

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 even more remarkable 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, radio-active ores, 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 1915.**—The continuance of the war in 1915 naturally had a very serious effect on the mineral industry in Australia, especially in New South Wales, where the total production for the year shewed a decrease of nearly £437,000 as compared with 1914, and of over two millions sterling in comparison with 1913. Operations on the Broken Hill field, a large proportion of the production from which was usually exported to the now belligerent countries, were, again seriously curtailed, the output of silver, lead, zinc hence shewing a decline of about £1,300,000 compared with 1913, while the export of zinc concentrates dropped by over £400,000. In Victoria, owing to the decline in the gold yield, the returns for 1915 showed a decrease in production of about £349,000. The Queensland production shews an advance of £346,000, due chiefly to increased yield from auriferous copper ores. South Australia shews an increase of over £400,000, contributed to most largely by ironstone flux, copper, and salt. For Western Australia the falling off in 1915 amounted to about £56,000, and was due entirely to the reduced gold yield. The Tasmanian production showed an increase in 1915 of about £219,000 over the return for the previous year, the improvement being due to the heavier yield from blister copper.

The comparative value of the production of minerals raised in each State during 1915 is given in the following table:—

COMMONWEALTH MINERAL PRODUCTION IN 1915.

| Minerals. | N.S.W. | Victoria. | Q'land. | S.A. | W.A. | Tas. | N.T. | C'wealth. |
|-------------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|---------------|-------------------|
| | £ | £ | £ | £ | £ | £ | £ | £ |
| Alunite ... | 5,680 | ... | ... | ... | ... | ... | ... | 5,680 |
| Antimony ... | 12,519 | 49,320 | 3,425 | ... | ... | ... | ... | 65,264 |
| Bismuth ... | 4,981 | ... | 26,775 | ... | ... | 37 | 1,203 | 32,996 |
| Coal ... | 3,424,630 | 275,343 | 409,342 | ... | 137,859 | 30,418 | ... | 4,277,592 |
| Coke ... | 313,241 | ... | ... | ... | ... | ... | ... | 313,241 |
| Copper ... | 234,437 | ... | 1,428,793 | 561,247 | 91,169 | 709,534 | 10,710 | 3,035,890 |
| Diamonds | 707 | ... | ... | ... | ... | ... | ... | 707 |
| Diatomaceous earth | 300 | 1,050 | ... | ... | ... | ... | ... | 1,350 |
| Gems (unspecified)... | ... | ... | 600 | ... | ... | ... | ... | 600 |
| Gold ... | 562,819 | 1,397,793 | 1,060,703 | 25,830 | 5,140,228 | 78,784 | 4,182 | 8,270,339 |
| Gypsum ... | ... | 621 | ... | 17,413 | ... | ... | ... | 18,034 |
| Iron ... | 267,000 | ... | ... | ... | ... | ... | ... | 267,000 |
| Iron oxide | 3,774 | ... | ... | ... | ... | ... | ... | 3,774 |
| Ironstone flux | ... | ... | 37,436 | 1264,612 | ... | ... | ... | 302,048 |
| Kaolin ... | 627 | 547 | ... | 1,934 | ... | ... | ... | 3,108 |
| Lead (pig, etc.) | 689,439 | ... | 10,638 | ... | 39,334 | ... | ... | 739,411 |
| Limestone flux | 15,631 | ... | 35,852 | 22,413 | ... | ... | ... | 73,896 |
| Manganese | 535 | 337 | 820 | 563 | 3 | ... | ... | 2,258 |
| Molybdenite | 16,337 | ... | 45,060 | ... | ... | ... | 10 | 62,007 |
| Opal ... | 6,403 | ... | 500 | ... | ... | ... | ... | 6,903 |
| Platinum | 476 | ... | ... | ... | ... | ... | ... | 476 |
| Salt ... | ... | ... | ... | 80,000 | ... | ... | ... | 80,000 |
| Scheelite | 4,004 | ... | 117 | ... | ... | ... | ... | 4,121 |
| Shale ... | 12,890 | ... | ... | ... | ... | ... | ... | 12,890 |
| Silver ... | 322,244 | 1,250 | 23,972 | 277 | 24,295 | ... | ... | 372,038 |
| Silver-lead ore, concentrates etc.) | 2,309,418 | ... | ... | 625 | ... | 91,689 | 1,073 | 2,402,805 |
| Tin ... | 266,780 | 9,447 | 183,472 | ... | 41,391 | 292,306 | 13,245 | 806,641 |
| Wolfram... | 5,031 | 883 | 54,300 | 35 | 25 | 11,115 | 5,278 | 76,667 |
| Zinc ... | 1,111,569 | ... | ... | ... | 143 | ... | ... | 1,111,712 |
| Unenumerated | 6,107 | 567 | 556 | 25,913 | 3,665 | *10,526 | ... | 47,334 |
| Total ... | 9,598,179 | 1,737,158 | 3,322,361 | 1,000,862 | 5,478,149 | 1,225,575 | 34,498 | 22,396,762 |

* Osmiridium, £1,581; Iron pyrites, £8,945.

† Iron Ore from Iron Knob.

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 supplies the value of exports only in connection with building stone, and it is obvious that such figures are of little value as regards production, while the Victorian figures are incomplete. It has therefore been considered advisable to discard both totals. By restricting the comparison to items in connection with which properly comparable information can be obtained for each State, it is believed that a satisfactory estimate of the progress of the mineral industry can be more readily obtained. The items excluded from the total for New South Wales in 1915 consist of—lime, £42,756; marble, £4187; Portland cement, £418,583; building stone, £657; and grindstones, £20. The South Australian figures are exclusive of flint pebbles, £1,023. For South Australia the principal items in the unenumerated class were phosphate rock, £5536; fireclay, £5374; while the sulphur contents of the copper ores were valued at £13,490.

4. **Total Production to end of 1915.**—In the next table will be found the estimated value of the total mineral production in each State up to the end of 1915. The figures given in this table are also exclusive of the same items referred to in connection with the preceding table. Thus the total for New South Wales falls short by £3,545,000 of that published by the State Department of Mines, the principal items excluded being cement, £3,076,000; lime, £409,000; and building stone, £26,000.

COMMONWEALTH MINERAL PRODUCTION TO END OF 1915.

| Minerals. | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tas. | North'n Territory. | C'wealth. |
|-----------------|-------------|-------------|-------------|------------|-------------|------------|--------------------|-------------|
| | £ | £ | £ | £ | £ | £ | £ | £ |
| Gold | 61,190,370 | 296,703,957 | 78,466,975 | 1,001,021 | 125,258,153 | 7,739,417 | 2,093,877 | 572,453,770 |
| Silver and lead | 71,328,237 | 224,799 | 2,453,027 | 341,665 | 927,337 | 6,766,659 | 78,665 | 82,120,409 |
| Copper | 12,891,943 | 218,590 | 15,156,018 | 29,214,272 | 1,354,208 | 11,836,220 | 345,458 | 71,048,709 |
| Tin | 10,282,811 | 804,041 | 8,814,042 | ... | 1,212,467 | 13,056,191 | 382,869 | 34,552,421 |
| Coal | 80,020,454 | 3,301,772 | 6,606,636 | ... | 1,509,592 | 656,601 | ... | 92,095,055 |
| Other | 22,918,878 | 535,025 | 2,561,297 | 2,093,648 | 94,489 | 261,004 | 56,835 | 28,521,176 |
| Total | 258,632,693 | 301,788,184 | 114,057,995 | 32,650,626 | 130,386,246 | 40,318,092 | 2,957,704 | 880,791,540 |

The "other" minerals in New South Wales include antimony, £318,614; bismuth, £137,557; chrome, £102,617; coke, £2,873,966; diamonds, £127,696; iron, £2,821,295; opal, £1,392,637; oil shale, £2,370,433; wolfram, £165,023; and zinc, £11,220,180. In the Victorian returns antimony ore was responsible for £350,983. Included in "other" in the Queensland production were opal, £177,695; gems, other, £285,894; bismuth and wolfram, £964,638; antimony ore, £54,378; manganese, £65,719; limestone flux, £386,033; and ironstone flux, £307,233. The chief item in South Australian "other" minerals was salt, £992,888, but large values must also be apportioned to limestone flux, the yield from the latter amounting to over £500,000 in the last 10 years. Considerable values from gypsum and rock phosphates are also included. In the Tasmanian returns limestone flux was responsible for nearly £100,000, and iron ore for about £26,000.

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 Official Year Books Nos. 1 to 4, but considerations of space preclude its repetition in the present issue.

2. **Production of Gold at Various Periods.**—In the following table 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 1915 was about 8000 ozs. higher than in 1914, but with the exception of that year it was the lowest recorded since 1890. In Victoria the yield for 1915 shewed a decrease of 84,150 ozs. fine on that for the preceding year. The falling off was largely due to decreased returns from various quartz mines at Bendigo, where the output diminished by 37,411 ozs. A decrease of 8,000 ozs. resulted from the closing of the Cathcart mine at Ararat. From cyaniding tailings the returns were over 18,000 ozs. less, and from dredging nearly 7,000 ozs. less than in the preceding year. In Queensland the actual yield of gold was slightly higher than in 1914, but the increase was due to larger returns from the auriferous copper ores. There was a slight falling-off in South Australia. For Western Australia the figures shew a decrease of over 23,000 oz. in 1915, as compared with 1914, diminished returns being recorded in the Coolgardie,

Dundas, East Coolgardie, East Murchison, Kimberley, Murchison, North Coolgardie, and Phillips' River fields. For Tasmania there was a decline of about 7700 ozs., chiefly due to the closing of the Tasmania Gold Mine at Beaconsfield.

VALUE OF GOLD RAISED IN AUSTRALIA, 1851 to 1915.

| 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 | 11,214,976 | ... | 8,800 | ... | ... | ... | 12,912,950 |
| 1857 | 674,477 | 11,320,852 | ... | 876 | ... | ... | ... | 11,996,205 |
| 1858 | 1,104,175 | 10,384,824 | ... | 2,348 | ... | ... | ... | 11,491,447 |
| 1859 | 1,259,127 | 9,394,912 | ... | 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 | ... | ... | ... | ... | 7,751,675 |
| 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 | ... | 2,636 | ... | 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 | 2,293 | ... | 18,390 | ... | 6,669,642 |
| 1874 | 1,041,614 | 4,390,572 | 1,052,899 | 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 | 3,032,160 | 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 | 3,216,484 | 944,869 | ... | ... | 201,297 | ... | 4,906,903 |
| 1881 | 573,582 | 3,333,512 | 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 | ... | 117,520 | 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 | 2,600,104 | 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 | 119,708 | 47,651 | 5,853,295 |
| 1890 | 460,285 | 2,354,240 | 2,182,563 | 20,808 | 86,664 | 75,888 | 80,769 | 5,261,217 |
| 1891 | 559,231 | 2,305,596 | 2,030,812 | 27,380 | 115,182 | 145,459 | 98,701 | 5,281,861 |
| 1892 | 575,299 | 2,617,824 | 2,164,391 | 26,097 | 226,284 | 158,917 | 109,668 | 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 | 2,867,316 | 2,330,282 | 33,401 | 787,099 | 217,024 | 109,699 | 7,502,038 |
| 1895 | 1,315,929 | 2,960,344 | 2,150,561 | 26,060 | 879,748 | 296,115 | 102,816 | 7,641,573 |
| 1896 | 1,073,360 | 3,220,348 | 2,132,979 | 14,350 | 1,068,608 | 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 | 3,349,023 | 2,750,348 | 10,676 | 3,990,698 | 291,496 | 84,789 | 11,678,778 |
| 1899 | 1,623,320 | 3,418,008 | 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 | 316,320 | 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 | 3,063,028 | 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 | 3,983 | 15,897,337 |
| 1905 | 1,165,013 | 3,173,744 | 2,517,295 | 45,853 | 8,305,554 | 312,380 | 30,971 | 15,550,910 |
| 1906 | 1,078,866 | 3,280,478 | 2,313,464 | 27,000 | 7,622,749 | 254,963 | 54,235 | 14,631,745 |
| 1907 | 1,050,730 | 2,954,617 | 1,978,998 | 20,540 | 7,210,749 | 277,607 | 31,928 | 13,515,179 |
| 1908 | 954,854 | 2,849,838 | 1,975,554 | 12,300 | 6,999,882 | 242,482 | 23,943 | 13,058,583 |
| 1909 | 869,546 | 2,778,956 | 1,935,178 | 30,206 | 6,776,274 | 190,201 | 24,148 | 12,604,609 |
| 1910 | 802,211 | 2,422,745 | 1,874,955 | 28,000 | 6,246,848 | 157,370 | 21,711 | 11,553,940 |
| 1911 | 769,353 | 2,148,855 | 1,640,323 | 15,000 | 5,823,075 | 132,108 | 30,910 | 10,551,624 |
| 1912 | 702,129 | 2,039,464 | 1,477,979 | 28,000 | 5,443,385 | 161,300 | 32,671 | 9,879,928 |
| 1913 | 635,703 | 1,847,475 | 1,123,768 | 27,800 | 5,581,701 | 141,876 | 13,250 | 9,376,573 |
| 1914 | 528,873 | 1,755,236 | 1,059,674 | 26,581 | 5,237,353 | 111,475 | 10,757 | 8,739,949 |
| 1915 | 562,819 | 1,397,793 | 1,060,703 | 25,830 | 5,140,228 | 78,784 | 4,182 | 8,270,339 |
| Total | 61,190,370 | 296,703,957 | 78,466,975 | 1,001,021 | 125,258,153 | 7,739,417 | 3,093,877 | 572,453,770 |

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, 1857; Queensland, 1900; South Australia, 1904; and Tasmania, 1899.

The following table shows the quantity in fine ounces of gold raised in each State and in the Commonwealth during each of the last ten years, the value of one ounce fine being £4 4s. 11 $\frac{1}{2}$ d.:—

QUANTITY OF GOLD PRODUCED IN THE COMMONWEALTH, 1906 to 1915.

| Year. | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tas. | Nor. Ter. | C'wealth. |
|-------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. |
| 1906 | 253,987 | 772,290 | 544,636 | 8,037 | 1,794,548 | 60,023 | 11,085 | 3,444,606 |
| 1907 | 247,363 | 695,576 | 465,882 | 5,609 | 1,697,555 | 65,354 | 4,389 | 3,181,728 |
| 1908 | 224,792 | 670,909 | 465,085 | 2,908 | 1,647,912 | 57,085 | 5,624 | 3,074,315 |
| 1909 | 204,708 | 654,222 | 455,579 | 7,111 | 1,595,270 | 44,777 | 5,685 | 2,967,352 |
| 1910 | 188,857 | 570,362 | 441,402 | 6,603 | 1,470,633 | 37,048 | 5,100 | 2,720,005 |
| 1911 | 181,120 | 504,000 | 386,165 | 3,537 | 1,370,868 | 31,101 | 7,277 | 2,484,068 |
| 1912 | 165,295 | 480,131 | 347,946 | 6,592 | 1,282,658 | 37,973 | 7,811 | 2,328,406 |
| 1913 | 149,657 | 434,933 | 265,735 | 6,545 | 1,314,044 | 33,400 | 3,119 | 2,207,433 |
| 1914 | 124,507 | 413,218 | 249,468 | 6,258 | 1,232,977 | 26,243 | 2,532 | 2,055,203 |
| 1915 | 132,498 | 329,068 | 249,711 | 6,081 | 1,210,112 | 18,547 | 985 | 1,947,002 |

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. South Australia has occupied the position of lowest contributor to the total gold yield of the Commonwealth since the year 1871. Taking the average of the last ten years, the relative position of each State in regard to the gold production of the Commonwealth was as follows:—

RELATIVE POSITION OF STATES AS GOLD PRODUCERS, 1906 to 1915.

| State. | Annual Average of Gold Production, 1906 to 1915. | Percentage on Commonwealth. | State. | Annual Average of Gold Production, 1906 to 1915. | Percentage on Commonwealth. |
|-------------------------|--|-----------------------------|------------------|--|-----------------------------|
| Commonwealth ... | £ 11,217,247 | 100.00 | New South Wales | £ 795,508 | 7.09 |
| Western Australia | 6,208,724 | 55.35 | Tasmania ... | 174,817 | 1.56 |
| Victoria ... | 2,346,746 | 20.92 | South Australia | 24,126 | 0.22 |
| Queensland ... | 1,644,554 | 14.66 | North'n Territ'y | 22,772 | 0.20 |

4. Methods of Gold Mining adopted in Each State.—(i.) *New South Wales.* In New South Wales the earlier "rushes" were to surface alluvial or shallow-sinking grounds. Many of these were apparently soon worked out, but there is reason to believe that in some instances payable results would be obtained by treating the rejected wash-dirt on more scientific principles. With the exhaustion of the surface deposits discoveries were made by sinking to what are called deep alluvial leads, representing the beds of old drainage channels in Pliocene and Pleistocene times. The first of these deep alluvial leads was discovered at Forbes, in New South Wales, in 1862. The Tertiary deep leads at Gulgong were discovered in 1871. Cretaceous leads occur at Tibobourra, and detrital gold has been found in permo-carboniferous conglomerates at Tal-lawang. The method of dredging is at present being extensively used for winning gold from

the beds of running streams, and from loose river flats and other wet ground where sinking would be impracticable. The system was introduced from New Zealand, where it was originally applied with great success on the Clutha River, and there are now dredges working on practically all the auriferous rivers of New South Wales. Hydraulic sluicing is employed also in several places, the necessary machinery being fitted to a pontoon for convenience in moving from place to place. The quantity of alluvial gold obtained, other than by dredging, amounted to 4183 ozs. in 1915, the chief yields being—Hill End, 246 ozs.; Windeyer, 386 ozs.; Braidwood, 233 ozs.; Major's Creek, 416 ozs.; Adelong, 283 ozs.; Sofala, 284 ozs. The quantity obtained by dredging was 22,146 ozs.; the largest returns being obtained at Araluen, 8300 ozs.; Adelong, 6900 ozs.; Braidwood, 809 ozs.; Gundagai, 3751 ozs.; Stuart Town, 1681 ozs.; Tumbaramba, 239 ozs. The dredges in operation during 1915 numbered 66, of which 22 were of the bucket type and 44 were suction plants. In the recovery of gold 17 bucket dredges and 5 pumping plants were employed, while 5 bucket dredges and 39 pumping plants were engaged in the winning of stream tin. The value of the plants in operation was estimated at £327,393. The quantity of gold won from quartz amounted to 74,749 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 10,965 ozs. and 28,454 ozs. Next come the Wellington field with 7729 ozs.; Hill End, 4246 ozs.; Wyalong, 3836 ozs.; Peak Hill, 3676 ozs.; and Adelong, 3635 ozs. The Mount Boppy mine in the Cobar district has for some years been the premier gold mine in the State.

