277
1903 ...	17,532	315	114,763	23,415	33,668	2,654	12,526	9,979	319,068
1904 ...	19,294	316	118,874	22,395	32,964	2,974	12,813	10,602	314,122
1905 ...	18,368	317	119,350	21,506	34,652	3,152	13,454	11,818	350,821
1906 ...	21,378	292	134,914	23,191	32,920	3,157	14,475	12,845	369,783
1907 ...	25,583	300	140,885	23,324	35,411	3,637	14,881	13,656	428,886
1908 ...	25,487	300	145,298	23,179	36,044	3,823	14,843	14,387	371,288
1909 ...	24,062	243	146,397	23,140	36,519	3,799	14,868	14,806	411,432
1910 ...	22,650	298	150,372	23,532	32,254	3,751	14,834	15,286	447,837

\* Not available.

Including New Zealand the production from Australasia takes second place amongst the possessions of the British Empire, British India coming first in order.

**5. Export of Coal.**—The exports of coal from the Commonwealth are practically confined to New South Wales.

The total quantity of coal of Australian production (exclusive of bunker coal) exported from the Commonwealth to other countries in 1910 was 1,701,875 tons, valued at £908,969, of which amount 1,700,184 tons, valued at £907,961, were exported from New South Wales. The quantity of bunker coal taken by overseas vessels was 1,159,658 tons, of which 901,480 tons were taken from New South Wales.

(i.) *New South Wales.* 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 are given on the authority of the Mines Department of that State, and include both bunker coal and coal exported from New South Wales to other States of the Commonwealth.

#### EXPORTS OF NEW SOUTH WALES COAL, 1881 to 1910.

Year.	1881.	1891.	1901.	1906.	1907.	1908.	1909.	1910.
Quantity ... 1000 tons	1,030	2,514	3,471	4,962	5,744	6,099	4,394	4,690
Value ... £1000	417	1,307	1,682	2,081	2,662	3,021	2,234	2,459

The principal overseas countries to which coal was exported from New South Wales during the year 1910 were as shown hereunder. The quantity and value refer strictly to exports, and exclude bunker coal.

#### DESTINATION OF NEW SOUTH WALES OVERSEA EXPORTS OF COAL, 1910.

Country.	Quantity.	Value.	Country.	Quantity.	Value.
	Tons.	£		Tons.	£
Chile ...	553,302	303,627	Peru ...	41,796	22,989
Philippine Islands...	199,509	105,194	Hawaii...	64,016	33,842
Straits Settlements	140,620	72,553	United States ...	202,474	111,112
Fiji ...	36,267	17,899	India ...	67,763	32,753
New Zealand ...	228,023	117,974	Java ...	92,343	47,856

The quantity of bunker coal taken from New South Wales by overseas vessels was about 901,000 tons, valued at £493,000.

The distribution of the total output from New South Wales collieries during the last six years was as follows; the particulars given of amounts exported include coal shipped as bunker coal:—

#### DISTRIBUTION OF TOTAL OUTPUT OF NEW SOUTH WALES COAL, 1905 to 1910.

Year.	Exports to Australasian Ports.	Exports to other Ports.	Local Consumption.	Total.
	Tons.	Tons.	Tons.	Tons.
1905 ...	2,066,576	1,651,477	2,914,085	6,632,138
1906 ...	2,260,090	2,701,450	2,664,822	7,626,362
1907 ...	2,379,024	3,364,483	2,914,417	8,657,924
1908 ...	2,715,310	3,383,366	3,048,349	9,147,025
1909 ...	2,200,769	2,192,834	2,626,276	7,019,879
1910 ...	2,478,497	2,211,936	3,483,075	8,173,508

The figures quoted above are given on the authority of the New South Wales Mines Department. Owing to the abolition of the record of interstate trade it is impossible to give the quantities forwarded to each of the States of the Commonwealth.

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

**CONSUMPTION OF COAL IN AUSTRALIA, 1905 to 1910.**

Year.	Quantity of Coal Consumed.			
	Home Produce.	Produce of the United Kingdom.	Produce of Other Countries.	Total.
	Tons.	Tons.	Tons.	Tons.
1905 ... ..	5,468,000	...	8,000	5,476,000
1906 ... ..	5,352,000	1,000	15,000	5,368,000
1907 ... ..	5,954,000	3,000	12,000	5,969,000
1908 ... ..	6,037,000	4,000	11,000	6,102,000
1909 ... ..	5,367,000	2,000	7,000	5,376,000
1910 ... ..	6,897,000	110,000	198,000	7,205,000

The figures for 1910 are, of course, abnormal, the comparatively heavy importation from the United Kingdom and foreign countries being due to uncertainty in the local supply on account of the strike of coal-miners in New South Wales. Of the total importation from foreign countries, India supplied 138,000 tons, and Japan 28,000 tons.

**6. 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 decline then set in until 1905, when the price stood at a little over 6s., followed by a rise of one penny in 1906, and a further rise of eightpence in 1907. In 1908 the average was 7s. 4d.; in 1909, 7s. 5½d.; and in 1910, 7s. 4d. per ton. 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), 1905 to 1910.**

Year.				Northern District.	Southern District.	Western District.
				s. d.	s. d.	s. d.
1905 ... ..	...	...	...	6 4.15	5 5.03	5 0.15
1906 ... ..	...	...	...	6 5.28	5 6.60	4 10.81
1907 ... ..	...	...	...	7 4.41	5 7.44	4 6.90
1908 ... ..	...	...	...	8 0.78	5 10.91	4 5.52
1909 ... ..	...	...	...	8 3.48	5 11.91	4 9.34
1910 ... ..	...	...	...	8 1.44	6 1.76	5 5.56

(ii.) *Victoria.* In Victoria the average price of coal up to the 31st December, 1890, was 19s. 3d. per ton. In 1895 the price was still as high as 12s. 2d., but in the following

five years there was a serious decline, the value in 1900 being quoted at 9s. 7d. per ton. In 1901, however, there was an astonishing rise, the figure being as high as 14s. 7d. Since that year, however, the price again declined, the average for 1905 being 10s. 2d.; for 1906, 10s.; for 1907, 11s. 6d.; for 1908, 11s. 5d.; for 1909, 12s.; and for 1910, 10s. 6d.