The table below shews as far as can be ascertained the yield from alluvial and quartz mining in each of the principal districts during 1915. Owing to the circumstance that it was impossible to obtain complete returns from all 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, 1915.

| District. | Alluvial. | | Quartz. | Total. |
|------------------------------|-------------------------|--------------|---------|---------|
| | Other than by Dredging. | By Dredging. | | |
| | ozs. | ozs. | ozs. | ozs. |
| Albert | 100 | ... | 845 | 945 |
| Bathurst | 775 | ... | 3,272 | 4,047 |
| Clarence and Richmond | 380 | ... | 71 | 451 |
| Cobar | ... | ... | 39,419 | 39,419 |
| Hunter and Macleay | ... | ... | 365 | 365 |
| Lachlan | 270 | 3,751 | 5,820 | 9,841 |
| Mudgee | 479 | 44 | 11,440 | 11,963 |
| New England | 60 | ... | 102 | 162 |
| Peel and Uralla | 292 | 148 | 1,807 | 2,247 |
| Southern | 743 | 9,375 | 3,031 | 13,149 |
| Tambarooora and Turon | 605 | 1,681 | 4,610 | 6,896 |
| Tumut and Adelong | 479 | 7,147 | 3,967 | 11,593 |
| Total | 4,183 | 22,146 | 74,749 | 101,078 |

(ii.) *Victoria.* Lode mining 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 beginning of 1915, 4614 and 4318 feet deep respectively. Altogether there were in 1915 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, Maryborough, Castlemaine, Ararat, Stawell, and Ballarat districts, the number of plants in operation at the end of

1915 being 72, of which 42 were bucket dredges, 21 pump hydraulic sluice, and 9 jet elevator. The total quantity of gold won by dredging and sluicing in 1915 was 50,152 ozs., and the total area treated being 366 acres. Tin to the value of £8640 was also won. 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, 1915.

| District. | Alluvial. | Quartz. | Total. |
|---------------------------|----------------|----------------|----------------|
| | Ozs. | Ozs. | Ozs. |
| Ararat and Stawell | 26,786 | 6,006 | 32,792 |
| Ballarat | 10,010 | 33,436 | 43,446 |
| Beechworth | 3,583 | 118,966 | 122,549 |
| Bendigo | 39,150 | 22,261 | 61,411 |
| Castlemaine | 8,944 | 39,940 | 48,884 |
| Gippsland | 3,902 | 5,082 | 8,984 |
| Maryborough | 25,091 | 6,661 | 31,752 |
| Total | 117,466 | 232,352 | 349,818 |

The largest output from lode mines in 1915 was furnished by the A1 Gaffney's Creek, with 11,762 ozs., followed by the Ajax Central at Daylesford, with 11,463 ozs. Of the deep alluvial mines the Cathcart Central Company, at Ararat, produced 14,348 ozs. In dredging, Cook's Pioneer, at Beechworth, was the most successful, with 5535 ozs. of gold, and tin to the value of £7500.

(iii.) *Queensland.* Operations in Queensland are at present chiefly confined to reefing, the yield from alluvial in 1915 being only 1960 ozs., of which 700 ozs. were won at the Batavia River and 330 ozs. at Gympie, while the quantity produced from stone treated was 117,222 ozs.; from copper and other ores 125,301 ozs.; and from old tailings 5,228 ozs.; making a total production of 249,711 ozs., valued at £1,060,703. The yields from the principal fields are given below:—

GOLD WON IN QUEENSLAND, ALLUVIAL AND QUARTZ, 1915.

| District. | Alluvial. | From Stone Treated. | From Copper and other Ores and old Tailings. | Total. |
|------------------------------------|--------------|---------------------|--|----------------|
| | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. |
| Charters Towers | 217 | 56,414 | 257 | 56,888 |
| Gympie | 333 | 40,269 | 854 | 41,456 |
| Mount Morgan | 13 | 144 | 120,567 | 120,724 |
| Ravenswood | ... | 8,980 | ... | 8,980 |
| Croydon | ... | 2,155 | 1,312 | 3,467 |
| Etheridge, Oaks and Woolgar | 146 | 5,204 | 1,197 | 6,547 |
| Cloncurry | 73 | 3 | 4,519 | 4,595 |
| Gladstone | 71 | 209 | 706 | 986 |
| Rockhampton | 11 | 42 | ... | 53 |
| Chillagoe | 9 | 2,498 | 742 | 3,249 |
| Other districts | *1,087 | 1,304 | 375 | 2,766 |
| Total | 1,960 | 117,222 | 130,529 | 249,711 |

* Including 700 ozs. from Batavia River, and 241 ozs. from the Palmer Goldfield.

(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. The battery and cyanide returns as published in the "Mining Review" shew that the chief producing centres in 1915 were Tarcoola, Wadnamanga, and Deloraine.

(v.) *Western Australia.* The auriferous deposits of Western Australia may be grouped under three headings—(1) Superficial deposits, (2) Deposits in beds of conglomerate, and (3) Lode and vein deposits. The first class includes a number of deposits of alluvial type, either in the beds of existing watercourses or in deep leads, up to 100 feet or more below present surface level. Associated with these are deposits of crystalline gold in "pug," oxide of iron, and soft weathered portions of underlying bed rock. Considerable areas of auriferous surface soil are also found, and these have apparently originated from the denudation by weathering of the bed rock and its associated veins. The shallow surface deposits have been worked by ground sluicing wherever water was available, but the most of the ground has been worked by "dry-blowing." The pug and clayey bedrock are usually treated in puddling machines or stamp batteries and Huntington mills or by a combination of both methods. In regard to (2) it may be noted that in several localities on the Pilbara goldfield and in one on the Yalgoo, gold has been found in conglomerate of the Nullagine series of rocks, now tentatively accepted as of Cambrian age. The gold is crystalline and is confined to the interstitial cementing material. Occasional occurrences of gold are met with in laterite conglomerate of tertiary and post tertiary age, and at Kintore in conglomerate of the same age. Lode and vein deposits alluded to in (3) are found in great variety in Western Australia. The gold is always found associated with iron pyrites in the un-oxidised portions of the lodes, and often also with copper pyrites, arsenical pyrites and galena. Tellurides of gold occur at times, and scheelite is a common accessory mineral. The principal auriferous rocks are of very great geological age, most probably pre-Cambrian, and possibly Archæan, and have all been subjected to intense metamorphism. It is found that the rich veins are not restricted to any one particular description of rock—granite, quartz, porphyry, quartz dolerite, diorite, etc., and even metamorphic sedimentary country rock have been found to carry them in various parts of the State. The total production of gold from all sources during 1915 was 1,210,112 ounces, of which only about 0.2 per cent. was alluvial. The yields in each district were as shewn below:—

GOLD WON IN WESTERN AUSTRALIA, ALLUVIAL AND QUARTZ, Etc., 1915.

| Goldfields. | Alluvial. | Dollied and Specimens. | Crushed. | Total. |
|------------------------------|--------------|------------------------|------------------|------------------|
| | Fine ozs. | Fine ozs. | Fine ozs. | Fine ozs. |
| East Coolgardie | 18 | 2,424 | 668,346 | 670,788 |
| East Murchison | 5 | 1,568 | 56,509 | 58,082 |
| Mount Margaret | 143 | 1,794 | 104,626 | 106,563 |
| Murchison | 355 | 3,197 | 104,497 | 108,049 |
| North Coolgardie | 31 | 242 | 59,241 | 59,514 |
| Coolgardie | 216 | 464 | 17,635 | 18,315 |
| Phillips River | ... | ... | 3,817 | 3,817 |
| North-east Coolgardie | 9 | 550 | 10,302 | 10,861 |
| Yilgarn | 12 | 19 | 91,092 | 91,123 |
| Broad Arrow | 138 | 1,045 | 21,108 | 22,291 |
| Peak Hill | 113 | ... | 2,710 | 2,823 |
| Pilbara | 634 | 40 | 7,868 | 8,542 |
| Dundas | ... | 344 | 23,540 | 23,884 |
| Yalgoo | ... | 138 | 8,704 | 8,842 |
| West Pilbara | 260 | 18 | 1,229 | 1,507 |
| Kimberley | 144 | ... | ... | 144 |
| Other goldfields | ... | ... | 354 | 354 |
| Total | 2,078 | 11,843 | 1,181,578 | 1,195,499 |

The figures in the previous table are compiled from returns from the individual mines and are somewhat incomplete; the total is therefore less than that shewn on page 416, which represents mint and export returns.

(vi.) *Tasmania.* The yield from Tasmania is chiefly obtained from quartz reefing, although there is a little alluvial mining carried on, as shewn in the table hereunder. The yields as returned from each district in 1915 are given below:—

GOLD WON IN TASMANIA, ALLUVIAL AND QUARTZ, 1915.

| District. | Quartz. | Alluvial. | Cyanide. | Blister Copper. | Total. |
|---------------------|---------|-----------|----------|--------------------|--------|
| | Ozs. | Ozs. | Ozs. | Ozs. | Ozs. |
| Beaconsfield | 26 | 6 | 4,690 | ... | 4,722 |
| Mathinna | 3,647 | ... | ... | ... | 3,647 |
| Mt. Victoria | 502 | 43 | ... | ... | 545 |
| Warrentinna | | | | | |
| Mt. Cameron | 8 | 75 | ... | ... | 83 |
| Lefroy | | | | | |
| Lisle | 21 | 205 | ... | ... | 226 |
| Golconda | | | | | |
| Lilydale | 19 | 67 | ... | 9,869 | 9,355 |
| West Coast | | | | | |
| Total | 4,223 | 396 | 4,690 | 9,869 | 19,178 |

The total production was valued at £78,784, equal to 18,547 ozs. fine, of which about 4,688 ounces were produced by the Tasmania Gold Mine Ltd., at Beaconsfield. During the year 1915, about 10,000 ounces of gold were produced from the ores treated at the reduction works of the Mt. Lyell Mining and Railway Co. Ltd.

(vii.) *Northern Territory.* Pine Creek is the chief mining field in the Northern Territory, but operations have for many years been carried on in a desultory manner, chiefly by Chinese labour. It is stated that the field has been unfairly exploited, the rich pockets only having been scooped out without any systematic prospecting. Confidence in the auriferous prospects of the area has been shaken by the failure of various companies, but in the view of the Mines Department the ground has not been properly tested or systematically mined, and the Department proposes to sink to a depth of 300 feet and prove that with proper methods the area is worthy of renewed exploration. The metal is also worked at Bridge Creek and Tanami fields.

5. Remarkable Masses of Gold.—Allusion has already been made in preceding Year Books to the discovery of "nuggets" and other remarkable masses of gold, but it is not proposed to repeat this information in the present issue. It may be noted, however, that in 1913 nuggets yielding 180 ozs., 50 ozs., and 23 ozs. were obtained at Poseidon in Victoria. In the same State also, and near the spot at Moliagul where the famous "Welcome Stranger," weighing 2284 ozs., was discovered in 1869, a mass of quartz yielding 94 ozs. of gold was obtained in 1913. A small lump of quartz from a mine at Tallangatta furnished 44 ozs. In an alluvial deposit at Corindhap four nuggets weighing respectively 100, 60, 60, and 30 ozs. were obtained at a depth of 13 feet.

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 ten years 1906 to 1915. The figures given in the table have been compiled chiefly from returns obtained directly by the Commonwealth Bureau of Census and Statistics from the gold-producing countries of the world.

WORLD'S GOLD PRODUCTION, 1906 to 1915.

| Year | World's Production of Gold. | Gold produced in Commonwealth. | Percentage of C'wealth on Total. |
|-------------|-----------------------------|--------------------------------|----------------------------------|
| | £ | £ | % |
| 1906 | 83,170,000 | 14,636,000 | 17.60 |
| 1907 | 84,741,000 | 13,518,000 | 15.95 |
| 1908 | 92,157,000 | 13,062,000 | 14.17 |
| 1909 | 92,924,000 | 12,611,000 | 13.57 |
| 1910 | 93,452,000 | 11,554,000 | 12.36 |
| 1911 | 94,938,000 | 10,552,000 | 11.11 |
| 1912 | 96,820,000 | 9,880,000 | 10.20 |
| 1913 | 92,361,000 | 9,377,000 | 10.15 |
| 1914 | 92,008,000 | 8,730,000 | 9.49 |
| 1915 | 100,527,000 | 8,270,000 | 8.23 |

While the production of gold in the Commonwealth shows a considerable decrease during the eighteen years from 1897 to 1915, the world's total production more than doubled itself 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 1915.

| Country. | 1897. | 1900. | 1913. | 1914. | 1915. |
|-------------------|------------|------------|------------|------------|------------|
| | £ | £ | £ | £ | £ |
| United States ... | 11,787,000 | 16,269,000 | 18,264,000 | 19,425,000 | 20,761,000 |
| Canada ... | 1,240,000 | 5,742,000 | 3,411,000 | 3,284,000 | 3,900,000 |
| Mexico ... | 2,045,000 | 1,884,000 | 3,861,000 | 3,737,000 | 3,280,000 |
| Transvaal ... | 11,654,000 | 1,481,000 | 37,373,000 | 35,657,000 | 33,628,000 |
| Rhodesia ... | 800 | 308,000 | 2,931,000 | 3,630,000 | 3,887,000 |
| Gold Coast ... | 85,000 | 38,000 | 1,649,000 | 1,744,000 | 1,720,000 |
| Madagascar ... | 8,500 | 142,000 | 246,000 | 222,000 | 286,000 |
| India ... | 1,571,000 | 1,893,000 | 2,292,000 | 2,333,000 | 2,370,000 |
| Corea ... | 208,000 | 371,000 | 677,000 | 680,000 | 768,000 |
| Japan ... | 142,000 | 290,000 | 897,000 | 920,000 | 1,342,000 |
| Java ... | 24,000 | 112,000 | 531,000 | 547,000 | 547,000 |
| Costa Rica ... | 2,000 | 31,000 | 88,000 | 104,000 | 152,000 |

The largest increase was recorded in the Transvaal, where the production more than trebled itself in the eighteen years 1897 to 1915.

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

PERSONS EMPLOYED IN GOLD MINING, 1901 and 1911 to 1915.

| Year. | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tas. | N. Terr. | C'w'lth. |
|----------|--------|-----------|---------|----------|----------|-------|----------|----------|
| | No. | No. | No. | No. | No. | No. | No. | No. |
| 1901 ... | 12,064 | 27,387 | 9,438 | 1,000 | 19,771 | 1,112 | 200 | 70,972 |
| 1911 ... | 4,650 | 14,015 | 5,227 | 920 | 15,428 | 570 | 358 | 41,168 |
| 1912 ... | 3,898 | 11,856 | 3,981 | 920 | 13,700 | 485 | 263 | 35,103 |
| 1913 ... | 3,570 | 11,931 | 3,123 | 800 | 13,445 | 481 | 175 | 33,525 |
| 1914 ... | 3,443 | 10,398 | 2,793 | 375 | 12,110 | 402 | 180 | 29,701 |
| 1915 ... | 2,888 | 8,755 | 2,766 | 200 | 11,323 | 215 | 99 | 26,246 |

§ 3. Platinum and the Platinoid Metals.

1. Platinum.—(i.) *New South Wales.*—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 Platina in the Fifield division, near Parkes, but the entire production in 1915 was small, amounting to only 56 ozs., valued at £476, while the total production recorded to the end of 1915 amounted to 13,732 ozs., valued at £34,750.

At Platina, gold is found in association with the platinum, and it is estimated that there are 200 acres of metalliferous country sufficiently rich to yield a satisfactory return, provided it were worked on a large scale with an abundant water supply.

(ii.) *Victoria.* In Gippsland, Victoria, the metal has been found in association with copper. The production of platinum in 1913 amounted to 127 ozs., and was contained in matte produced by the Gippsland Copper, Platinum, and Gold Mining and Smelting Company, from ores raised from the old mine at Cooper's Creek. There was no production in 1914 and 1915.

2. Osmium, Iridium, etc.—(i.) *New South Wales.* Small quantities of osmium, iridium, and rhodium are 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.

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

(iii.) *Tasmania.*—For many years osmiridium has been known to exist in the bed of the Savage River, on the West Coast, and in rivulets and creeks in the Serpentine country, but it was not until early in 1911 that efforts were made to work the deposits. During that year the price paid for the mineral was as high as £7 10s. per oz., and about 100 men were engaged in the search for it. The quantity produced amounted to 272 ozs., valued at £1888. In 1912 the production was 779 ozs., valued at £5742, or an average of £7 7s. 9d. per oz. The production in 1913 amounted to 1262 ozs., valued at £12,016, in 1914 to 1019 ozs., valued at £10,076., and in 1915 to 246 ozs., valued at £1,581. A specimen found by a prospector at the Whyte River weighed 2 ozs. 8 dwt. 7 gr. It is stated that the selling price has occasionally reached as high as £11 per oz., but this extraordinary value is dependent on causes which are not too well known. Owing to the war, the market in 1914 was for a time closed, but a parcel of 13 ozs. forwarded to America was sold at an average of £5 13s. 6d. per oz. Besides a steady and increasing use in the manufacture of fountain pens there is at present some demand for iridium and osmiridium in connection with the prevailing fashion in hard platinum jewellery.

§ 4. Silver.

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

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, 1901, and the five years ending 1915:—

PRODUCTION OF SILVER AND LEAD, AUSTRALIA, 1881 to 1915.

| Year. | N.S.W. | Vic. | Q'land. | S. Aust. | W. Aust. | Tasmania. | North. Terr. | C'wealth. |
|-------|-----------|-------|---------|----------|----------|-----------|-----------------|-----------|
| | £ | £ | £ | £ | £ | £ | £ | £ |
| 1881 | ... | 5,239 | 13,494 | 1,182 | 11,224 | ... | ... | 31,139 |
| 1891 | 3,621,614 | 6,017 | 21,879 | 1,787 | 250 | 62,138 | 4,140 | 3,717,825 |
| 1901 | 1,954,964 | 6,550 | 69,234 | 3,886 | 7,718 | 325,335 | ... | 2,367,687 |
| 1911 | 2,652,548 | 2,070 | 79,765 | 140 | 33,335 | *253,361 | ... | 3,021,219 |
| 1912 | 3,745,796 | 2,000 | 121,855 | 326 | 41,995 | 309,098 | 820 | 4,221,890 |
| 1913 | 4,173,867 | 2,074 | 134,121 | 1,400 | 82,422 | 319,997 | 2,228 | 4,716,109 |
| 1914 | 3,611,369 | 1,540 | 38,640 | 529 | 69,228 | 96,225 | 545 | 3,818,076 |
| 1915 | 3,321,101 | 1,250 | 23,972 | 902 | 63,629 | 91,689 | 1,073 | 3,503,616 |

* Exclusive of silver to the estimated value of £42,831 contained in blister copper.

New South Wales. 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 the Mines Department 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 five years, will shew the estimated total value of the yield:—

VALUE OF PRODUCTION FROM SILVER-LEAD MINES OF NEW SOUTH WALES, 1911 TO 1915.

| Year. | Value of Silver, Lead, and Spelter produced within the C'wealth. | Value of Concentrates Exported. | Total. |
|-------|--|---------------------------------|-----------|
| | £ | £ | |
| 1911 | 1,949,271 | 3,259,246 | 5,208,517 |
| 1912 | 2,477,442 | 3,692,352 | 6,169,794 |
| 1913 | 2,709,867 | 3,759,691 | 6,469,558 |
| 1914 | 2,592,322 | 3,004,243 | 5,596,570 |
| 1915 | 1,684,717 | 3,176,434 | 4,811,151 |

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 1905 and during the last ten years:—

ESTIMATED QUANTITY AND VALUE OF SILVER YIELDED BY MINES OF NEW SOUTH WALES TO END OF 1915.

| Period. | Produced in Australia. | | Contained in Concentrates, etc., Exported. | | Total Production. | |
|------------------------|------------------------|------------|--|------------|-------------------|------------|
| | Quantity. | Value. | Quantity. | Value. | Quantity. | Value. |
| To the end of 1905 ... | Fine ozs. | £ | Fine ozs. | £ | Fine ozs. | £ |
| 1906 | 97,504,005 | 15,580,901 | 111,085,453 | 19,116,088 | 208,589,458 | 34,696,989 |
| 1907 | 5,575,410 | 775,409 | 3,111,013 | 432,669 | 8,686,423 | 1,208,078 |
| 1908 | 5,921,457 | 795,982 | 6,228,225 | 845,845 | 12,149,682 | 1,641,827 |
| 1909 | 6,484,288 | 693,034 | 5,499,381 | 587,768 | 11,983,669 | 1,280,802 |
| 1910 | 3,717,016 | 382,605 | 6,867,775 | 732,563 | 10,584,791 | 1,115,168 |
| 1911 | 5,196,323 | 561,280 | 7,608,336 | 843,257 | 12,804,659 | 1,404,537 |
| 1912 | 5,731,468 | 620,578 | 8,797,677 | 973,210 | 14,529,145 | 1,593,783 |
| 1913 | 5,220,538 | 641,707 | 8,293,711 | 1,036,715 | 13,514,249 | 1,678,422 |
| 1914 | 5,906,638 | 719,249 | 8,596,251 | 1,038,714 | 14,504,889 | 1,757,963 |
| 1915 | 5,481,286 | 630,658 | 7,879,240 | 820,754 | 13,360,526 | 1,451,412 |
| 1915 | 3,081,952 | 325,210 | 5,222,927 | 544,055 | 8,304,879 | 869,265 |
| Total ... | 149,822,381 | 21,726,613 | 179,189,989 | 26,971,638 | 329,012,370 | 48,698,251 |

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.* A description of the silver-bearing area in this district is given in preceding issues of the Year Book. During 1913 the output of ore from the mines in this division amounted to 1,744,000 tons, the highest recorded in the history of the field, but owing to the dislocation caused by the war the quantity raised in 1914 decreased to 1,442,000 tons. For 1915 the production was returned as 1,505,000 tons, but the British Junction, North Junction Lead and Block 10 mines were closed throughout the year. The value of the output in 1915 was £3,342,000 as compared with £4,968,000 in 1913.

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 TO END OF 1915.

| Mine. | Authorised Capital. | Value of Output to end of 1915. | Dividends and Bonuses Paid to end of 1915. |
|---|---------------------|---------------------------------|--|
| | £ | £ | £ |
| Broken Hill Proprietary Co. Ltd. ... | 600,000 | *42,772,000 | 10,874,302 |
| Broken Hill Proprietary Block 14 Co. Ltd. ... | 155,000 | 3,611,296 | 575,660 |
| British Broken Hill Proprietary Co. Ltd. ... | 339,000 | 3,379,149 | 633,800 |
| Broken Hill Proprietary Block 10 Co. Ltd. ... | 1,000,000 | 4,302,433 | 1,352,500 |
| Sulphide Corporation Ltd. (Central Mine) ... | 1,100,000 | †16,941,010 | 1,711,875 |
| Broken Hill South Silver Mining Co. ... | 200,000 | 6,764,462 | 1,755,000 |
| North Broken Hill Mining Co. Ltd. ... | 600,000 | †4,435,237 | 1,198,940 |
| Broken Hill Junction Lead Mining Co. ... | 150,000 | †975,176 | 85,000 |
| Junction North Broken Hill Mine ... | 250,000 | †1,929,412 | 79,793 |
| The Zinc Corporation Ltd. ... | | 1,594,174 | 10,000 |
| Barrier South Ltd. ... | 168,000 | 151,157 | 50,000 |
| Totals | 4,562,000 | 86,855,506 | 18,326,870 |

* The value of the ores purchased during the years 1908 to 1914 is not included. † Output understated owing to incomplete returns. ‡ Not available.

(b) *Yerranderie.* The mines on the Yerranderie field in the Southern Mining District produced 475,180 ozs. of silver in 1915, besides 735 ozs. of gold, and 1302 tons of lead, the total production being valued at £81,066. Mining operations in this locality are carried on under considerable difficulties owing to the heavy cost of transport, the cost of cartage to and from Camden railway station—£2 5s. per ton—preventing successful exploitation of the lower grade ores.

(c) *Cobar.* A considerable quantity of silver is obtained from the Great Cobar Ltd. Mine and attached properties, the production in 1914 amounting to 24,305 ozs. Owing to the dislocation of the industry caused by the war the yields in 1915 fell to 1838 ozs.

(ii.) *Tasmania, West Coast.* The production of silver-lead ore in 1915 was 10,383 tons, valued at £91,689, to which the Zeehan Mines contributed £31,686. In the Mt. Farrell District the North Mt. Farrell contributed £23,582, while the Magnet Mines returned a yield of £31,352, and the Round Hill, Mt. Claude, £5069. The silver contents of the copper ores treated at the Mt. Lyell works amounted in 1915 to 452,645 ozs.

(iii.) *Queensland.* The yield for the chief silver-producing centres in 1915 was as follows:—Chillagoe, silver £3377, lead £397; Charters Towers, silver £2588, lead £1060; Cloncurry, silver £7025; Mt. Morgan, silver £3078; Herberton, silver £2250; lead £2580; Burketown, lead £4186.

(iv.) *South Australia.* Rich specimens of silver ore have been discovered at Miltalie and Poonana, in the Franklin Harbour district, also at Mount Malvern, near Rapid Bay, and in the vicinity of Blinman and Farina. The surrounding district is highly mineralized, but, so far, has not been thoroughly prospected.

(v.) *Northern Territory.* Silver-lead ores are worked near Pine Creek, and at Mount Shoobridge near Brook's Creek railway station.

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

WORLD'S PRODUCTION OF SILVER, 1905 to 1914.

| Year | 1905. | 1906. | 1907. | 1908. | 1909. | 1910. | 1911. | 1912. | 1913. | 1914. |
|---------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| World's production in 1000 fine ozs.* | 181,338 | 184,552 | 183,386 | 213,570 | 227,291 | 240,223 | 254,214 | 250,979 | 214,391 | 211,103 |

* Add 000 to figures for fine ounces.

Australasia's share in the world's silver production in 1914 was estimated at 3,520,000 ounces, or about 1.7 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 in the London market at various periods and during the last five years is given below:—

PRICE OF SILVER, 1881 to 1915.

| Year | 1881. | 1891. | 1901. | 1908. | 1909. | 1911. | 1912. | 1913. | 1914. | 1915. |
|------------------------|-------|-------------------|-------------------|------------------|--------------------|-------------------|-------------------|-------------------|-------------------|--------------------|
| Pence per standard oz. | 51½ | 45 $\frac{1}{16}$ | 27 $\frac{3}{16}$ | 24 $\frac{3}{8}$ | 23 $\frac{11}{16}$ | 24 $\frac{9}{16}$ | 28 $\frac{1}{16}$ | 27 $\frac{9}{16}$ | 25 $\frac{5}{16}$ | 23 $\frac{11}{16}$ |

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 33½d., 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 in 1901 and during each of the last five years is given below:—

NUMBER OF PERSONS EMPLOYED IN SILVER MINING, 1901 and 1911 to 1915.

| Year. | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tasmania. | N. Terr. | C'wealth. |
|---------|--------|-----------|---------|----------|----------|-----------|----------|-----------|
| | No. | No. | No. | No. | No. | No. | No. | No. |
| 1901... | 6,298 | ... | 40 | 150 | ... | 2,414* | ... | 8,902† |
| 1911... | 8,495 | ... | 433 | 30 | 43 | 1,125 | † | 10,173 |
| 1912... | 9,062 | ... | 208 | 30 | 60 | 1,681 | ... | 11,041 |
| 1913... | 9,357 | ... | 204 | 30 | 132 | 1,272 | 16 | 11,011 |
| 1914... | 8,242 | ... | 130 | 25 | 100 | 491 | 10 | 8,998 |
| 1915... | 5,564 | ... | 49 | 25 | 70 | 519 | 86 | 6,313 |

* Including copper miners. † Included in South Australia. ‡ 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 1911 to 1915 is shewn in the following tables :—

PRODUCTION OF COPPER, AUSTRALIA, 1881 to 1915.

| State. | 1881. | 1891. | 1901. | 1908. | 1911. | 1912. | 1913. | 1914. | 1915. |
|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| QUANTITY. | | | | | | | | | |
| N.S.W. ... { Copper | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. |
| { Ore | * | * | 6,087 | 8,679 | 10,618 | 8,990 | 9,153 | 5,081 | 2,463 |
| Victoria... { Copper | * | * | 645 | 392 | 1,482 | 2,044 | 308 | 1,526 | 4,510 |
| { & Ore | * | * | ... | 983 | 36 | ... | 36 | ... | ... |
| Q'land ... { Copper | 330 | 85 | 3,061 | 14,961 | 20,384 | 23,120 | 23,655 | 18,436 | 19,704 |
| S. Aust ... { Copper | 3,824 | 3,551 | 6,736 | 6,152 | 5,922 | 6,295 | 7,161 | 6,861 | 7,725 |
| { Ore | 21,638 | 13,239 | 2,353 | ... | ... | ... | ... | ... | ... |
| W. Aust. ... { Copper | ... | ... | 479 | 10,654 | ... | 28 | 82 | 183 | 946 |
| { Ore | ... | * | 10,157 | 2,503 | ... | 9,536 | 4,359 | 3,913 | 737 |
| Tasmania { Copper | ... | ... | 9,790 | 8,833 | 8,308 | 6,528 | 6,535 | 7,509 | 7,901 |
| { Ore | ... | ... | 10,029 | 1,185 | ... | ... | ... | 3,288 | 66 |
| Northern Territory | ... | ... | ... | ... | 163 | 377 | 41 | 405 | 1,272 |
| C'wealth { Copper | ... | ... | 25,614 | 44,167 | 57,567 | 56,918 | 51,310 | 47,222 | 45,324 |
| { Ore | ... | ... | 23,184 | ... | ... | ... | ... | ... | ... |

* Not available.

VALUE.

| | £ | £ | £ | £ | £ | £ | £ | £ | £ |
|-----------------------|---------|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| New South Wales... | 227,667 | 119,195 | 412,292 | 502,812 | 590,102 | 579,791 | 598,735 | 274,671 | 234,437 |
| Victoria ... | 8,185 | 216 | ... | 3,928 | 2,088 | ... | 2,829 | ... | ... |
| Queensland ... | 19,637 | 3,554 | 194,227 | 893,535 | 1,151,351 | 1,698,280 | 1,660,178 | 1,118,648 | 1,428,793 |
| South Australia ... | 418,296 | 235,317 | 500,077 | 345,968 | 332,500 | 461,500 | 488,986 | 417,487 | 561,247 |
| Western Australia ... | ... | 4,463 | 75,246 | 57,091 | 78,118 | 59,824 | 142,513 | 38,174 | 91,169 |
| Tasmania ... | ... | ... | 1,026,748 | 609,651 | 408,649 | 440,444 | 375,664 | 496,041 | 709,534 |
| Northern Territory | ... | ... | ... | ... | 1,470 | 3,998 | 482 | 4,460 | 10,710 |
| Commonwealth ... | 673,786 | 362,745 | 2,208,590 | 2,412,985 | 2,564,278 | 3,243,837 | 3,269,355 | 2,349,881 | 3,035,890 |

A short account of the discovery of copper in the different States is given in the earlier Year Books.