(iii.) *Queensland.* The average annual price of coal at the pit's mouth in Queensland during the period 1901 to 1910 ranged from 5s. 8½d. in 1906 to 7s. 5d. in 1910. Prices in the principal coal-producing districts during the last five years were as follows:—

#### PRICE OF COAL, QUEENSLAND, 1906 to 1910.

District.	Value at Pit's Mouth.				
	1906.	1907.	1908.	1909.	1910.
	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.
Ipswich and Darling Downs ...	5 2½	6 1½	6 6½	6 8½	6 11
Wide Bay and Maryborough ...	8 0½	8 4	9 5½	9 7½	10 5½
Rockhampton ...	11 2½	11 6½	11 7½	11 6	11 9
Clermont ...	...	...	...	4 6	8 0

(iv.) *Western Australia.* The average price of the Collie (Western Australia) coal up to the end of 1901 was 9s. 4d. per ton, the price in 1901 being 11s. 7d. In 1902 the average stood at 12s. 3d., and from that time the price fell steadily until 1906, when it was 7s. 7½d. per ton. In 1907, the average price was 7s. 8½d.; in 1908, 8s. 7½d.; in 1909, 8s. 5½d.; and in 1910, 8s. 8d. per ton.

(v.) *Tasmania.* The average price per ton of coal at the pit's mouth in Tasmania was 8s. in 1901. In 1902 it was 8s. 7d.; in 1903, 8s. 9d.; in 1904 and 1905, 9s. 8d.; in 1906, 9s. 9d.; in 1907, 1908, and 1909, 8s.; and in 1910, 11s. 9d.

7. **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 six years ended 1910, was as follows:—

#### PRICES OF FOREIGN COAL, 1905 to 1910.

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.
1905 ...	6 11½	8 7½	10 6½	10 2½	5 8
1906 ...	7 3½	8 11	11 2½	12 2½	5 9½
1907 ...	9 0	9 8½	12 3	13 8½	5 11½
1908 ...	8 11	10 3½	12 11½	13 1½	5 11½
1909 ...	8 0½	10 2½	12 5½	11 8½	5 7½
1910 ...	8 2½	9 11½	*	11 10½	5 10½

\* Not available.

The price of coal at the pit's mouth in the principal British possessions is averaged by the same authority as follows:—

#### PRICE OF COAL, BRITISH POSSESSIONS, 1905 to 1910.

Year.	British India.	C'wealth of Australia.	New Zealand.	Canada.	Transvaal.	Cape of Good Hope.	Natal.
	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.	Per ton. s. d.
1905	3 4	6 2	10 7	9 4	7 3	18 8	8 3
1906	3 11	6 3	10 7	9 4	6 5	18 5	8 6
1907	4 8	6 10	10 7	10 8½	6 0	18 5	9 0
1908	5 3	7 4½	10 4½	10 8	5 10½	16 8½	8 10
1909	4 8½	7 6½	10 10½	10 10½	5 8	14 4½	7 1½
1910	4 1	7 6½	11 1½	10 8½	5 6½	13 7½	6 0

**8. Employment and Accidents in Coal Mining.**—The number of persons employed in coal mining in each of the States during the year 1910 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 over 6 millions, more than one-half of whom were employed in coal mining, the number in the United Kingdom being 992,000; the United States, 666,000; Germany, 613,000; France, 187,000; Belgium, 143,000; India, 116,000; and Austria, 74,000.

Recent returns shew the rate in the United Kingdom in respect of deaths through accidents in coal mines as 1.43, and for the British Empire 1.48 per 1000 persons employed in coal mines. For France the rate is given as 1.17, for Germany 2.30, and the United States 3.35. For foreign countries generally the rate is stated at 2.48 per 1000.

#### EMPLOYMENT AND ACCIDENTS IN COAL MINING, 1910.

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 ...	17,618	21	109	1.16	6.04	389,215	75,000
Victoria ...	1,532	3	22	1.90	14.36	123,236	16,805
Queensland ...	1,823	3	34	1.65	18.65	290,389	25,633
South Australia ...	...	...	...	...	...	...	...
Western Australia ...	521	2	78	4.00	149.71	131,083	3,361
Tasmania ...	248	...	4	...	16.13	...	20,614
Commonwealth	21,742	29	247	1.33	11.36	336,517	39,672

#### § 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 import during the year 1910 amounting to 16,891 tons, valued at £20,630, the bulk of which came from the United Kingdom, Belgium, and Germany, and was taken chiefly by South Australia, Victoria, and Western Australia. The table hereunder gives the production in New South Wales during the last five years.

#### COKE MADE IN NEW SOUTH WALES, 1906 to 1910.

Year.	1906.	1907.	1908.	1909.	1910.
Quantity ... Tons	186,060	254,609	283,873	204,274	282,337
Value, total ... £	110,607	159,316	199,933	137,194	189,069
Value per ton ...	11s. 11d.	12s. 6d.	14s. 1d.	13s. 5d.	13s. 4d.

The falling-off in the returns for 1909 is, of course, due to the shortage of supplies occasioned by the coal strike.

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 following table shews the amount manufactured locally, and the amount imported during the last five years; the quantities imported include shipments landed from other States of the Commonwealth.

**QUEENSLAND—COKE MANUFACTURED LOCALLY AND IMPORTED, 1906 to 1910.**

Year.	1906.	1907.	1908.	1909.	1910.
Manufactured locally ... .. tons	8,672	8,280	10,684	8,633	11,188
Imported ... .. „	22,661	34,013	58,804	55,559	*32,054

\* Nine months only.

The development in smelting operations in Queensland is reflected in the increased consumption of coke. It must be understood that the coke referred to above is the production of coke-making establishments only, and does not include the inferior article produced at gasworks.

## § 12. Oil Shale and Mineral Oils.

1. **Production of Shale.**—(i.) *New South Wales.* 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 1910 amounted to 68,293 tons, valued at £33,896, as compared with 48,718 tons, valued at £23,617, in 1909. With the exception of 1500 tons obtained in the Greta Measures, the whole of the output for 1910 was won in the Western District, chiefly from the mines of the Commonwealth Oil Corporation at Wolgan, and New Hartley, near Capertee. The retorts at Wolgan were ready for operation at the close of the year, while the British Australian Oil Company is erecting works for the production of oil at Hamilton. Up to the end of 1910 the entire production for the State amounted to 1,490,312 tons, valued at £2,251,081.

(ii.) *Victoria.* Up to the present no extensive deposit of oil shale has been located in Victoria.

(iii.) *Queensland.* Deposits of oil shale are known to exist at various localities in Queensland, and what is believed to be a payable oil-bearing area has been located near Roma. In 1907 a contract was let for sinking a bore at this place to search for artesian water, natural gas, or petroleum, to a depth of 4500 feet. In October, 1908, when the bore had reached a depth of 3702 feet, a flow of gas, estimated at over 1,000,000 cubic feet per day, was struck and became ignited accidentally. The fire was extinguished, and after an extra length of casing had been put down the gas was apparently shut off from below. It was then intended to continue the boring till the stipulated depth of 4500 feet was reached, but up to the present this has not been carried out.

(iv.) *South Australia.* In this State large areas of bituminous shale, of which the boundaries are only approximately known, occur at Leigh's Creek and Lake Phillipson. Reference to the mineral known as coorongite is made in sub-section 13.