2. **Sources of Production.**—(i.) *New South Wales.* 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 from this district in 1915 was £134,212, out of a total for the State of £234,437. At the Great Cobar Mine the Company's smelters closed down on the 9th April, 1914, and operations in 1915 were confined to raising ore, unwatering and repairs. As the smelters re-opened in January, 1916, it is hoped that the production will again reach the record of previous years.

The Cadia Copper mine, at Cadia, in the Orange division, produced 500 tons of copper matte valued at £16,011. The Cobar Gladstone mine returned a total of £47,000. A yield of 161 tons of matte valued at £6,488 was obtained from the Grafton Mine at Cangai, and the Mouramba Copper Mines at Nymagee produced 663 tons of copper valued at £37,780.

The Electrolytic Refining and Smelting Company of Australia Limited, established at Port Kembla, produced 20,733 tons of copper valued at £1,745,000, chiefly from matte and ore imported from other States, especially from Queensland. The English and Australian Copper Co. Ltd., at Waratah, obtained 60 tons valued at £4415 from local ores.

(ii.) *Queensland.* The yield in this State amounted in 1915 to 19,704 tons, valued at £1,428,793, to which the Cloncurry field contributed 9880 tons, valued at £716,796. Next in order were Mount Morgan with 8018 tons, valued at £581,739; Gladstone 680 tons, £48,960; Chillagoe, 593 tons, £42,678; Mount Perry, 254 tons, £18,396; Herberton, 192 tons, £13,929, and Etheridge, 184 tons, £1324.

The Cloncurry district—reckoned the richest and most extensive cupriferaous area in Australia—produces more than half the copper output of the State, and its importance as a producer will be still further enhanced by the present and prospective extension of railway facilities.

(iii.) *South Australia.* Taking the entire period over which production extended, the yield of copper in South Australia easily outstrips that of any other State in the Commonwealth. In recent years, however, Queensland, Tasmania, and New South Wales have come to the front as copper producers, as the table on the preceding page will shew. Deposits of copper ore are found over a large portion of South Australia. A short account of the discovery, etc., of some of the principal mining areas, such as Kapunda, Burra Burra, Wallaroo, and Moonta, is given in preceding issues of the Official Year Book. During 1915, copper mining, in a small way, was carried on at Kanyaka, East of Boorthana, Paull's, West Burra, Mount Coffin, Nichol's Nob, and Warra Warra in the Northern district; at Cutava and near Olary in the North East; at Monalena in the North West, and at Tumby Bay in Eyre Peninsula. In the same period the well-known Wallaroo and Moonta mines raised over 187,000 tons of ore, and treated 176,000 tons of 3.07 to 3.30 per cent. ore. The concentration plant at the mines, in addition to copper, produces sulphuric acid and bluestone. Very little was done at the once famous Kapunda mine. Government operations at the Yelta mine, which were discontinued on the 30th June, 1913, have not been resumed, and the mine is now let to tributers.

(iv.) *Western Australia.* The value of copper exported from this State in 1915 was £91,169. According to the returns, the production in the West Pilbara field was 315 tons, valued at £3546, while the Phillips River field shewed a production of 3681 tons, valued at £24,093. The Peak Hill district shewed a production of 237 tons, valued at £7618, and the Ashburton field returned 146 tons, valued at £3744. Small quantities also were produced on the Murchison and Yalgoo fields.

(v.) *Tasmania.* The quantity of blister copper produced in Tasmania during 1915 was 7901 tons, valued at £709,167, and of copper and copper ore, 66 tons, valued at £367, the bulk of the production being due to the Mount Lyell Mining and Railway Co. Ltd. This Company treated 340,855 tons of ore in 1915, and produced 7901 tons of blister copper, containing copper, 7814 tons; silver, 452,645 ozs.; and gold, 9870 ozs., the whole being valued at £742,312. The employes in 1915 numbered 1721, of whom 892 were miners, 684 were engaged in the reduction works, and 145 in the railway department.

(vi.) *Northern Territory.* Copper has been found at various places, including Copperfield, 5 miles south-east of Pine Creek, and Mount Diamond and Burns Wolfram, 45 miles east of Pine Creek.

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 1901 and in each of the last five years. The figures are given on the authority of "The Mineral Industry." No quotations were recorded for the months August, September and October, in the London price for 1914, and the average for that year is based on the returns for the remaining nine months.

FLUCTUATION IN VALUE OF COPPER, 1901 and 1910 to 1915.

| 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 | |
| 1910 | 57.05 | 13.04 | 12.74 | |
| 1911 | 55.97 | 12.63 | 12.38 | |
| 1912 | 72.94 | 16.56 | 16.34 | |
| 1913 | 68.35 | 15.69 | 15.27 | |
| 1914 | 61.52 | ... | 13.50 | |
| 1915 | 72.53 | ... | 17.28 | |

* 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. During the last five months of 1913 sales by the Lake Superior Companies were scattered and irregular.

4. **World's Production of Copper.**—The world's production of copper in 1901 and during the five years 1910-14 is estimated to have been as follows:—

WORLD'S PRODUCTION OF COPPER, 1901 and 1910 to 1914.

| Year | ... | ... | ... | 1901. | 1910. | 1911. | 1912. | 1913. | 1914. |
|-------------------------------------|-----|-----|-----|---------|---------|---------|-----------|-----------|-----------|
| World's production— (short tons) | ... | ... | ... | 583,517 | 966,998 | 969,750 | 1,114,769 | 1,104,517 | 1,018,395 |

On account of the war it is not possible to give a satisfactory estimate for the year 1915, but the total has been computed at about 1,200,000 tons.

5. **Employment in Copper Mining.**—The number of persons employed in copper mining during 1901 and in each of the last five years was as follows:—

PERSONS ENGAGED IN COPPER MINING, 1901 and 1911 to 1915.

| Year. | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tasmania. | Nor. Ter. | C'wealth. |
|-------|--------|-----------|---------|----------|----------|-----------|-----------|-----------|
| | No. | No. | No. | No. | No. | No. | No. | No. |
| 1901 | 2,964 | 4 | 814 | 4,000 | 321 | * | † | 8,103‡ |
| 1911 | 2,151 | 57 | 2,458 | 4,030 | 317 | 1,565 | 29 | 10,607 |
| 1912 | 2,384 | 6 | 3,457 | 4,500 | 223 | 1,681 | 52 | 12,303 |
| 1913 | 2,629 | 12 | 3,687 | 4,000 | 213 | 2,162 | 53 | 12,756 |
| 1914 | 1,357 | ... | 2,578 | 3,000 | 192 | 2,099 | 88 | 9,314 |
| 1915 | 914 | ... | 2,149 | 2,000 | 144 | 1,758 | 97 | 7,062 |

* Included with silver miners. † No returns. ‡ Excluding Tasmania.

§ 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 shows the production in each of the Commonwealth States during the years 1881, 1891, 1901, and 1911 to 1915:—

TIN PRODUCED IN AUSTRALIA, 1881 to 1915.

| State. | 1881. | 1891. | 1901. | 1911. | 1912. | 1913. | 1914. | 1915. |
|-------------------------------------|-------------------|------------------|---------------|--------------------|--------------------|--------------------|--------------------|--------------------|
| QUANTITY. | | | | | | | | |
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. |
| New South Wales { Ingots Ore | 5,824 609 | 1,454 203 | 648 11 | 958 970 | 900 1,175 | 903 2,118 | 650 1,667 | 857 1,331 |
| Victoria ... Ore | † | † | 77 | 33 | 48 | 57 | 53 | 95 |
| Queensland* ... Ore | † | † | 1,661 | 3,091 | 3,230 | 3,197 | 2,085 | 2,125 |
| West Australia (Ore & Ingots) | ... | ... | 734 | 495 | 651 | 484 | 363† | 429 |
| Tasmania ... Ore | † | † | 1,790 | 3,953 | 3,714 | 4,010 | 2,573 | 2,599 |
| Northern Territory Ore | ... | ... | 81 | 239 | 271 | 258 | 160 | 140 |
| Commonwealth { Ingots, ore, etc. | † | † | 5,002 | 9,739 | 9,989 | 11,027 | 7,551 | 7,576 |
| VALUE. | | | | | | | | |
| | £ | £ | £ | £ | £ | £ | £ | £ |
| New South Wales.. { Ingots Ore | 531,303 37,492 | 124,320 9,643 | 76,080 464 | 191,000 116,089 | 183,000 155,074 | 182,800 238,492 | 101,400 165,730 | 135,350 131,430 |
| Victoria ... Ore | 7,334 | 5,092 | 4,181 | 3,417 | 5,793 | 6,959 | 4,955 | 9,447 |
| Queensland ... Ore | 193,699 | 116,387 | 93,723 | 307,847 | 364,503 | 343,666 | 176,197 | 183,472 |
| West Australia (Ore & Ingots) | ... | 10,200 | 40,000 | 55,220 | 79,738 | 73,142 | 35,649 | 41,391 |
| Tasmania ... Ore | 375,775 | 293,170 | 212,542 | 513,500 | 543,103 | 531,983 | 259,300 | 292,906 |
| Northern Territory Ore | ... | 1,938 | 5,586 | 22,900 | 27,001 | 25,526 | 15,200 | 13,245 |
| Commonwealth ... | 1,145,603 | 560,750 | 432,576 | 1,209,973 | 1,358,152 | 1,401,571 | 758,431 | 806,641 |

* Dressed tin ore, about 70% tin. † Tin ingot and ore. ‡ Not available.

2. **Sources of Production.**—(i.) *New South Wales.* A large proportion of the output in New South Wales was obtained by dredging, the quantity so won in 1915 being 1164 tons, valued at £116,549. In the Tingha division the yield amounted to 662 tons, valued at £64,076, the yield from dredging being estimated at £41,563. The Emmaville division in the New England district shewed a yield of 1045 tons, valued at £105,104, of which dredging produced 513 tons, valued at £51,954. In the Wilson's Downfall division, 139 tons, valued at £13,303, were raised. The Glen Innes division, also in the New England district, returned a yield of 103 tons, valued at £10,043. The Ardlethan field, in the Lachlan division, produced ore and concentrates to the value of £53,771.

(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 in 1915 was obtained in the Eldorado district. About £1300 worth was obtained at Beechworth, £570 worth at Toora, and a small quantity at Digger's Creek.

(iii.) *Queensland.* The chief producing districts in Queensland during 1915 were Herberton, 1164 tons valued at £94,759; Chillagoe, 320 tons, £26,181; Cooktown, 296 tons, £30,170; Stanthorpe, 181 tons, £17,847; and Kangaroo Hills, 129 tons, £11,100. The increased price of the metal more than counterbalanced the effects of the dry season, so that the total production in 1915 was over £7000 in excess of that for 1914.

(iv.) *Western Australia.* The production of tin ore and ingot for the State during 1915 amounted to 429 tons, valued at £41,391, to which the Greenbushes field contributed 247 tons, valued at £21,431, and the Pilbara field 79 tons, valued at £7633. There was no production from the other fields in 1915.

(v.) *Tasmania.* The tin ore raised in 1915 amounted to 2599 tons, valued at £292,306, a considerable falling-off as compared with the year 1913, when the production was returned as 4010 tons, valued at £531,983. The heavy decline was of course due to the paralysis of the tin market occasioned by the war, coupled to some extent with unfavourable weather conditions. The bulk of the production in 1915 came from the North-Eastern Division with 1254 tons of ore, valued at £152,786. Of the total yield in this division, 727 tons were contributed by the Pioneer and Gladstone districts, 314 tons by Derby, and 145 tons by Branhholm. The next highest output was returned from the North Western Division with 674 tons, to which the celebrated Mt. Bischoff contributed 446 tons, and the Mt. Bischoff Extended, 166 tons.

(vi.) *Northern Territory.* Mount Wells, in the Burrundie district, has yielded a fair output of tin since 1886, and recent developments have proved that the lodes are increasing in size and quality. Copper, silver-lead and tin shows occur abundantly in the district, but little work has been done on them. The recently discovered tin field at Maranboy Springs, about 40 miles east of the Katherine telegraph station, promises to yield good returns. A fairly extensive deposit has been located at Hayes Creek, about 12 miles from Brook's Creek and only 6 miles from the railway line. Efficient prospecting would probably reveal the existence of other deposits. Small yields of tin were also obtained at Crest of the Wave, 35 miles east of Pine Creek.

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

THE WORLD'S TIN PRODUCTION, 1911 to 1915.

| 1911. | 1912. | 1913. | 1914 | 1915. |
|------------------|------------------|------------------|------------------|------------------|
| Tons. 117,040 | Tons. 122,538 | Tons. 124,890 | Tons. 111,226 | Tons. 112,281 |

The yields from the chief producing countries in each of the last two years were as follows:—

| | 1914. | 1915. |
|---------------------|-----------|-----------|
| Malaya | 49,000 | 47,000 |
| Bolivia | 22,000 | 22,000 |
| Banka | 14,000 | 13,800 |
| Siam | 6,800 | 7,800 (a) |
| Cornwall | 5,000 | 5,000 (a) |
| Billiton | 4,000 (a) | 4,000 (a) |
| Nigeria | 4,500 | 4,000 |
| China | 1,900 (b) | 3,000 (b) |
| Australia | 1,500 (b) | 2,300 |
| South Africa | 2,100 | 2,100 |

(a) Estimate. (b) Shipments to Europe and U.S.A.

4. *Prices of Tin.*—The average price of the metal in the London market for the year 1897 and from 1905 to 1915 was as follows:—

PRICE PER TON OF TIN, 1897 to 1915.

| Year. | | | Price per Ton. | | | Year. | | | Price per Ton. | | |
|-------|-----|-----|----------------|----|----|-------|-----|-----|----------------|----|----|
| | | | £ s. d. | | | | | | £ s. d. | | |
| 1897 | ... | ... | 61 | 8 | 0 | 1910 | ... | ... | 155 | 6 | 2 |
| 1905 | ... | ... | 143 | 1 | 8 | 1911 | ... | ... | 192 | 7 | 0 |
| 1906 | ... | ... | 180 | 12 | 11 | 1912 | ... | ... | 209 | 8 | 5 |
| 1907 | ... | ... | 172 | 12 | 9 | 1913 | ... | ... | 206 | 5 | 7 |
| 1908 | ... | ... | 133 | 2 | 6 | 1914 | ... | ... | 156 | 12 | 7* |
| 1909 | ... | ... | 134 | 15 | 6 | 1915 | ... | ... | 163 | 19 | 2 |

* Quotations incomplete.

According to "The Mineral Industry" the maximum price obtained for tin during the period 1897-1915 was reached in April, 1914, when the metal was quoted at £231 per ton.

5. **Employment in Tin Mining.**—The number of persons employed in tin mining in 1901 and during the last five years is shown below:—

PERSONS ENGAGED IN TIN MINING, COMMONWEALTH, 1901 and 1911 to 1915.

| Year. | N.S.W. | Victoria. | Qld. | W. Aust. | Tas. | Nor. Ter. | C'wealth. |
|-------|--------|-----------|-------|----------|-------|-----------|-----------|
| | No. | No. | No. | No. | No. | No. | No. |
| 1901 | 1,428 | ... | 1,148 | 413 | 1,065 | ... | 4,054 |
| 1911 | 2,225 | 34 | 1,860 | 321 | 1,755 | 280 | 6,475 |
| 1912 | 2,646 | 57 | 2,153 | 409 | 1,762 | 287 | 7,314 |
| 1913 | 2,362 | 116 | 2,102 | 403 | 1,947 | 267 | 7,197 |
| 1914 | 2,168 | 65 | 1,570 | 217 | 1,523 | 186 | 5,729 |
| 1915 | 1,648 | 27 | 1,218 | 188 | 1,221 | 154 | 4,456 |

§ 7. Zinc.

1. **Production of Zinc.**—The production of spelter is practically confined to the Broken Hill district of New South Wales, where zinblend 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 had 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 (spelter and concentrates) amounted to 49,879 tons; in 1909 they totalled 373,906 tons, valued at £1,041,280; and in 1915, 190,916 tons, valued at £1,111,569, 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 1915:—

NEW SOUTH WALES.—PRODUCTION OF ZINC, 1889 to 1915.

| Year. | Quantity of Zinc (Spelter and Concentrates) Produced. | Value. | Year. | Quantity of Zinc (Spelter and Concentrates) Produced. | Value. |
|-------|---|-----------|-------|---|-----------|
| | Tons. | £ | | Tons. | £ |
| 1889 | 97 | 988 | 1912 | 520,518 | 1,766,242 |
| 1891 | 219 | 2,622 | 1913 | 506,661 | 1,547,987 |
| 1899 | 49,879 | 49,207 | 1914 | 359,310 | 1,020,711 |
| 1911 | 516,378 | 1,414,980 | 1915 | 190,916 | 1,111,569 |

The total quantity of zinc (spelter and concentrates) produced in New South Wales to the end of the year 1915 was 3,876,604 tons, valued at £11,220,180.

At the Silver Spur mine at Texas, in the Stanthorpe division in Queensland, part of the ore is high in zinc and lead, but low in silver. Profitable extraction of the zinc and lead depends, however, on railway connection with the mine. Zinc sulphide is produced by the Mount Garnet mine in the Herberton district, and during 1915, several hundred tons of good quality ore were raised.

During the year 1915, a small quantity of zinc, valued at £143, was produced in Western Australia.

2. **Prices of Zinc.**—During the four years 1911 to 1914, the price of zinc averaged £23 15s. per ton, ranging from £21 in 1914 to £26 3s. 4d. in 1912. Owing to the heavy demand and other circumstances arising out of the war, the price in 1915 reached the very high average of £68 19s. 7d. per ton.

§ 8. Iron.

1. **General.**—The fact that iron-ore is widely distributed in the Commonwealth has long been known, and extensive deposits have been discovered from time to time at various places throughout the States. 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 1908-12.* 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, together with its amendment in 1912, provided for the payment of bounties on iron in accordance with the terms set out hereunder:—

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, 1914 |
| 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 | 10 per cent. on value | | |
| 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 to 1914-15, are shewn in the following statement:—

**PARTICULARS OF BOUNTIES PAID ON PIG IRON, BAR IRON, STEEL, Etc.,
1909 to 1915.**

| Period. | 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 Australian Ore. | Wire netting made from wire manufactured in the United Kingdom | Total. |
|---------------------------------|--------------------------------------|---|------------------------------------|---|--|---------|
| | £ | £ | £ | £ | £ | £ |
| Half-year ended 30th June, 1909 | 575 | 568 | 2,314 | 192 | ... | 3,649 |
| 1909-10 | 1,491 | 1,254 | 23,510 | 287 | 6,036 | 32,578 |
| 1910-11 | 1,940 | 2,080 | 20,462 | 121 | 4,824 | 29,427 |
| 1911-12 | 723 | 671 | 15,611 | 74 | 5,968 | 23,047 |
| 1912-13 | ... | 38 | 16,949 | ... | 1,110 | 18,097 |
| 1913-14 | 7,136 | ... | 40,121 | ... | 4,554 | 51,811 |
| 1914-15 | 2,474 | ... | 31,813* | ... | 593 | 34,880 |
| Total | 14,339 | 4,611 | 150,780 | 674 | 23,085 | 193,489 |

* Including £19,808 under Iron Bounty Act, see (ii.) infra.

(ii.) *The Iron Bounty Act 1914.* This Act repealed the Manufactures Encouragement Act 1908-14, and provides for a bounty on Australian pig iron up to the end of 1915. The rate of bounty is 8s. per ton, and the total amount authorised is £30,000. Provision is made for transfer, if required, to the State, of lands, buildings, etc., used in the manufacture of pig iron. During the financial year 1915-16, bounty amounting to £24,465 was paid on 61,162 tons. So far New South Wales is the only State where bounty has been claimed.

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 earlier issues of the Year Book (see No. III., p. 508). During 1915 the following materials were received at the blast furnace at the Eskbank Iron Works, Lithgow:—Iron ore, 134,684 tons; limestone, 42,379 tons; and coke, 96,316 tons. The output was 76,318 tons of pig iron, and the quantity of steel ingots made 25,040 tons. The iron ore was raised from quarries at Tallawang and Coombing Park.

The Broken Hill Proprietary Company has established works for the manufacture of iron and steel on a large scale at Newcastle, and operations were started early in 1915. The Company is utilising the immense deposit of iron ore at the Iron Knob quarries in South Australia, abundant stores of first quality coal can be obtained from the various coalfields in the vicinity of Newcastle, and arrangements have been made for the local supply of the necessary quantities of limestone. The works have been planned so as to allow of ready extension as the business develops. During the year ended 31st May, 1916, the production of steel ingots amounted to over 86,000 tons. The quantity of commercial steel rolled was returned at 63,000 tons, of which 43,000 tons consisted of rails, over 5000 tons of shell steel, and over 4000 tons of joists and channels. In addition to the blast furnace four open hearth furnaces were in operation, and it is proposed to increase the number to seven. Plans provide for a duplication of the blast furnace and coke oven plants, as well as for new steel furnaces, in addition to the seven alluded to.

The following table shews the quantity and value of finished iron, pig iron, etc., made in New South Wales during the last seven years from locally-raised ores.

NEW SOUTH WALES.—PRODUCTION OF IRON, 1909 to 1915.

| Particulars. | 1909. | 1910. | 1911. | 1912. | 1913. | 1914. | 1915. |
|---------------|---------|---------|---------|---------|---------|---------|---------|
| Quantity Tons | 29,762 | 40,497 | 36,354 | 32,677 | 46,563 | 75,150 | 76,318 |
| Value ... £ | 106,357 | 161,948 | 145,416 | 130,708 | 186,252 | 254,257 | 267,000 |

The bounty paid in 1913, 1914 and 1915 on iron and steel made from ores mined in New South Wales was as follows:—

BOUNTY PAID ON IRON AND STEEL, NEW SOUTH WALES, 1913, 1914 and 1915.

| Description. | 1913. | | 1914. | | 1915. | |
|--------------|----------|----------|----------|----------|----------|----------|
| | Tonnage. | Bounty. | Tonnage. | Bounty. | Tonnage. | Bounty. |
| Pig iron ... | 40,490 | £ 24,294 | 58,528 | £ 35,117 | 75,000 | £ 30,000 |
| Steel ... | 1,088 | 653 | 14,929 | 8,957 | ... | ... |
| Total ... | 41,578 | 24,947 | 73,457 | 44,074 | 75,000 | 30,000 |

A quantity of iron oxide is purchased by the various gasworks for use in purifying gas, the output in New South Wales being drawn chiefly from the deposits at Port Macquarie, while smaller quantities are obtained from Mittagong and Narrabri. At Turrawan, in the Narrabri division, a deposit of ore said to contain from 55 to 65 per cent. of pure iron oxide has been found, and about 70 tons were raised and sent to Newcastle for the manufacture of paint. During 1915 the iron oxide raised amounted to 2,294 tons, valued at £3,774, while the total output to the end of that year was 22,000 tons, valued £43,669. Up to the end of 1912 a certain amount of ironstone was raised each year for fluxing purposes, but as the smelting companies obtained suitable ores for treatment there was no subsequent production. The total raised for the period 1899-1912 amounted to 107,000 tons, valued at £81,618.

(ii.) *Victoria.* Iron ore has been located at various places in Victoria, particularly at Nowa Nowa, in the Gippsland district, and at Dookie. A blast furnace was erected in 1881 near Lal Lal, on the Moorabool River, and some very fair quality iron was produced, which was used for truck wheels and stamper shoes 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 profitably 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 1915, 45,686 tons of ironstone, valued at £37,436, were raised, of which 41,000 tons, valued at £36,000, came from the Rockhampton district, and about 4000 tons, valued at about £1600, from the Cloncurry field.

(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. The Broken Hill Company utilises ore from this quarry at its iron-works at Newcastle, New South Wales, and the amount raised in 1915 was over 236,000 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 the most 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. Iron pyrites for the manufacture of sulphuric acid and of manures, is produced on the West Coast, the quantity raised in 1915 being 12,836 tons, valued at £8945.

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

(viii.) *World's Production of Iron, 1915.* The quantity of iron produced in Australia is but a very small proportion of the world's production, which in 1915 amounted to 64,516,000 metric tons (pig iron). The leading position for magnitude of production is held by the United States, which in 1915 produced 30,000,000 tons, compared with Germany's 11,790,000 tons, and the United Kingdom 8,793,000 tons. The position of the three countries named is similar to what it has been for several years past. Unfortunately, complete returns for a later year than 1911 are not available in regard to steel, but the production for that year is given as 58,276,000 metric tons.

§ 9. Other Metals.

1. **Antimony.**—This metal is widely distributed in the north-eastern portion of New South Wales, between the 148° meridian and the coast, and has been found native at Lucknow, near Orange. Dyscrasite, a silver antimonide, has been found in massive blocks in the Broken Hill lodes. The export of antimony (metal and ore) in 1914 amounted to 637 tons, valued at £12,519. The ore was raised mainly in the Hillgrove division, where it is found in association with scheelite and gold. The total quantity of antimony ore raised in New South Wales up to the end of 1915 was 17,345 tons, valued at £318,614. The production of antimony ore in Victoria during 1915 amounted to 11,113 tons, valued at £49,320. The whole of this ore was raised by a company 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 principal district at present being exploited for antimony extends from Northcote to Mount Mulligan. Ore has also been obtained in the Dividing Range near Herberton, and adjacent to some of the central tributaries of Emu Creek. Production in 1915 amounted to 193 tons, valued at £3425. In Western Australia lodes of stibnite carrying gold have been found in the Roeburne district.

2. **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.

3. **Barium.**—A valuable lode of barium sulphate has been discovered near Dalwin, on the North Lyell railway, in Tasmania, and it is proposed to develop the deposit. It is stated that the lode is from 2½ to 7 feet wide over a length of over 40 chains.

4. **Bismuth.**—This metal has been found in New South Wales, near Glen Innes, in the Deepwater division, and also at Whipstick, in the Pambula division, its discovery dating from 1877. About 18 tons of metal and ore, valued at £4981, were exported from New South Wales during 1915; the total quantity exported to the end of that year was

583 tons, valued at £137,557. In Queensland wolfram and bismuth have been found in various districts, but the chief centres of production in 1915 were the Herberton and Chillagoe fields. The total production in 1915 was valued at £81,075, of which £54,300 was returned as wolfram, £772 as bismuth, and £26,003 as bismuth and wolfram. In South Australia deposits are found at Balhannah, at Mount Macdonald, and at Murninnie, on the shores of Spencer's Gulf. In Tasmania 5 tons, valued at £1203, were raised in 1915 principally from the Shepherd and Murphy mine at Middlesex.

5. **Chromium.**—In New South Wales chromium is found at Bowling Alley Point, on the Peel River, at Barraba, at Gordon Brook, in the Clarence River district, at Bingara, Wallendbeen, and near Gundagai. The production during recent years has been trifling, the quantity raised in 1915 being 638 tons, from an area at Wood's Reef, Barraba. The total exports to the end of 1915 amounted to 31,084 tons, valued at £102,617. Chrome iron ore is found in Queensland in the Rockhampton district, where the Elgalla mine, at Cawarral, produced a small quantity in 1911. There was also some production from the mine near Broadmount.

6. **Carnotite.**—A discovery of carnotite ore was made in 1906 twenty miles E.S.E. from the Olray railway station in South Australia. (See also "Radium.")

7. **Cobalt.**—This metal was found at Carcoar in New South Wales in 1889, and subsequently at Bungonia, Port Macquarie, and various other places. There was no export of cobalt in 1915, and the total produced since 1860 amounted in value to only a little over £8000. 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.

8. **Lead.**—This metal was first noted in New South Wales in 1849, when small specimens of native metal were found by the Rev. W. B. Clarke. At present lead mining *per se* is not practised to any extent in the Commonwealth, the supply of the metal being chiefly obtained in conjunction with silver. In New South Wales, lead in the form of pig, carbonate, and chloride, exported in 1915, amounted to 30,305 tons, valued at £689,439. The total lead exported to the end of 1915 was 218,039 tons, valued at £3,426,000. 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, copper or gold contents of the ore, the lead produced in 1915 amounting to 486 tons, valued at £10,638, of which 17 tons, valued at £397, were produced from mines in the Chillagoe district, 129 tons, valued at £2580, from Herberton, 98 tons, valued at £2212, from the Etheridge district, and 182 tons, valued at £4186, from the Burketown district. Pig lead to the value of £302 was exported from Western Australia in 1915. Complete information is not available as to the lead contents of Tasmanian silver-lead ores. At one time South Australia produced a fair amount of lead, £22,303 worth being raised in 1902, but the production rapidly decreased, and no output has been recorded since 1910.

9. **Mercury.**—In New South Wales mercury was first recorded by the Rev. W. B. Clarke in 1841. Cinnabar has been found in lodes and impregnations at various places, such as Bingara, Clarence River, etc. Up to the present the production of quicksilver has been small, the total being only about 3000 lbs. Pulganbar, in the Copmanhurst division, and Ewengar in the Drake division, were the only districts raising ore in 1915. In Victoria native mercury and cinnabar have been found at Silver Creek, a tributary of the Jamieson River. 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, and it is also found in New Guinea.

10. **Manganese.**—Ores of this metal occur 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. During 1915, 713 tons, valued at £535, were

raised at Grenfell. 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. Small quantities of manganese ore were raised in Victoria during 1915 from mines in the vicinity of Heathcote. Extensive deposits of the ore were mined at Boolcunda in South Australia some years ago. Deposits have also been noted at Kangaroo Island, Quorn, Tumby, and various other parts of the State. The production in 1915 was valued at £563. In Western Australia ores of the metal are found widely scattered, the black oxide being especially plentiful in the Kimberley district.

11. **Molybdenum.**—In New South Wales molybdenite (associated with bismuth) is obtained at Kingsgate, near Glen Innes, at Deepwater, at Rocky River in the Tenterfield division, in the Bathurst division, and at Whipstick in the Pambula division, the export in 1915 being 32 tons, valued at £16,937, as compared with 61 tons, valued at £11,451, in the previous year. The production at Kingsgate was valued at about £7300. In the Deepwater division £3000 worth was obtained. A small quantity was also obtained at Wunglebong in the Tenterfield division. The Whipstick mines yielded 12 tons of molybdenite, valued at £6000. There was a small production from Yetholme in the Bathurst division, and prospecting operations were carried on in the Kempsey, Armidale, Bega, Tamworth, Wilson's Downfall, and Goulburn divisions. The production in Queensland for 1915 was 97 tons, valued at £45,060, practically the whole of which was contributed by the mines in the Chillagoe field. A small quantity was produced in 1914 from mines in the Moonta district in South Australia, and the occurrence of the metal is reported from various other localities. The existence of molybdenite in the Darling Range in Western Australia has been known for many years, and the high price for the metal is causing renewed attention to be devoted to the deposit.

12. **Radium.**—(i.) 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 at Radium Hill are now being mined, and the concentrates forwarded to Sydney for treatment at the company's works at Woolwich. Monazite from Pilbara, Western Australia, has been shewn to give off radium emanations. The mineral has been called "pilbarite." 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.

(ii.) *Production of Radium Bromide.* At the end of November, 1912, a small quantity of radium bromide was produced at the Radium Hill Co.'s works at Woolwich, Sydney, this being the first occasion on which a marketable amount of this salt has been obtained outside of Europe. It is estimated by the chemist in charge that the present plant at the works is capable of providing £600 worth of radium weekly. From the 30th June, 1913, to the end of May, 1914, the works produced 239 milligrams of high grade radium preparation. The industry, however, is at present inactive in consequence of the war.

13. **Tungsten.**—Wolfram and scheelite, the principal ores of tungsten, are both mined to a small extent in New South Wales. During 1915 the export of wolfram was 50 tons, valued at £5031, and of scheelite 33 tons, valued at £4004. Wolfram was mined chiefly at Torrington, in the Deepwater division, and scheelite at Hillgrove. In Victoria small quantities of ore were raised during 1915 at Mount Murphy, Bendoc, and Koetong. In Queensland, tungsten ores are found in several districts, the chief centres of production in 1915 being Chillagoe and Herberton. (See also Bismuth.) A deposit of wolfram was discovered near Yankalilla, in South Australia, as far back as 1893, but the production up to date has been small. It is believed that careful examination will lead to

increased production from the deposits at Callawonga Creek. About 95 tons of wolfram, valued at £11,115, were produced in Tasmania during 1915, of which 50 tons, valued at £6068 were raised at the Storey's Creek tin mine at Avoca, and 35 tons, valued at £3692, at the Shepherd and Murphy mine at Middlesex. In the Northern Territory small yields of wolfram were obtained at Burns Wolfram mine, 40 miles east of Pine Creek, and at Yenberrie in the same district. Numerous samples of good wolfram ore have been obtained at the Frew River in Central Australia.