(v.) *Western Australia.* A deposit of carbonaceous shale of considerable thickness is known to exist at Coolgardie, but the mineral has not yet been raised in any quantity.

(vi.) *Tasmania.* The extensive deposits of oil shale (tasmanite) in the Mersey district were not worked prior to 1910. The known shale area extends over a strip of country about six miles long and two miles wide, but it is probable that the area in which the shale beds occur is more extensive than is at present known. Two companies recently commenced operations in the vicinity of the Mersey, and about 14,000 acres of Crown land were applied for by investors and speculators. The production of shale in 1910 amounted to 364 tons, valued at £214. Kerosene shale of fine quality is found in the country between the Jessie and Flowerdale Rivers, but the extent of the beds has not been proved. The seams are in a series of sandstones and clays, approximately 250 feet thick; one of these seams is 20 inches in thickness.

2. **Export of Shale.**—In 1910 New South Wales exported 9085 tons of shale valued at £16,785, of which 2308 tons were sent to the United Kingdom, 6193 tons to the Netherlands, and 312 tons to India.

3. **Shale Oils Bounties.**—The Shale Oils Bounties Act 1910 provides for the payment of bounties on certain goods manufactured in Australia from Australian shale on or after the 1st July, 1910, and before the 1st July, 1913. The total amount to be made available for bounties under this Act is £50,000. Particulars are given in the following tabular statement:—

**COMMONWEALTH SHALE OILS BOUNTIES—AMOUNT PAYABLE.**

Description of Goods.	Rate of Bounty.	Maximum Amounts which may be paid during the Financial Year 1910-11.	Maximum Amounts which may be paid during each of the Financial Years 1911-12 and 1912-13.	Date of Expiry of Bounty.
Kerosene* ...	2d. per gallon.	£ 8,000	£ 16,000	30th June, 1913.
Refined paraffin wax ...	2s. 6d. per cwt.	2,000	4,000	

\* The product of shale, having a flashing point of not lower than 73 degrees Fahrenheit, determined by the "Abel Pensky" test apparatus in manner prescribed.

During the year ended 30th June, 1911, the Commonwealth Oil Corporation Limited, operating at Hartley Vale, New South Wales, received bounty on kerosene to the amount of £920, and on refined paraffin wax to the amount of £553.

### § 13. Other Non-Metallic Minerals.

1. **Alunite.**—Probably the most remarkable deposit of alunite in the world occurs at Bulladelah, 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 1910, 34,604 tons had been exported, valued at £102,048, the exports for the year 1910 being 1136 tons, valued at £2840. Supplies of accessible mineral having been largely depleted, the company which owns the quarries is now endeavouring to locate further deposits of a sufficiently high grade to pay for working.

It is reported that large deposits of a high-class alunite have been discovered near Sunbury, Victoria.

2. **Asbestos.**—This substance has been found in various parts of Australia, but up to the present has not been produced in any considerable quantity. In New South Wales the deposits at Jones' Creek, in the Gundagai division, were opened up during the year 1909 and a trial parcel of 15 tons shipped to Germany. It is stated that if reports are satisfactory a plant will be erected and mining operations actively carried on. 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, and in 1909 £154 worth of this mineral was raised. In 1899 Tasmania raised 200 tons, valued at £363, but there has been no production during the last ten years. Deposits of asbestos of the mountain leather and mountain cork varieties have recently been discovered at Oodlawirra in South Australia.

3. **Barytes.**—In New South Wales during 1910 about 343 tons of barytes, valued at £618, were obtained at Bethungra, in the Cootamundra division, while 100 tons were raised at Cobargo.

4. **Clays and Pigments.**—Valuable deposits of clays and pigments of various sorts are found throughout the Commonwealth. There is a considerable local production of earthenware, bricks, and tiles, but the finer clays have not as yet been extensively used. It is stated that kaolin of a high class has been discovered at Dunbible, near Murwillumbah, in New South Wales; during 1909 these deposits were being opened up, and parcels aggregating 30 tons realised £37 10s., but there was no production in 1910. From Tichborne, in the Parkes division, kaolin is despatched to Sydney for manufacturing purposes, while at Ulladulla about 100 tons of pottery clay were mined. Deposits of steatite near Wallendbeen were worked during 1910, the quantity disposed of during the year amounting to 98 tons. In Victoria 288 tons of kaolin, valued at £202, were raised during 1910, of which 198 tons were raised at Egerton, and the balance at Knowsley and Gordons. In Queensland 4186 tons of fireclay, valued at £1675, were mined during the year 1910. On Kangaroo Island, South Australia, where, it is stated, the first pottery mill in the Commonwealth was erected, there are vast deposits of felspar, china stone, silica, and firebrick clay. There are also very extensive deposits of fireclay near Ardrossan on the Yorke Peninsula, and it is stated that a syndicate has recently been formed to work these deposits. Deposits of ochre have been opened up at Dubbo and Wellington in New South Wales, and ochres and pigments of excellent quality have been produced therefrom. Extensive deposits of iron oxide, giving a return of 80 per cent. ochre, have recently been discovered near Oodlawirra in South Australia.

5. **Coorongite.**—This peculiar indiarubber-like material was first noted many years ago near Salt Creek and in the vicinity of Coorong Inlet, in South Australia. It was thought that the substance owed its origin to subterranean oil-bearing strata, but so far the search for petroleum has not been attended with success.

6. **Fuller's Earth.**—A deposit of this mineral has been located at Boggabri, in New South Wales, and trial samples have realised from £4 to £6 10s. a ton in Sydney. The deposit, which is of considerable extent, is situated in close proximity to the railway, and can, therefore, be handled very cheaply.

7. **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 was raised some years ago by the Graphite Plumbago Company at Mt. Bopple, near Netherby, on the Maryborough-Gympie line. There is an extensive deposit of the mineral at Mt. Bopple, but the quality is rather inferior. In Western Australia a company has recently been formed to work deposits near Bunbury.

8. **Gypsum.**—This mineral is found at various places in the Commonwealth. There is a large quarry at Boort, Victoria, while in South Australia deposits are being worked at Lake Fowler and near Marion Bay, Yorke Peninsula.



9. **Tripolite, or Diatomaceous Earth.**—Although tripolite has been found at Barraba, Cooma, Wyrallah, and in the Warrumbungle Mountains in New South Wales, the deposits have not yet been worked commercially on any considerable scale. From the deposits at Bunyan, in the Cooma division, 57 tons of diatomaceous earth, valued at £242, were produced in 1910. 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. From the deposit at Talbot, 500 tons, valued at £2000, were obtained in 1910.