In Western Australia a deposit of wolfram was discovered in the West Kimberley district about 70 miles to the north-east of Derby. The export in 1915 was, however, trifling. Wolfram is mined at various points in Tasmania, the production for 1915 being 95 tons, valued at £11,115, obtained chiefly at Avoca and from the Shepherd and Murphy mine at Middlesex. Scheelite has been discovered on King Island in Bass Strait.

14. **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. No production was recorded subsequently. Small quantities of the mineral are also found in the Northern Territory.

15. **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 radium is regarded as one of the products of disintegration of uranium.

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. (See No. III., pp. 515-6.)

(ii.) *New South Wales.* The production in 1915 amounted to 9,449,008 tons, valued at £3,424,630, or a decrease of about 942,000 tons in quantity, and £313,000 in value, as compared with the output in 1914. The decreased return in 1915 is accounted for largely by the lessened production from the Northern District Collieries consequent on the restriction of the export trade owing to the war.

(iii.) *Victoria.* During 1915, 590,968 tons of coal were raised, valued at £275,343. Of this total 528,922 tons, valued at £238,015, were raised by the State coal mine at Wonthaggi. The total production for 1915 was about 29,000 tons lower than in the preceding year.

(iv.) *Queensland.* The quantity of coal raised in 1915 was 1,024,273 tons, valued at £409,342, this production being only slightly less than in 1913 and 1914. Twenty-seven collieries were working in the Ipswich district, seven on the Darling Downs, five in the Maryborough district, one in the Central district, and four at Blair Athol. 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 1915, and the output for the year was 286,666 tons, or about 32,000 tons less than in 1914.

(vi.) *Tasmania.* The principal collieries in Tasmania are the Cornwall and Mount Nicholas, the former producing 25,000 and the latter 37,000 tons out of a total yield in 1915 of 65,000 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 1915.

| Year. | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tas. | C'wth. |
|------------------|------------|-----------|-----------|----------|----------|--------|------------|
| QUANTITY. | | | | | | | |
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. |
| 1881 | 1,769,597 | 22,634 | 65,612 | ... | ... | 11,163 | 1,646,372 |
| 1891 | 4,037,929 | 22,634 | 271,603 | ... | ... | 49,256 | 4,375,622 |
| 1901 | 5,969,426 | 209,329 | 539,472 | ... | 117,836 | 45,438 | 6,880,501 |
| 1911 | 8,691,604 | 659,398 | 891,568 | ... | 249,890 | 57,067 | 10,550,127 |
| 1912 | 9,895,815 | 593,155 | 902,166 | ... | 295,079 | 53,560 | 11,729,775 |
| 1913 | 10,414,165 | 596,896 | 1,037,944 | ... | 313,818 | 55,043 | 12,417,866 |
| 1914 | 10,390,622 | 620,251 | 1,053,990 | ... | 319,210 | 60,794 | 12,444,667 |
| 1915 | 9,449,008 | 590,968 | 1,024,273 | ... | 286,666 | 64,536 | 11,415,451 |
| VALUE. | | | | | | | |
| | £ | £ | £ | £ | £ | £ | £ |
| 1881 | 603,248 | ... | 29,033 | ... | ... | 4,465 | 636,746 |
| 1891 | 1,742,706 | 19,731 | 128,198 | ... | ... | 17,303 | 1,908,028 |
| 1901 | 3,178,929 | 147,928 | 189,877 | ... | 68,561 | 18,175 | 2,602,770 |
| 1911 | 3,167,165 | 301,141 | 323,968 | ... | 111,154 | 26,214 | 3,929,672 |
| 1912 | 3,660,015 | 259,321 | 338,264 | ... | 135,857 | 24,568 | 4,418,025 |
| 1913 | 3,770,365 | 274,340 | 403,767 | ... | 153,614 | 25,367 | 4,628,053 |
| 1914 | 3,737,761 | 289,099 | 416,292 | ... | 148,684 | 27,853 | 4,619,689 |
| 1915 | 3,424,630 | 275,343 | 409,342 | ... | 137,859 | 30,418 | 4,277,592 |

The Victorian figures for 1915 include about 2900 tons of brown coal, the bulk of which was raised at Altona.

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 or Trias-Jura | 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, Bullah Dellah. | Very inferior coal with bands; of no value. |

In regard to the Tertiary deposits, it may be noted that no serious attempt has been made to use the coal as fuel in New South Wales. At Kiandra a deposit of lignite was found to possess a maximum thickness of 30 feet, but as a general rule the seams vary

from 3 to 4 feet in thickness. The Triassic or Trias-Jura 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. These beds extend under the great western plains, but the presence of artesian water precludes the possibility of their being worked. The Clarence basin extends into Queensland, and at Ipswich thick and valuable seams of coal are 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 16,550 square miles. The deepest part of the basin is somewhere in the vicinity of Sydney, where the "Sydney Harbour Colliery" is working the top seam at a depth of 2884 feet. Towards the north, south and west the seams rise towards the surface, and outcrop in the neighbourhood of Newcastle, Bulli and Lithgow. 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. At the present time the Greta coal seams are being extensively worked between West Maitland and Cessnock, and this stretch of country, covering a distance of fifteen miles, is now the most important coal mining district in Australasia. The Permo-Carboniferous measures have in various places been disturbed by intrusions of volcanic rocks, which in some instances have completely cindered the seams in close proximity to the intrusive masses, while in other instances the coal has been turned into a natural coke, some of which has realised good prices as fuel.

The table hereunder gives the yields from the various divisions at intervals from 1881 to 1915:—

COAL RAISED IN NEW SOUTH WALES, 1881 to 1915.

| District. | 1881. | | 1901. | | 1911. | | 1915. | |
|--------------|-----------|---------|-----------|-----------|-----------|-----------|-----------|-----------|
| | Quantity. | Value. | Quantity. | Value. | Quantity. | Value. | Quantity. | Value. |
| | Tons. | £ | Tons. | £ | Tons. | £ | Tons. | £ |
| Northern ... | 1,352,472 | 437,270 | 3,999,252 | 1,669,519 | 5,793,646 | 2,320,673 | 6,307,015 | 2,397,833 |
| Southern ... | 253,283 | 115,505 | 1,544,454 | 407,196 | 2,066,621 | 636,163 | 2,261,398 | 784,316 |
| Western ... | 163,842 | 50,473 | 424,720 | 102,214 | 831,337 | 210,329 | 880,595 | 242,481 |
| Total ... | 1,769,597 | 603,248 | 5,968,426 | 2,178,929 | 8,691,604 | 3,167,165 | 9,449,008 | 3,424,630 |

Sydney Harbour Colliery. This colliery possesses considerable interest from the circumstance that its workings are amongst the deepest in the world. Extended reference to the history of its opening will be found in preceding Year Books. (See No. VI., page 504.)

(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. 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, 2864 tons of brown coal, valued at £573, were raised in 1915.

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

PRODUCTION OF COAL IN VICTORIA, 1906 to 1915.

| Year. | State Coal Mine. | Outtrim Howitt Company | Jumbunna Coal Company | Coal Creek. | Silkstone Co-operative Company | Austral Coal. | Other Companies. | Total Production. | Value. |
|-------|------------------|------------------------|-----------------------|-------------|--------------------------------|---------------|------------------|-------------------|---------|
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | £ |
| 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 | 1,730 | 128,673 | 76,945 |
| 1910 | 201,053 | 46,832 | 61,954 | 10,968 | ... | 36,052 | 13,050 | 369,909 | 189,254 |
| 1911 | 506,059 | 28,359 | 57,397 | 4,589 | ... | 34,607 | 28,987 | 659,998 | 301,141 |
| 1912 | 455,659 | 24,326 | 53,306 | 4,829 | ... | 31,506 | 23,529 | 593,155 | 259,321 |
| 1913 | 486,238 | 22,460 | 38,795 | 6,218 | ... | 33,462 | 9,723 | 596,896 | 274,940 |
| 1914 | 550,107 | 16,597 | 24,236 | 5,887 | ... | 20,034 | 3,390 | 620,251 | 289,099 |
| 1915 | 528,922 | 7,500 | 28,160 | 6,338 | ... | 16,229 | 3,819 | 590,968 | 275,343 |

Included in the total "for other companies" is an amount of 655 tons raised by the Powlett North Woolamai, at Powlett, and 300 tons by the Victorian Coal and Coke Co., at Kilcunda. The figures also include 2864 tons of brown coal raised at Altona.

(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. Arrangements have been made for opening up a deposit of brown coal at Bowen, on the Morgan Railway Line, about 87 miles from Adelaide.

(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. Boring operations have proved the existence of seams of workable coal for some distance on both sides of the Dawson 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 1915.

| Year | ... | ... | 1861. | 1871. | 1881. | 1891. | 1901. | 1915. |
|----------|-----|------|--------|--------|--------|---------|---------|-----------|
| Quantity | ... | Tons | 14,212 | 17,000 | 65,612 | 271,603 | 539,472 | 1,024,273 |
| Value | ... | £ | 9,922 | 9,407 | 29,033 | 128,198 | 189,877 | 409,342 |

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

QUEENSLAND COLLIERIES, 1913, 1914 and 1915.

| Collieries. | 1913. | | 1914. | | 1915. | |
|--------------------------------|--------------|-------------------------------|--------------|-------------------------------|--------------|-------------------------------|
| | Tons Raised. | Average Value at Pit's Mouth. | Tons Raised. | Average Value at Pit's Mouth. | Tons Raised. | Average Value at Pit's Mouth. |
| Ipswich ... | 695,422 | s. d. 7 1 | 718,205 | s. d. 7 1 | 682,491 | s. d. 7 3 |
| Darling Downs ... | 103,538 | 8 6 | 105,645 | 8 9 | 97,411 | 8 11 |
| Nundah (Brisbane) | ... | ... | 625 | 5 3 | ... | ... |
| Wide Bay and Maryborough ... | 129,611 | 10 11 | 118,120 | 11 4 | 104,358 | 11 10 |
| Rockhampton (central) ... | 13,574 | 10 4 | 7,818 | 8 9 | 6,741 | 8 6 |
| Clermont ... | 95,799 | 7 7 | 102,980 | 8 5 | 123,731 | 7 8 |
| Mount Mulligan (Chillagoe) ... | ... | ... | 597 | 17 2 | 9,541 | 12 7 |
| Total... .. | 1,037,944 | 7 9 | 1,053,990 | 7 11 | 1,024,273 | 8 0 |

It is estimated that more than one-third of the production from Ipswich was shipped as bunker coal, while the total amount shipped at the South Brisbane railway wharf for bunkers, cargo, and other purposes was returned at 296,000 tons. The average value of Queensland coal in 1915 was the highest recorded for the last sixteen years.

(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 increased output up to 1914 is partly due to the establishment of a bunkering trade at Bunbury and Fremantle, and partly to the employment of improved machinery. Difficulties with an inflow of water on the Scottish Collieries and a falling-off in the bunkering trade were responsible for the diminished returns in 1915. The production from this field since 1901 was as follows:—

PRODUCTION OF COAL IN WESTERN AUSTRALIA, 1901 to 1915.

| Year | 1901. | 1909. | 1910. | 1911. | 1912. | 1913. | 1914. | 1915. |
|---------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Quantity Tons | 117,836 | 214,302 | 262,166 | 249,890 | 295,079 | 313,818 | 319,210 | 286,666 |
| Value £ | 68,561 | 90,965 | 113,699 | 111,154 | 135,857 | 153,614 | 148,684 | 137,859 |

(vi.) *Tasmania.* In Tasmania coal occurs in the following geological periods:—
 (1) Permo-Carboniferous: Lower Coal Measures. (2) Mesozoic: Upper Coal Measures.
 (3) Tertiary: Brown Coal and Lignite deposits. Permo-Carboniferous coal is found at Avoca, Mt. Nicholas and Fingal, Thomson's Marshes, Langloh, Seymour, York Plains, Mike Howe's Marsh, Longford, Colebrook, Schouten Island, Spring Bay and Prosser's Plains, Compton and Old Beach, Lawrenny, Longhole, Sandfly, Ida Bay, Hastings and Southport, Recherché and South Coast, Tasman's Peninsula. Deposits of lignite and brown coal are plentiful in beds of Tertiary age, but they have not been exploited to any extent. An estimate gives the approximate quantity of coal available as sixty-five million tons, of which eleven millions are in the Lower Coal Measures and fifty-four millions in the Upper Measures, exclusive of an unknown quantity in strata fringing the Central Tiers.

PRODUCTION OF COAL IN TASMANIA, 1901 to 1915.

| District. | 1901. | 1909. | 1910. | 1911. | 1912. | 1913. | 1914. | 1915. |
|-------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. | Tons. |
| North-western ... | 2,952 | 1,543 | 1,720 | 1,496 | 956 | 1,167 | 1,074 | 270 |
| Eastern ... | 37,239 | 57,227 | 71,115 | 54,296 | 51,205 | 52,759 | 58,743 | 63,507 |
| Midland ... | 1,536 | 560 | 721 | 635 | 679 | 847 | 847 | 691 |
| South-eastern ... | ... | 6,832 | 8,899 | 640 | 720 | 270 | 130 | 68 |
| South-western ... | 3,711 | | | | | | | |
| Total ... | 45,438 | 66,162 | 82,455 | 57,067 | 53,560 | 55,043 | 60,794 | 64,536 |

• The bulk of the output in 1915 was raised from the Cornwall and Mt. Nicholas mines, which produced 25,470 and 37,431 tons respectively.

3. **Production of Coal in Various Countries.**—The total known coal production of the world in 1912 amounted to about 1100 million tons (exclusive of brown coal or lignite), towards which the Commonwealth contributed 11 million tons, or about 1 per cent. The following table shews the production of the British Empire and the chief foreign countries in units of 1000 tons in 1901 and during each of the years from 1908 to 1914 where the returns are available:—

COAL PRODUCTION, BRITISH EMPIRE, 1901 and 1908 to 1914.

| Year. | United Kingdom. | British India. | Canada. | Australian C'wealth. | New Zealand. | Union of S. Africa. |
|----------|-----------------|----------------|------------|----------------------|--------------|---------------------|
| | 1000 tons. | 1000 tons. | 1000 tons. | 1000 tons. | 1000 tons. | 1000 tons. |
| 1901 ... | 219,047 | 6,636 | 5,791 | 6,881 | 1,228 | 712 |
| 1908 ... | 261,529 | 12,770 | 9,720 | 10,194 | 1,861 | 5,137 |
| 1909 ... | 263,774 | 11,870 | 9,376 | 8,186 | 1,911 | 5,534 |
| 1910 ... | 264,433 | 12,047 | 11,526 | 9,759 | 2,197 | 6,351 |
| 1911 ... | 271,892 | 12,716 | 11,908 | 10,550 | 2,066 | 6,933 |
| 1912 ... | 260,416 | 14,706 | 15,237 | 11,730 | 2,178 | 7,248 |
| 1913 ... | 287,430 | 14,708 | 13,404 | 12,418 | 1,888 | 8,660 |
| 1914 ... | 270,070 | 16,214 | 12,133 | 12,445 | 2,276 | 8,313 |

COAL PRODUCTION, FOREIGN COUNTRIES, 1901 and 1908 to 1914.

| Year. | Russian Empire. | Sweden. | German Empire. | Belgium. | France. | Spain. | Japan. | United States. |
|----------|-----------------|------------|----------------|------------|------------|------------|------------|----------------|
| | 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 | 8,885 | 240,789 |
| 1908 ... | 25,888 | 243 | 144,602 | 23,140 | 36,519 | 3,799 | 14,806 | 428,895 |
| 1909 ... | 26,736 | 298 | 148,645 | 23,532 | 37,030 | 3,751 | 15,429 | 371,288 |
| 1910 ... | 25,914 | 307 | 156,033 | 22,683 | 37,902 | 3,605 | 17,349 | 403,677 |
| 1911 ... | 28,414 | 355 | 172,065 | 22,603 | 38,602 | 3,853 | 17,632 | 447,854 |
| 1912 ... | 30,640 | 360 | 174,875 | 22,372 | 40,648 | 3,626 | 19,640 | 443,188 |
| 1913 ... | 32,206 | 364 | 190,109 | 22,858 | 39,410 | 4,293 | 21,415 | 477,202 |
| 1914 ... | 33,113 | 367 | 161,535 | .. | .. | 3,600 | 19,372 | 508,893. |

The United States returns include a large proportion of anthracite, the quantity averaging for the last five years about 75 million tons.

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

4. **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 1915 was 929,998 tons, valued at £508,446, of which amount 927,225 tons, valued at £506,361, were exported from New South Wales. Owing to the war the figures are, of course, considerably below those of normal years.

In the following table will be found the quantity and value of the exports from New South Wales, at decennial intervals since 1881 and during the last five years. The figures are given on the authority of the Mines Department of that State, and include both bunker coal and coal exported from New South Wales to other States of the Commonwealth :—

EXPORTS OF NEW SOUTH WALES COAL, 1881 to 1915.

| Year. | 1881. | 1891. | 1901. | 1911. | 1912. | 1913. | 1914. | 1915. |
|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Quantity, 1000 tons | 1,030 | 2,514 | 3,471 | 5,024 | 6,053 | 6,232 | 5,868 | 4,668 |
| Value ... £1000 | 417 | 1,307 | 1,682 | 2,664 | 3,233 | 3,342 | 3,159 | 2,485 |

The principal oversea countries to which coal was exported from New South Wales during the year 1915-16 were as shewn hereunder. The quantity and value refer strictly to exports, and exclude bunker coal :—

DESTINATION OF NEW SOUTH WALES OVERSEA EXPORTS OF COAL, 1915-16.

| Country. | Quantity. | Value. | Country. | Quantity. | Value. |
|------------------------|-----------|---------|-------------------|-----------|--------|
| | Tons. | £ | | Tons. | £ |
| Chile | 205,383 | 111,178 | United States ... | 40,456 | 22,567 |
| Philippine Islands ... | 10,243 | 5,361 | India | 50,075 | 27,611 |
| Straits Settlements | 47,272 | 25,206 | Java | 98,625 | 50,727 |
| Fiji | 34,255 | 18,241 | Mauritius | 2,351 | 1,312 |
| New Zealand | 314,202 | 171,912 | Ecuador | 8,174 | 4,490 |
| Peru | 23,414 | 13,785 | New Caledonia ... | 21,018 | 11,938 |
| Hawaii | 38,291 | 20,799 | | | |

The quantity of bunker coal taken from New South Wales by oversea vessels was about 696,000 tons, valued at £415,000.

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

DISTRIBUTION OF TOTAL OUTPUT OF NEW SOUTH WALES COAL, 1911 to 1915.

| Year. | Exports to Australasian Ports. | Exports to other Ports. | Local Consumption. | Total. |
|-------------|--------------------------------|-------------------------|--------------------|------------|
| | Tons. | Tons. | Tons. | Tons. |
| 1911 | 2,525,776 | 2,498,304 | 3,667,524 | 8,691,604 |
| 1912 | 3,096,179 | 2,956,939 | 3,832,697 | 9,885,815 |
| 1913 | 3,465,787 | 2,765,937 | 4,182,441 | 10,414,165 |
| 1914 | 2,581,810 | 3,286,223 | 4,522,589 | 10,390,622 |
| 1915 | 2,601,070 | 2,067,324 | 4,780,614 | 9,449,008 |

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 shews the consumption of coal in Australia, computed in the manner specified, for the last five years:—

CONSUMPTION OF COAL IN AUSTRALIA, 1911 to 1915.

| Year. | Quantity of Coal Consumed. | | | |
|-------------|----------------------------|--------------------------------|-----------------------------|-----------|
| | Home Produce. | Produce of the United Kingdom. | Produce of Other Countries. | Total. |
| | Tons. | Tons. | Tons. | Tons. |
| 1911 | 7,407,000 | 7,000 | 4,000 | 7,418,000 |
| 1912 | 7,907,000 | 1,500 | 14,000 | 7,922,500 |
| 1913 | 8,671,491 | 872 | 3,577 | 8,675,940 |
| 1914 | 8,944,867 | 23,066 | | 8,967,933 |
| 1915 | 9,250,592 | 6,580 | | 9,257,172 |

The bunker coal taken away in 1915 is estimated to have been a million 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., and in 1915, 7s. 3d. 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 five years was as follows:—

PRICE OF COAL IN NEW SOUTH WALES (PER TON), 1911 to 1915.

| Year. | Northern District. | Southern District. | Western District. |
|-------------|--------------------|--------------------|-------------------|
| | s. d. | s. d. | s. d. |
| 1911 | 8 0.13 | 6 1.88 | 5 0.72 |
| 1912 | 8 1.15 | 6 1.06 | 4 11.98 |
| 1913 | 7 9.91 | 6 1.13 | 5 1.85 |
| 1914 | 7 8.26 | 6 4.12 | 5 6.33 |
| 1915 | 7 7.24 | 6 11.23 | 5 6.08 |

(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 1909, 12s.; for 1912, 8s. 9d.; for 1913, 9s. 3d., and for 1914 and 1915, 9s. 4d. These averages are exclusive of brown coal, the production of which in 1915, was valued at about 4s. per ton.

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

PRICE OF COAL, QUEENSLAND, 1911 to 1915.

| District. | Value at Pit's Mouth. | | | | |
|-----------------------------------|-----------------------|-------------------|-------------------|-------------------|-------------------|
| | 1911. | 1912. | 1913. | 1914. | 1915. |
| | Per-ton. s. d. | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. |
| Ipswich | 6 5 | 6 7 | 7 0½ | 7 1 | 7 3 |
| Darling Downs | 8 5 | 8 6½ | 8 6 | 8 9 | 8 11 |
| Nundah (Brisbane) | .. | .. | .. | 5 3 | .. |
| Wide Bay and Maryborough | 10 10 | 10 10½ | 10 11 | 11 4 | 11 10 |
| Rockhampton | 10 4½ | 10 6 | 10 4 | 8 9 | 8 6 |
| Clermont | 7 6 | 7 6 | 7 7 | 8 5 | 7 8 |
| Mount Mulligan (Chillagoe) | .. | .. | .. | 17 2 | 12 7 |

(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.; in 1910, 8s. 8d.; in 1911, 8s. 10d.; in 1912, 9s. 2d.; in 1913, 9s. 9d., in 1914, 9s. 4d., and in 1915, 9s. 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.; in 1910, 11s. 9d.; in 1911 and 1912, 9s. 2d.; in 1913, 9s. 3d., in 1914, 9s. 2d., and in 1915, 9s. 5d. per ton.

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, excluding Russia, for which no information is available, for the five years ended 1912, was as follows:—

PRICE OF FOREIGN COAL, 1908 to 1912.

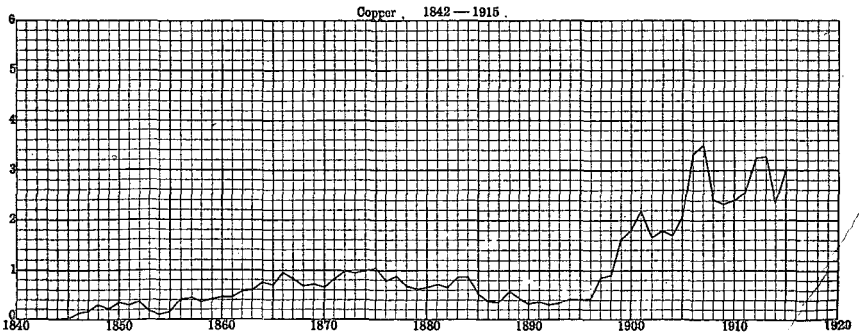
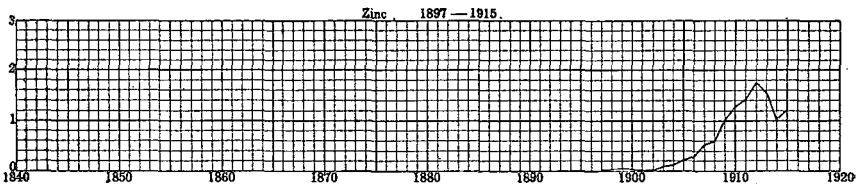
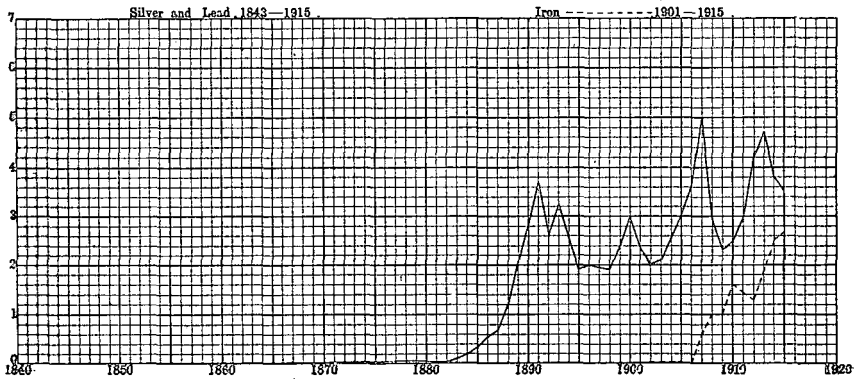
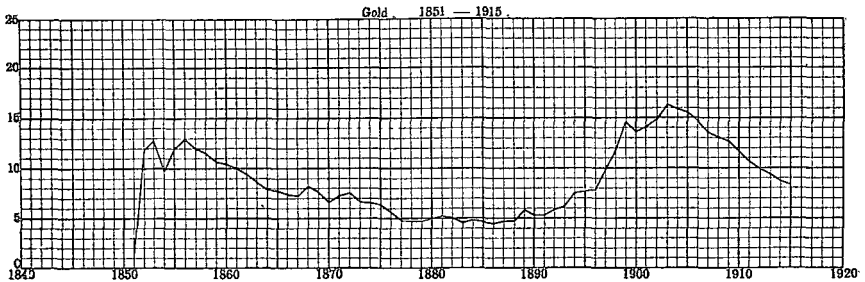
| Year. | United Kingdom. | Germany. | France. | Belgium. | United States. |
|-------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. |
| 1908 | 8 11 | 10 3½ | 12 11½ | 13 1½ | 5 11½ |
| 1909 | 8 0½ | 10 2½ | 12 5½ | 11 8½ | 5 7½ |
| 1910 | 8 2½ | 9 11½ | 12 3½ | 11 10½ | 5 10½ |
| 1911 | 8 1½ | 9 9½ | 12 5½ | 12 0 | 5 10½ |
| 1912 | 9 0½ | 10 6½ | 12 8½ | 13 5½ | 6 1 |

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, 1908 to 1912.

| Year. | British India. | C'wealth of Australia. | New Zealand. | Canada. | Union of Sth. Africa. |
|-------------|-------------------|------------------------|-------------------|-------------------|-----------------------|
| | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. | Per ton. s. d. |
| 1908 | 5 3 | 7 4½ | 10 4½ | 10 8 | 6 9½ |
| 1909 | 4 8½ | 7 6½ | 10 10½ | 10 10½ | 6 3½ |
| 1910 | 4 1 | 7 6½ | 11 1½ | 11 0½ | 5 10½ |
| 1911 | 3 11½ | 7 5½ | 10 10½ | 10 9½ | 5 8½ |
| 1912 | 4 6 | 7 6½ | 10 11½ | 11 5½ | 5 6½ |

GRAPHS SHEWING VALUES OF THE PRINCIPAL MINERALS PRODUCED IN THE COMMONWEALTH, 1840 to 1915.

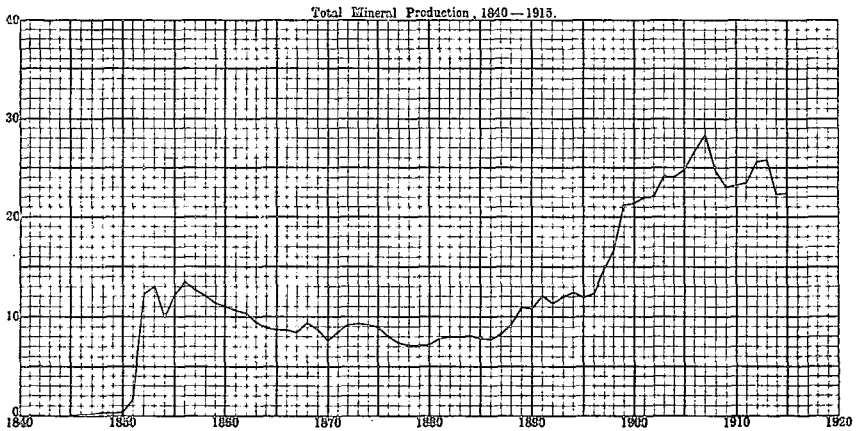
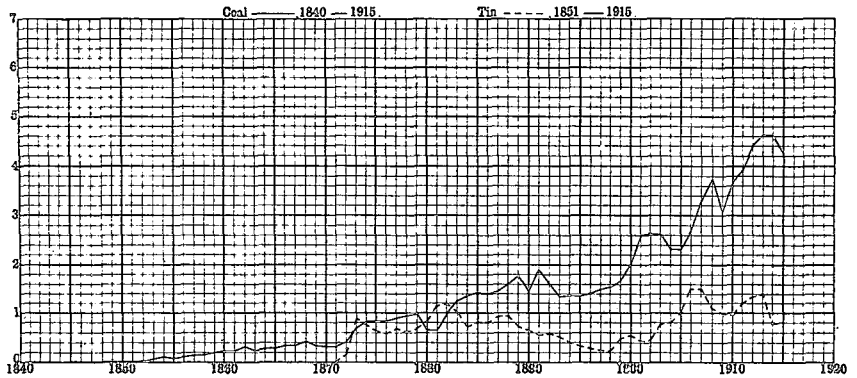


(See pages—for gold, 415; silver, 423; iron, 433; zinc, 431; copper, 426.)

EXPLANATION OF GRAPHS—The values shown in the above diagrams are those of the total Commonwealth production of certain of the most important minerals in successive years from 1842 to 1915.

The base of each small square represents an interval of one year, and the vertical height represents in the case of gold £1,000,000, in the case of silver, zinc and copper £200,000, and in the case of iron £20,000.

GRAPHS SHEWING VALUES OF THE PRINCIPAL MINERALS PRODUCED IN THE COMMONWEALTH, 1840 to 1915.



(See pages 439 for coal ; 439, tin ; and 413 total mineral production.)

EXPLANATION OF GRAPHS—The values shewn in the above diagrams are those of the total Commonwealth production of certain of the most important minerals in successive years from 1840 to 1915.

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

8. **Employment and Accidents in Coal Mining.**—The number of persons employed in coal mining in each of the States during the year 1915 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, some years ago, gave the total known number of persons engaged in coal mining in the principal countries of the world as 3½ millions, the number in the United Kingdom being 1,068,000; the United States, 723,000; Germany, 628,000; France, 199,000; Russia, 169,000; Belgium, 146,000; Austria, 75,000; India, 133,000; and Japan, 145,000.

The latest available returns shew the rate in the United Kingdom in respect of deaths through accidents in coal mines as 1.17, 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, 1915.

| 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 ... | 18,221 | 23 | 49 | 1.26 | 2.69 | 411,000 | 193,000 |
| Victoria ... | 1,312 | 3 | 20 | 2.28 | 15.24 | 197,000 | 30,000 |
| Queensland ... | 2,518 | 5 | 47 | 1.99 | 18.67 | 205,000 | 22,000 |
| Western Australia ... | 498 | 2 | 81 | 4.02 | 162.47 | 143,000 | 3,600 |
| Tasmania ... | 161 | ... | 2 | ... | 12.42 | ... | 32,000 |
| Commonwealth | 22,710 | 33 | 199 | 1.45 | 8.77 | 346,000 | 57,000 |

§ 11. Coke.

1. **Production of Coke.**—Notwithstanding the large deposits of excellent coal in Australia, there was, prior to the war, a fairly considerable amount of coke imported from abroad. In 1915-16, the import amounted to 1707 tons, valued at £3714, of which 1603 tons, valued at £3542, came from the United Kingdom. The table hereunder gives the production in New South Wales during the last five years:—

COKE MADE IN NEW SOUTH WALES, 1911 to 1915.

| Year. | 1911. | 1912. | 1913. | 1914. | 1915. |
|--------------------|-----------|----------|----------|-----------|-----------|
| Quantity ... Tons | 264,687 | 241,159 | 298,612 | 304,800 | 417,753 |
| Value, total ... £ | 184,337 | 162,454 | 208,989 | 213,069 | 313,241 |
| Value per ton ... | 13s. 11d. | 13s. 5d. | 14s. 0d. | 13s. 11d. | 14s. 11d. |

The output for 1915 is the largest yet recorded, and was participated in by the ovens in each of the coal-mining districts.