10. **Salt.**—Salt is obtained from salt lakes in the western and north-western districts of Victoria, and from salterns in the neighbourhood of Geelong. Large quantities are also obtained from the shallow salt lakes of South Australia, chiefly on Yorke Peninsula. Lake Hart, about sixty square miles in area, situated about 120 miles N.W. from Port Augusta, contains immense supplies of salt of good quality, which at present, however, owing to distance from market, possess no economic value. The salt is simply scraped from the beds of the lakes in summer time and carted to the refinery. It is stated that care must be taken not to leave too thin a crust of salt over the underlying mud, as the resultant "crop" after the winter rains will in that case be smaller than usual. A bore recently put down near Kingscote, on Kangaroo Island, revealed brine which can be profitably used by evaporation. The production of crude salt in South Australia during 1910 was 54,000 tons, valued at £27,000. In Western Australia supplies are obtained from dried-up shallow lakes and consumed locally or exported. The chief centres of production were formerly Rottnest Island, near Fremantle, and Middle Island, near Esperance, but the greater part of that now produced is obtained at Port Gregory.

11. **Natural Manures.**—In Victoria large quantities of "copi," an impure hydrous sulphate of lime, are obtained in the North-western district. South Australia possesses deposits of rock phosphate near Port Clinton and Ardrossan on Yorke Peninsula, at Belvedere near Kapunda, and at Kooringa, and also at many other places which have only been prospected to a small extent. The production in 1910 was valued at £5200. 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 are available shewing the production of recent years.

## § 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 diamondiferous deposits were located. None of the diamonds so far discovered have proved of any considerable size, the largest weighing about  $6\frac{1}{2}$  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 1910 was estimated at 3606 carats, valued at £2881, while the total production to the end of 1910 is given as 170,960 carats, valued at £114,343. The yield in 1910 was contributed by miners working in the vicinity of Copeton, in the Tingha division. 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. In South Australia diamonds have been found on the Echunga goldfield, the most notable gem being Glover's diamond, which was sold for £70.

2. **Sapphires.**—These gems were discovered in New South Wales in 1851, near Burrandong. They 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 sapphires in Queensland in 1910 was valued at £21,200, and up to the end of 1910 the total was £161,793.

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, until recently, contributed the bulk of the production. In 1910, however, out of a total production valued at £66,200, the yield from the Lightning Ridge field near Walgett, amounted to £46,200, while the output from the White Cliffs field was returned at £20,000. At the Lightning Ridge field, operations extended over a large area, and some fine gemstone was won at the deeper levels. The colour and brilliance of the stones generally were quite up to the standard. Occasionally, black opals of very fine quality are found on this field, one specimen weighing  $6\frac{1}{2}$  carats being sold in 1910 for £102.

The total value of opal won in New South Wales since the year 1890 is estimated at £1,237,899.

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 about 1875. 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 1910 was estimated at £3000, and up to the end of that year at £166,500. 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. At present, the industry is not in a very satisfactory position as the shallower grounds of the older centres have been worked out, and there appears to be little disposition to explore the deeper grounds.

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. The mine at The Glen in the Emmaville division was reopened and worked for a short period during 1908, when about 1000 carats of emeralds, valued at about £1650, were obtained. The largest stone in the rough weighed 60 carats. 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 *zircon*s 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 *crocidolite* have been obtained at Yarra Creek in the Murchison district. *Rubies* have been found at various places in New South Wales and Queensland. *Tourmaline* has been found on Kangaroo Island, in South Australia, and *beryls* near Williamstown, Victoria.

### (C). GENERAL.

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

1. **Total Employment in Mining.**—The number of persons engaged in the mining industry in each State and in the Commonwealth is an index of the significance of the mineral wealth. During the year 1910 the number so employed was as follows:—

## NUMBER OF PERSONS ENGAGED IN MINING, 1910.

State.	Number of Persons Engaged in Mining for						Total.
	Gold.	Silver, Lead, and Zinc.	Copper.	Tin.	Coal and Shale.	Other.	
New South Wales ...	5,247	7,999	2,286	2,028	18,044	1,809	37,413
Victoria ...	16,553	...	40	25	1,532	120	18,270
Queensland ...	6,115	590	2,418	1,932	1,823	1,287	14,165
South Australia ...	950	60	4,150	...	...	1,020	6,180
Western Australia ...	16,279	21	559	326	521	5	17,711
Tasmania ...	682	1,173	2,042	1,598	248	27	5,770
Northern Territory ...	306	65	49	322	...	...	742
Commonwealth ...	46,132	9,908	11,544	6,231	22,168	4,268	100,251

The following table shews the number of persons engaged in mining in the Commonwealth during each of the years 1891, 1901, and 1910, together with the proportion of the total population so engaged:—

## PROPORTION OF PERSONS ENGAGED IN MINING, AUSTRALIA, 1891, 1901, 1910.

State.	1891.		1901.		1910.	
	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	37,413	2,291
Victoria ...	24,649	2,151	28,670	2,381	18,270	1,425
Queensland ...	11,627	2,934	13,352	2,664	14,165	2,394
South Australia ...	2,683	834	7,007	1,931	6,922	1,726
Western Australia ...	1,269	2,496	20,895	11,087	17,711	6,534
Tasmania ...	3,988	2,695	6,923	4,017	5,770	3,020
Commonwealth ...	74,820	2,341	113,462	2,992	100,251	2,294

**2. Wages Paid in Mining.**—In the next table will be found a statement of the average wages earned by employees 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 district. 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 or 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. For Western Australia, the rates shewn in gold mining refer to the chief centres only, and are exclusive of Nullagine where much higher rates prevail owing to increased cost of living consequent on the remoteness of the district. 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, 1910-11.

Class of Mine.	New South Wales.	Victoria.	Queensland.	South Australia.	Western Australia.	Tasmania.
<b>GOLD—</b>	per day.	per day.	per day.	per day.	per day.	per day.
Labourers ...	8/- to 9/-	6/- to 7/-	6/- to 12/-	8/-	9/- to 11/10	7/-
Bracemen ...	8/- to 10/-	6/6 to 7/6	3/6 to 12/-	8/-	9/- to 13/4	7/6
Platmen ...	8/6 to 10/-	6/6 to 7/6	7/- to 13/4	8/-	9/- to 13/4	7/6
Miners ...	9/6 to 10/6	7/6 to 8/4	7/4 to 13/4	9/6	10/- to 13/6	7/6
Wet ...	11/6	8/- to 9/-	10/-	11/-	10/10 to 15/2	8/4
Shaft-sinking ...	11/-	8/4 to 10/-	10/-	11/-	11/8 to 15/-	8/4
Wet ...	...	8/4 to 10/-	...	11/-	12/6 to 16/8	9/2
Blacksmiths ...	10/6 to 11/6	8/4	6/- to 16/8	9/6	12/- to 16/8	8/-
Carpenters ...	10/6 to 12/-	8/4	8/- to 16/8	10/6	12/- to 16/8	8/- to 8/4
Engine-drivers—						
Stationary ...	9/- to 11/-	8/4	9/- to 15/-	10/-	12/- to 15/-	8/-
Winding ...	11/-	10/-	9/10 to 15/-	10/-	12/- to 16/8	8/4
Battery feeders ...	9/3	5/- to 6/-	6/8 to 11/8	8/-	9/- to 11/10	7/6 to 8/-
Shift bosses ...	10/- to 11/3	9/-	9/- to 16/8	13/4	16/8	wk. salary
Machine miners ...	9/6 to 11/6	7/6 to 8/4	9/10 to 14/8	11/-	12/4 to 14/4	8/4
Timbermen ...	10/6 to 11/6	8/-	8/2 to 15/-	10/-	12/- to 15/-	8/4
<b>SILVER-LEAD—</b>						
Labourers ...	9/6	Not mined.	(Note.—The above figures refer to averages per shift in all metalliferous mines in Q'nsland)	8/-	Same as gold.	7/6 to 8/6
Bracemen ...	10/6			8/-		8/- to 9/-
Miners ...	11/- to 13/-			9/6		8/4 to 10/-
Blacksmiths ...	10/6 to 13/6			9/6		9/- to 12/2
Carpenters ...	12/6 to 13/6			10/6		9/8 to 13/4
Engine-drivers—						
Winding ...	12/-	One mine only	(see above)	10/-	Do.	9/4 to 19/-
Shift bosses ...	14/-			13/4		10/- to 13/4
Truckers ...	9/6			8/-		7/6 to 9/-
Timbermen ...	11/- to 12/-			10/-		8/4 to 13/4
<b>COPPER—</b>						
Labourers ...	8/- to 9/-	8/-	...	8/-	Do.	8/6 to 9/-
Miners ...	8/8 to 10/-	8/8	...	9/6		9/6 to 10/6
Blacksmiths ...	10/6	11/8	...	9/6		10/6 to 13/4
Carpenters ...	11/-	10/-	...	10/6		9/6 to 12/6
Engine-drivers—						
Winding ...	10/6 to 11/-	10/-	(see above)	10/-		11/-
Bracemen ...	8/6	8/6	...	8/-	Do.	9/6
Drill sharpeners ...	9/2	...	...	10/-		9/6 to 10/6
Timbermen ...	8/8 to 9/6	9/-	...	10/-		10/- to 11/6
Machine miners ...	9/6 to 10/6	...	...	11/-		9/6 to 10/6
Miners in wet ground ...	...	(sluicing)	...	11/-		15/- per shift
<b>TIN—</b>						
Labourers ...	8/-	7/6	...	...	Do.	7/- to 8/6
Miners ...	9/6 to 9/10	...	...	...		7/6 to 9/-
Blacksmiths ...	10/6	10/-	...	...		9/- to 13/4
Carpenters ...	10/6	10/-	...	...		9/- to 12/-
Engine-drivers—						
Stationary ...	9/- to 11/-	...	(see above)	Not mined.		9/- to 10/-
Shift bosses ...	10/-	10/-	...	...	Do.	8/- to 10/6
Nozzlemen ...	9/6	8/4	...	...		8/- to 9/6
Racemen ...	8/8	7/6	...	...		7/- to 9/6
Face bosses ...	...	...	...	...		9/- to 15/-
Boxmen ...	9/-	8/4	...	...		...
Sluicemen ...	8/8	8/4	...	...		8/6 to 9/6
<b>COAL—</b>						
Deputies ...	9/- to 11/4	8/- to 12/-	10/-	...	14/3	8/- to 8/6
Shot firers ...	10/- to 11/4	11/2	10/-	...	13/5	...
Shiftmen ...	7/- to 12/4	7/6 to 10/2	10/6 to 11/6	...	13/5	7/- to 8/-
Wheelers ...	4/10 to 9/1	6/6 to 9/2	4/- to 10/-	...	11/7	3/- to 7/-
Overmen ...	£3 to £5/10/wk	12/- to 15/-	13/4	...	£5 per week.	10/- to 11/8
Miners ...	10/- to 13/6	...	10/- to 11/-	...	13/-	8/- to 10/-
Machine-men ...	11/- to 12/5	12/5	10/-	...	13/5 to 14/11	...
Engine-men—						
Winding ...	11/- to 12/4	10/-	10/- to 12/-	Not mined.	Do.	...
Hauling ...	10/- to 11/3	10/-	9/- to 10/-	...		8/4
Other ...	8/9 to 11/3	9/2	8/6	...		6/- to 8/-
Labourers ...	7/- to 9/-	6/- to 8/-	7/6	...		6/- to 7/6
Blacksmiths ...	9/- to 11/4	9/- to 10/-	6/- to 10/-	...		7/- to 8/-
Carpenters ...	9/- to 11/-	9/- to 11/2	7/8 to 9/4	...		6/6 to 8/-
Safety lampmen ...	6/6 to 10/9	...	...	...	...	...
Platmen or banksmen	6/- to 9/6	7/- to 9/2	4/6 to 9 -	...	11/5	6/-

\* Contract 10/6 to 17/- . At State Mine 3/- per ton. The higher rates all at State Mine.

**3. Accidents in Mining, 1910.**—The following table gives particulars of the number of men killed and injured in mining accidents during the year 1910:—

**NUMBERS KILLED AND INJURED IN MINING ACCIDENTS, 1910.**

Mining for—	N.S.W.	Victoria.	Q'land.	S. Aust.	W. Aust.	Tas.	Cwlth.
<b>KILLED.</b>							
Coal and shale ...	21	3	3	...	2	...	29
Copper ...	7	...	5	3	...	6	97
Gold ...	4	12	8		27	2	
Silver, lead and zinc...	17	...	2		...	...	
Tin ...	1	...	...		...	...	
Other minerals ...	...	...	3		...	...	
Total ...	50	15	21	3	29	8	126
<b>INJURED.</b>							
Coal and shale ...	109	22	59	...	78	4	272
Copper ...	9	...	54	5	3	17	801
Gold ...	7	66	70		504	17	
Iron ...	...	...	...		...	...	
Silver, lead and zinc...	20	...	3		...	10	
Tin ...	...	...	...		2	8	
Other minerals ...	...	...	5		...	1	
Total ...	145	88	191	5	587	57	1,073

**§ 16. State Aid to Mining.**

**1. Introduction.**—The development of the mineral resources of the several States is fostered and encouraged by the respective Governments in various ways. It is proposed to deal below only with the more direct and special methods by which assistance is rendered for developmental or other purposes, and not to include herein particulars of certain general developmental works found in nearly all civilised countries, such as geological surveys and schools of mines; there is also, as a general rule in all States, some provision for free assays for prospectors. Particulars as to the total expenditure on mining development in each State from loan funds are given in the section of this book dealing with the subject of *State Finance* (see Section XX. § 4); it should be noted, however, that in addition considerable sums have been spent in some of the States on Government aid to mining out of the consolidated revenue.

**2. New South Wales.**—Though there is no Act in force in this State specifically relating to the provision of loans in aid of mining development and prospecting, various arrangements have been made for rendering financial assistance to prospectors and others.

(i.) *Prospecting Votes.* Since the year 1887 annual appropriations have been made by Parliament "to promote prospecting for gold or other minerals, and to encourage the opening of new goldfields." The total amount expended under these votes to the 31st

December, 1910, was £416,215. During the year 1910 aid was granted by the Prospecting Board in 208 cases, and refused in 158, while the total amount expended from the vote during the year was £11,280.

(ii.) *Boring Plants.* No special provision exists in New South Wales for the expenditure of funds on boring for minerals, though on several occasions, as, for instance, where the proving of the occurrence of coal in certain localities was considered to be a question of national importance, diamond drills have been provided from special votes.

(iii.) *Government Batteries.* Provision has been made for the erection of crushing batteries by the State, and also for assistance to prospectors in the erection of plants. In the latter case the amount advanced is to be repaid by agreement with the Secretary for Mines.

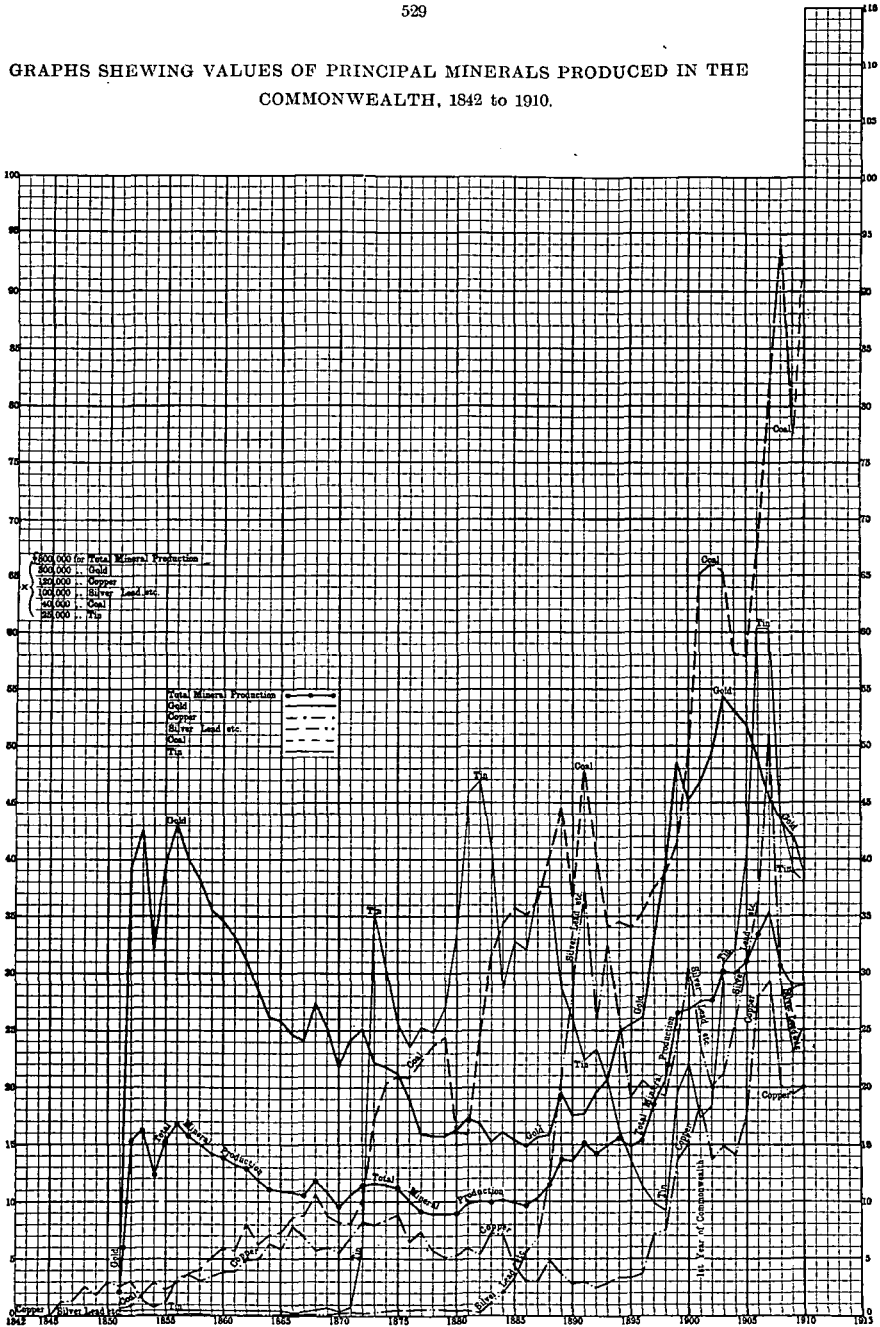
3. *Victoria.*—State assistance to mining in Victoria is provided for by the Mining Development Acts, 1896 to 1911. The original Act provided for the advances and grants to be made out of the sum of £140,000 raised by the issue of Treasury bonds, but an amending Act of 1898 provided that they should be paid also out of any moneys authorised from time to time. Various Acts have been passed for the appropriation of money, generally out of surplus revenue, for mining development or for special purposes in connection therewith, such as the equipment of Schools of Mines, the purchase of cyanide patents, of a metallurgical laboratory, or of boring machinery. A considerable amount of boring for the purpose of locating mineral deposits is also carried out by the Government.

(i.) *Advances to Miners for Prospecting.* Any two or more persons in combination may apply for an advance not exceeding £250 for the purpose of assisting them to prospect for any minerals or metals, and, subject to the usual evidence as to *bona fides*, undertakings to secure repayment, and proof of previous expenditure of £1 for every £1 granted, the Minister may recommend the granting of the loan.

(ii.) *Advances to Companies for Development of Mining.* Under Part I. of the Act of 1896, a company may apply for a loan for the purpose of (a) carrying on pioneer mining, (b) procuring and erecting machinery, and (c) providing all works necessary for carrying on such pioneer mining. The loans to any one company may not exceed £10,000, and are subject to the same conditions as advances to miners (see (i.) above). Under the amending Act of 1908 a sum of not more than £50,000 is authorised to be advanced by way of loan to companies for development of deep alluvial or of deep quartz mining. Evidence and information must be furnished by an applicant for a loan as to the history of the company, the nature of the land upon which it is intended to carry on mining operations, the machinery and appliances which it is proposed to use, and as to the estimated cost of such machinery; and a statement must be provided shewing the period of time over which the advance is to extend. Applications are referred by the Minister to the Government Geologist for report and are then dealt with by the Executive Council. Interest on loans at the rate of  $3\frac{1}{2}$  per cent. per annum must be paid half-yearly, and the payments to the Treasurer form a first charge on the profits and assets, except uncalled capital, of the company.

(iii.) *The Establishment of Plant for Testing Metalliferous Material.* Government testing plants may be established only in districts where there is no battery where ore is crushed or dealt with for payment. If the Minister be of opinion that there is a necessity in the interest of the mining industry for the establishment of a testing plant in any district, he may submit to the Treasurer such evidence as in his opinion is sufficient to justify the expenditure necessary to procure and erect the same, and the Treasurer may recommend the Governor to grant, and the Governor may grant, the necessary funds. The purchase, transport, erection, and removal of any testing plant, and the rates to be charged for its use must be in accordance with regulations made under the Act.

GRAPHS SHEWING VALUES OF PRINCIPAL MINERALS PRODUCED IN THE  
COMMONWEALTH, 1842 to 1910.



(See pages—for total mineral production, 484; gold, 486; silver, 494; copper, 497; tin, 501; coal, 511.

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 1910.

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 central portion of the diagram.

Of the twenty-four batteries which had been erected by the Government up to the end of the year 1910, sixteen have been managed by local committees, without expense to the Mines Department as far as the cost of working is concerned, while the remaining eight were worked directly under the supervision of departmental officers. The quantity of ore treated during 1910 was 2827 tons for a yield of 2349 ozs. of gold, shewing an average of 16½ dwts. per ton. The total cost of working and maintenance during the year amounted to £2982, and the sum received from the public for crushing was £841, giving a net cost of £2141. From 1897, when the first battery was erected, to the end of 1910, a total of 36,074 tons, yielding, 22,313 ozs., has been treated. A sum of £22,705 has been spent on the erection of the twenty-four plants; the amount received for crushing was £7905, and as the cost of maintenance was £30,012, the net cost amounted to £22,107.

Diamond drills are hired out by the Government under specified conditions to companies at a rental of from £2 to £4 per month according to size and kind of drill, £200 being lodged as security to cover breakages, and hand-boring plants are also hired under similar conditions at a rental of 10s. per month.

(iv.) *Construction of Roads and Tracks for Mining.* Under Part II. of the Act of 1896 the Minister may, subject to certain conditions, on the application of the council of any shire situated in an outlying or mountainous part of Victoria, construct a road suitable for the transport of mining machinery and appliances to any locality where mining is being carried on by more than one company, or by holders of miners' rights.

(v.) *Construction of Races and Dams.* Under Part IV. of the Act of 1896 the Minister is empowered, subject to the report of the Government Geologist and the Chief Engineer of Water Supply, and to the approval of the Treasurer and Governor in Council, to construct races and dams for working alluvial deposits for gold, to divert water for such uses subject to all existing rights, and to make regulations for the payment of rates for the use of the water.

(vi.) *Dissemination of Information.* Part VI. of the Act of 1896 provides that if the Minister be of opinion that it is advantageous to expend money for the purpose of disseminating information in Great Britain and other countries as to the mining resources of Victoria, and for holding in Victoria a public exhibition of mining machinery and appliances, he may recommend the Governor through the Treasurer to grant moneys necessary for the purpose.

(vii.) *Expenditure on Government Aid to Mining.* The following statement shews the total expenditure under the Mining Development and Surplus Revenue Acts up to the end of the year 1910 :—

#### VICTORIA.—EXPENDITURE ON GOVERNMENT AID TO MINING

TO END OF YEAR 1910.

Particulars.	Advances to Mining Com- panies.	Advances to Pros- pectors.	Boring for Gold and Coal.	Roads and Tracks.	Erection of Testing Plants.	Mis- cellaneous.	Total.
Amount	£ 142,977	58,429	59,231	69,425	22,705	48,224	400,991

In addition, the expenditure from votes from the 30th June, 1904, to the 30th June, 1910, was £76,771 on boring for gold and coal, and £16,417 on testing plants.

The repayments by companies of the loans advanced amounted on the same date to £17,851, and by parties of miners to £1977. A sum of £5292 has been repaid for part of the cost of boring, and also hire of plant and loss of diamonds. Several companies have



discontinued operations, and their security in the way of plant was taken possession of and sold for a total of £13,956. The amount of loans was, however, £30,626, and thus a loss of £16,670 was incurred.

4. **Queensland.**—Special assistance granted to the mining industry in this State may be conveniently dealt with under the headings specified below:—

(i.) *Assistance to Prospectors.* Assistance is granted in connection with sinking wells and providing equipment or rations for small parties of miners, and in some cases for prospecting or developing lodes. Such assistance is granted directly by the Minister, sometimes to a local authority, sometimes through the warden, and sometimes to miners or progress associations.

(ii.) *Grants for Roads and Bridges to Gold and Mineral Fields.* These grants are made either for the purpose of repairing existing roads and bridges or of constructing new ones; they are made with Executive approval, generally to local authorities.

(iii.) *Loans in aid of Deep Sinking.* These loans are made with the approval of the Executive in order to prove lodes at a depth or for diamond drilling.

(iv.) *The Mining Machinery Advances Act 1906.* Under this Act loans may be made for (a) procuring and erecting machinery for carrying on mining operations, or (b) procuring, erecting, or removing and re-erecting plant for treating minerals. Loans are granted by the Minister on the approval of the Governor in Council, interest at a rate not exceeding 5 per cent. per annum being charged. There is no limit to the amount which may be advanced, but the borrower must contribute £1 for £1 towards the work for which the loan is granted. The borrower must also execute a bill of sale or mortgage over the machinery or property, but the moneys advanced are not recoverable against the borrower personally, but only against the secured property.

(v.) *Amounts Granted or Advanced, 1910.* The total amount granted or advanced under the several systems above mentioned to the end of 1910 was as follows:—

**QUEENSLAND.—PARTICULARS OF AMOUNTS GRANTED OR ADVANCED, 1910.**

Purposes for which Granted, etc.	Prior to 1910.	During 1910.	Total to end of 1910.
	£	£	£
Assistance to prospectors ... ..	30,398	1,391	31,789
Grants for roads and bridges ... ..	15,314	3,732	19,046
Loans in aid of deep sinking ... ..	58,050	4,770	62,820
Advances under Act of 1906 ... ..	3,751	763	4,514
Total ... ..	107,513	10,656	118,169

In addition special sums are occasionally granted or advanced in certain cases; for example, in 1908 sums of £2460 and £306 were advanced for the purposes of oil boring and coal prospecting, respectively; while in 1910, there was a special allowance of £3505 for boring for coal.

5. **South Australia.**—By regulations made in February, 1894, and amended in January, 1899, under Part VI. of the Mining Act of 1893, provision is made for State aid to mining by way of:—(i.) Rewards to discoverers, (ii.) subsidies, and (iii.) loan of boring plant.

(i.) *Rewards to Discoverers.* Rewards may be paid to the discoverer (being the holder of a miner's right) of any new mineral district, or of any new and valuable

deposits of metals, minerals, coal, or oil. The amount of the reward depends upon the distance of the discovery from the nearest payable mineral deposits already worked, and upon the number of men employed on the new field within six months after the report of the discovery has been made; the reward may not in any case exceed £1000. No rewards have yet been granted.

(ii.) *Subsidies.* Applications for subsidies may be made by any person engaged in deep sinking, prospecting, or mining. No subsidy may exceed 100 per cent. on the amount proposed to be expended by the applicant, and the total grant to any one person or company may not exceed £1000. Fifty per cent. of the net profits must be applied in payment of the subsidy, and a bill of sale of all chattels belonging to the applicant and used in connection with the mine must be executed. If an applicant for assistance is mining on private land, the granting of a subsidy is subject to additional conditions. The total amount advanced by subsidies up to the 30th June, 1911, was £53,822; while the total repayments to date amounted to £6112. Portion of the outstanding debit is represented by machinery that has fallen into the hands of the Government.

(iii.) *Loan of Boring Plant.* The regulations also provide for the loan of diamond drills. There are two Government boring plants in South Australia, the capital expenditure thereon up to the 30th June, 1909, amounting to £6057.

(iv.) *Government Batteries and Cyaniding Plants.* There are four Government batteries and cyanide works in South Australia, the capital cost thereof amounting to £14,319. Up to the end of the year 1910 the total quantity of ore treated by these plants amounted to 18,338 tons, from which 15,207 ounces of gold, valued at £55,669, were extracted.

**6. Northern Territory.**—In the Northern Territory, Government assistance in the form of free rations is granted to prospectors and free assays are made. There are three Government boring plants, and two batteries and cyanide plants (both the latter being situated in the Macdonnell Ranges). The total amount of ores treated at the batteries up to the end of 1910 was 11,349 tons, from which 14,067 ounces of gold, valued at £52,133, were recovered.

**7. Western Australia.**—In this State, Government aid to mining is provided both under the Mining Development Act 1902 and under a more general vote for developmental purposes. A large amount of general developmental work has been carried out by the Government, particularly in regard to water supply; particulars of the eastern goldfields water supply scheme may be found in the section of this book dealing with *Water Conservation and Irrigation* (see Section XIV. § 1). The Act of 1902, referred to above, is in many respects similar to the Victorian Act of 1896; its chief provisions may conveniently be considered under the headings indicated below.

(i.) *Advances to Prospectors.* The Minister may, after obtaining a report from a professional officer, grant a loan not exceeding £300 to any miner who applies for assistance to enable him to prospect for gold or minerals. An applicant must furnish the necessary descriptions, statements, and information, verified by statutory declarations, and for every £1 advanced the borrower must expend £1 in work, labour, or material.

(ii.) *Advances for Pioneer Mining.* The purposes for which, and the conditions upon which, advances may be made are similar to those specified under Part 1 of the Victorian Act of 1896 (see 3 ii. above); the amount advanced to any one borrower is limited to £1000.

(iii.) *Establishment of Testing Plants.* Plant for crushing, ore-dressing, cyaniding, or smelting may either be established by the Minister or he may subsidise companies who are willing to erect and work such plant for the public at prescribed rates. Any such plant may only be erected in a district (a) in which large deposits of ore exist,

(b) where existing plant for treating deposits in bulk at reasonable rates is not available, and (c) where the establishment of such plant is necessary for the development of mining.

In 1910 there were thirty-four State batteries and twenty-four cyanide plants in operation; there were also five slime plants and two tin-dressing plants. The total amount expended on the erection of State batteries up to the end of 1910 was £91,982 from revenue, and £192,319 from loan, giving a total of £284,301. During the year receipts amounted to £75,975, and working expenditure to £77,458.

The total value of gold and tin recovered to the end of 1910 at the State plants was £3,480,671, resulting from the treatment of 784,407 tons of gold ore and 45,492 tons of tin ore.

(iv.) *Assistance for Boring.* Subject to certain conditions the Minister may agree to pay not more than half the cost of boring either for gold, minerals, or water, and with the approval of the Governor and after receiving a report from the proper officer that such boring is in the general interest of the State, he may pay the whole cost.

(v.) *Miscellaneous.* The Minister may advance or himself expend moneys (a) to drain any area, (b) to assist mining by sinking or cross-cutting; (c) to sink shafts for minerals at great depths, and (d) to provide means of transport for miners to prospect unproved country.

(vi.) *Particulars of Advances, 1910.* The following statement shews the sums advanced during the year 1910 under the provisions of the Mining Development Act:—

**WESTERN AUSTRALIA.—ADVANCES MADE IN 1910 UNDER MINING DEVELOPMENT ACT, 1902.**

Particulars.	Advances in Aid of Mining Work and Equipment of Mines.	Advances in Aid of Boring.	Subsidies to Crushing Plants.	Providing Means of Transport.	Total.
Amount... £	4,873	276	930	202	6,281

In addition to the above, amounts totalling £1620 were expended from the Mining Development Vote on various matters, such as water supply, roads, subsidies to assist cartage of ore, drainage, timber tramways, and subsidies for development work done below the 100 feet level in small mines. Subsidies to the extent of £1240 were paid to private crushing plants, the condition being that they crush for the public at fixed rates. The receipts under the Mining Development Act, exclusive of interest payments, amounted to £2333 for refunds of advances, £141 for sales of plant, and £728 miscellaneous—a total of £3202.

8. *Tasmania.*—In Tasmania provision is made for State aid to mining under the Deep-Sinking Encouragement Acts 1899, 1900, and 1901. Under these Acts sums of £5000, £2000, and £1000 respectively were provided for assisting persons and companies to sink shafts or to drive tunnels below a specified depth, the amount advanced in any particular case varying according to the amount expended by the borrower. The total amount advanced to October, 1909, was £6861, granted to five companies in sums ranging from £682 to £1452, leaving an unexpended balance of £1139. None of the companies to whom the advances were made has been successful, and consequently none of the sums advanced, which were to be repaid out of profits, has been refunded. A sum of £200 was placed on the estimates for 1910-11 for the purpose of assisting prospectors, the money to be expended on the £ for £ principle, not exceeding £50 in any one case.