A small quantity of coke is made in Queensland, the quantity returned in 1915 being 17,085 tons, but the bulk of that used in ore reduction is imported, mainly from New South Wales. The following table shows the amount manufactured locally during the last five years:—

QUEENSLAND.—COKE MANUFACTURED, 1911 to 1915.

| Year. | 1911. | 1912. | 1913. | 1914. | 1915. |
|----------------------------------|--------|--------|--------|--------|--------|
| Manufactured locally tons | 35,025 | 38,136 | 14,942 | 16,685 | 17,085 |

The Queensland State Mining Engineer pointed out that from 50,000 to 60,000 tons of coke were obtained yearly from New South Wales, but owing to the abolition of records of interstate freetrade, particulars for the last five years are not available.

§ 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. The discovery of the mineral in New South Wales dates probably as early as 1802. Its occurrence in the Hartley Vale district was noted by Count Strzelecki in 1845. 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 1915 amounted to 15,474 tons, valued at £12,890, as compared with 50,049 tons, valued at £27,372, in 1914. The falling off in 1915 was due to the closing of the British-Australian Oil Company's mine at Temi, near Murrurundi. It is hoped that the yield in 1916 will be improved by increased production from the Western district, where it is stated that the new retorts at Wolgan are giving satisfactory returns.

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

(iii.) *Queensland.* The discovery of natural gas and traces of oil in a deep bore at Roma has fostered the hope that energetic prospecting will lead to the discovery of mineral oil in quantity in this locality. Oil-bearing shales are common in many parts of the State. The deposit at Daringa on the Central railway line shewed a thickness of 6 feet, and contained about 30 gallons of oil to the ton. Inflammable gas and a little oil have been noted in bores put down for coal on the Dawson River. There are shale deposits at Munduran Creek, near Gladstone, Casuarina Island, Redbank plains in the Ipswich District and Murphy's Creek, near Toowoomba. It is stated that the borings have not so far penetrated to a sufficient depth to properly test the strata.

(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. Specimens of bitumen have been discovered on Kangaroo Island, and it was supposed that they were the product of a petroleum-bearing area. The Government Geologist states, however, that the island strata are not of such nature as to support this supposition. In regard to

the mainland area it is argued by some investigators that the bores so far put down have not been carried to sufficient depth to fairly test the strata. A bonus of £5000 for the discovery of oil has been offered by the South Australian Government. An oil expert engaged by the Government reported adversely on the prospects, but his conclusions have been challenged by other investigators. A large number of licenses to search for oil have been taken out, and boring operations are being carried on near Kingston and near Robe, the bore at the latter having reached a depth of 2,000 feet.

(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.* Tasmanite shale has been discovered in the basins of the Mersey, Don, and Minnow Rivers, and the Government geologist estimates the probable capacity of the beds at 12,000,000 tons. The crude oil content of average quality shale has been estimated at 40 gallons to the ton. In July, 1912, the Railton-Latrobe Shale Oil Company acquired the leases and plant of the Tasmanian Shale and Oil Company, at Latrobe, and it is intended to develop the deposits on a large scale. The production in 1914 was, however, small, amounting to 75 tons, valued at £75, while no returns from this source were included in the production records for 1915. Large pieces of asphaltum have been discovered in places along the sea coast and in several of the bays of Port Davey Harbour, but it is believed that the material originates in submarine beds.

(vii.) *Northern Territory.* The existence of oil shale has been reported for many years in the Boroloola district, while several oil licenses have been applied for in the Victoria River district. Results so far, however, have been negative, and experts have pronounced unfavourably on the prospects.

(viii.) *Papua.* An expert has reported that the deposits of oil-bearing shale can be worked at a profit, and oil of a satisfactory quality has been obtained from two comparatively shallow bores. It is proposed to test the deeper deposits where indications warrant expectation of a copious supply.

2. **Export of Shale.**—In 1915 New South Wales exported 20 tons of shale, valued at £79.

3. **Shale Oils Bounties.**—The Shale Oils Bounties Act 1910 provided 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 made available for bounties under this Act was £50,000.

During the year 1913, the bounties paid in New South Wales amounted to £985 on 118,000 gallons of kerosene, and £809 on 324 tons of refined paraffin wax. As the bounty expired on the 30th June, 1913, the articles mentioned were produced prior to that date.

§ 13. Other Non-Metallic Minerals.

1. **Alunite.**—Probably the most remarkable deposit of alunite in the world occurs at Bullahdelah, in the county of Gloucester, New South Wales, a large proportion of a low bluff ridge in the district being composed of this mineral. The deposits are worked by quarrying, and from 1890 up to the end of 1915, 45,730 tons had been exported, valued at £146,323 the exports for the year 1915 being 1420 tons, valued at £5680.

Deposits of a high-class alunite are reported to have been discovered near Sunbury, in Victoria.

In South Australia an extensive deposit of the mineral was located in 1913 at Carrickalinga Head, on the coast north of Normanville, and within a short distance of Adelaide. It is stated that the specimens so far analysed have proved richer in valuable constituents than any similar find yet recorded. A trial shipment was forwarded to England, and satisfactorily disposed of, but owing to the war the industry is temporarily in abeyance. Another deposit has been located near Warnertown.

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. There was, however, no record of production in 1915. 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 gold-field, 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 been discovered at Oodlawirra, while deposits of a good blue variety have been discovered near Hawker and about 23 miles from Eudunda, in South Australia.

3. **Barytes.**—In New South Wales during 1915 about 78 tons of barytes, valued at £136, were obtained in the Mudgee division.

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. In New South Wales the production of kaolin in 1915 amounted to 1514 tons, valued at £1,204, raised in the Murrumburrah, Molong, Gulgong, and Goulburn divisions, and at Wallendbeen, Boxer's Creek and Home Rule. Fireclay to the amount of 80 tons was raised in the Bathurst division, and 1,500 tons, valued at £1,800 were raised by the Lithgow Colliery Co. Deposits of steatite near Wallendbeen were worked during 1915, the quality raised during the year amounting to 60 tons. Near Morangaroo 4500 tons of silica were raised by the Silica Fire Brick Company. In Victoria 142 tons of kaolin were obtained at Axedale, 10 tons at Pyalong, and 250 tons at Egerton, the total value given, as £547. In Queensland 4963 tons of fireclay, valued at £556, were mined during the year 1915, in the Mount Morgan district. 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. Porcelain and other clays of good quality have been found in the Kingston district in Tasmania. A small parcel of kaolin from the Zeehan district yielded about 50 per cent. after treatment, but it is stated that the product could not be profitably exported to Europe. Deposits of ochre have been opened up at Dubbo, Wellington, and Marulan, 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 been discovered near Oodlawirra in South Australia.

5. **Coorongite.**—This peculiar india-rubber like material was first noted many years ago near Salt Creek and in the vicinity of Coorong Inlet, in South Australia, as well as at various localities on Kangaroo Island. 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. (See also § 12., iv.). While the origin of coorongite is still in doubt, it is held by some observers that it is not a petroleum product.

6. **Fuller's Earth.**—Small quantities of this material were produced in 1912, from leases near Narrabri, in New South Wales, the total sold amounting to 50 tons, valued at £287.

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. A small quantity was raised during 1915 from a site on the Bookookoorara in the Wilson's Downfall division. In Victoria the mineral occurs in Ordovician slates in several of the goldfields, but is not worked. In Queensland graphite was raised some years ago by the Graphite Plumbago Company at Mt. Bopple, near Netherby, on the Maryborough-Gympie line. A deposit has been located in the hundred of Roberts, about 9 miles N.W. of Arno Bay in South Australia. In Western Australia deposits occur on the Donnelly River, and at Kendenup, about 40 miles from Albany.

8. **Gypsum.**—This mineral is found in various places in the Commonwealth. It occurs in two forms, large crystals, and a floury earth consisting of minute crystals and known as "copi." Both forms are exceedingly pure. It is used largely as a natural manure and to some extent in the manufacture of Portland cement. Gypsum, or hydrous sulphate of lime, when burnt forms plaster of Paris, but in spite of the abundant supply of suitable material it has not yet been used for this purpose. In Victoria during 1915 there was a production of 690 tons, valued at £621, of which 580 tons were obtained at Boort, 60 tons at Lake Boga, and 48 tons at Fairley. Numerous deposits of gypsum are found in Southern Yorke's Peninsula in South Australia. A deposit of gypsum sand containing practically an inexhaustible supply is found on the edge of Lake Austin in Western Australia.

9. **Magnetite.**—Deposits of this mineral have been discovered at Fifield and at Piedmont in New South Wales, and in 1915 about 830 tons, valued at £1660, were raised in the former locality. The mineral is found at Heathcote in Victoria, and a deposit of exceptional purity has been located in the vicinity of Tumby Bay in South Australia, about five miles from the township of Tumby. The Broken Hill Co. is working a small deposit near the Beetaloo Waterworks. During 1915, 688 tons of magnetite, valued at £1196, were exported from Western Australia. A large area of magnetite-bearing country has been located at Bulong, about 20 miles east of Kalgoorlie.

10. **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 been worked commercially on any considerable scale. From the deposits at Bunyan, in the Cooma division, 126 tons of diatomaceous earth, valued at £220, were produced in 1915. In Victoria there is a remarkably pure deposit at Lillieur, near Talbot, while beds of the mineral are also met with at other places in the Loddon Valley, near Ballarat, at various places close to Melbourne, at Craigieburn, Lancefield, Portland, Swan Hill, Bacchus Marsh, etc. From the deposit at Lillieur, 274 tons, valued at £1050, were obtained in 1915. A fairly extensive deposit of tripolite exists in Queensland, between Nerang and Beaudesert, but the various outcrops have as yet been only partially examined. In Tasmania a deposit of diatomaceous earth has been located at Oatlands, but its use for the manufacture of explosives is apparently prejudiced by the circumstance that the diatoms are pulverised and contaminated with clay.

11. **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 60 square miles in area, situated about 120 miles N.W. from Port Augusta, contains immense supplies of salt of good quality, which at present, however, owing to distance from market, possess no economic value. The salt is simply scraped from the beds of the lakes in summer time and carted to the refinery. It is stated that care must be taken not to leave too thin a crust of salt over the underlying mud, as the resultant "crop" after the winter rains will in that case be smaller than usual. A bore recently put down near Kingscote, on Kangaroo Island, revealed brine from which salt can be profitably obtained by evaporation. 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.

12. **Natural Manures.**—Gypsum has already been referred to. (See 8 *ante*.) 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. Phosphate of lime has been found in small quantities in the limestone caves of New South Wales. In the Wellington division, from the area situated near the caves, about 1100 tons of phosphate rock

valued at £3,000, were raised during 1915. In addition to use as a flux at the Lithgow Iron Works, part of the rock is ground up for manures. 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 quantity raised in recent years.

§ 14. Gems and Gemstones.

1. **Diamonds.**—Diamonds were first noted in New South Wales by H. J. Hargraves in 1851, and in October of the same year by Geological Surveyor Stutchbury. The Cudgegong field was discovered in 1867, and shortly afterwards the Bingara diamantiferous deposits were located. Stones of small size are also found at Cope's Creek and other places in the Inverell district. The largest diamond won in New South Wales was reported to have been obtained in 1905 at Mt. Werong, near Oberon, and weighed 28 $\frac{5}{16}$ carats. It is difficult to secure accurate returns in connection with the production of precious stones, but the yield of diamonds in 1915 was estimated at 839 carats, valued at £707, while the total production to the end of 1915 is given at 186,963 carats, valued at £127,696. The yield in 1915 was contributed by miners working in the vicinity of Copeton, in the Tingha division. Owing to the absence of a market consequent on the war the production in 1915 shewed a great reduction on that for 1913, when 5573 carats, valued at £5,141 were won. Small quantities of diamonds are found in Victoria in the gravels of streams running through granite country in the Beechworth district; at Kongbool in the Western District; and near Benalla. The stones are generally small and the production up to date has been trifling. In 1912, eleven small diamonds, valued at £20, were picked out of the sluice boxes of the Great Southern alluvial mine at Rutherglen. 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 1915 was valued at £600, as compared with £43,292 in 1913, the decrease being due to the absence of a market consequent on the outbreak of the war. The estimated return for 1915 has been distributed thus:—Purchases by gem buyers, £400; stones sold privately, £100; machine stones, £100. The gem mining industry practically collapsed on the outbreak of war, as the German buyers ceased business. It is hoped that gem-cutting on a large scale will shortly be established in England.

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

3. **Precious Opal.**—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 1914, however, out of a total production, valued at £26,534, the yield from the Lightning Ridge field, near Walgett, amounted to

£21,636, while the output from the White Cliffs field was returned at £4,898. The war has had a very depressing effect on the industry, and the production in 1915 fell to £6403. Some very fine stones are at times obtained, one weighing 5 ozs. and valued at £300 being recovered in 1911. Occasionally, black opals of very fine quality are found, one specimen from the Wallangulla field, weighing $6\frac{1}{2}$ carats, being sold in 1910 for £102. It is stated that this locality is the only place in the world where the "black" variety of the gem has been found. The total value of opal won in New South Wales since the year 1890 is estimated at £1,392,000.

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

In Queensland, the first recorded discovery of the gem dates from 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 1915 was estimated at £500, and up to the end of that year at £177,695. 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 suffers from the peculiar disability that in good seasons there is plenty of work available on the pastoral stations, and most men prefer this to the uncertain results obtainable by fossicking, while in dry seasons when constant work is not obtainable, the search for opal is limited by the difficulty in obtaining sufficient water. The small return in 1915 was also due to the lack of a market consequent on the outbreak of war.

Precious opal has been discovered in South Australia in a locality 116 miles N. by E. of Tarcoola. The specimens show similar characteristics to those obtained at White Cliffs in New South Wales.

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 23 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 re-opened 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. Small emeralds of fine quality have been found at Poona, in Western Australia, and it is stated that prospecting at greater depths would possibly reveal the existence of larger specimens. Amongst other gems found in New South Wales at various times may be mentioned *turquoises*, discovered in 1894, near Bodalla; *topazes*, fine specimens of which have been obtained in the New England district, and *zircons* and *garnets*. Zircons of small size are plentifully found in the vicinity of Table Cape in Tasmania. Topazes are common in the tin drifts of Tasmania, and some fine specimens have been found. Turquoises are also found in thin veins in Victoria. In Gascoigne's mine, situated near the King River, in the parish of Edi, samples of the gem have been found equal in colour to the best Persian stone, and a considerable quantity of turquoises from this mine has been sold in England and Germany. Fine *agates* are found in many places in Victoria, but have not been made use of to any extent. The gems also occur plentifully in the bed of Agate Creek, about 4 miles south of Forsayth, on the Etheridge field in Queensland. 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, and at Poona in Western Australia. Very large but impure beryl crystals have been found at Ben Lomond in Tasmania. Some fine samples of *chiastolite* or luck stone have been found at Mt. Howden, near Bimbourie, in South Australia.

(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 fluctuates according to the season, the price of industrial metals, the state of the labour markets, and according also to the permanence of new finds, and the development of the established mines. During the year 1915 the number so employed was as follows:—

NUMBER OF PERSONS ENGAGED IN MINING, 1915.

| State. | Number of Persons Engaged in Mining for | | | | | | Total. |
|------------------------|---|-------------------------------|---------|-------|-----------------------|--------|--------|
| | Gold. | Silver, Lead, and Zinc. | Copper. | Tin. | Coal and Shale. | Other. | |
| New South Wales ... | 2,888 | 5,564 | 914 | 1,648 | 18,221 | 2,176 | 31,411 |
| Victoria | 8,755 | .. | ... | 27 | 1,312 | 299 | 10,393 |
| Queensland | 2,766 | 49 | 2,149 | 1,218 | 2,518 | 931 | 9,631 |
| South Australia ... | 200 | 25 | 2,000 | ... | ... | 1,075 | 3,300 |
| Western Australia ... | 11,323 | 70 | 144 | 188 | 498 | 30 | 12,253 |
| Tasmania | 215 | 519 | 1,758 | 1,221 | 161 | 34 | 3,908 |
| Northern Territory ... | 99 | 86 | 97 | 154 | ... | 40 | 476 |
| Commonwealth ... | 26,246 | 6,313 | 7,062 | 4,456 | 22,710 | 4,585 | 71,372 |

The following table shews the number of persons engaged in mining in the Commonwealth during each of the years 1891, 1901, and 1915, together with the proportion of the total population so engaged. The general falling-off since 1901 is due to the stagnation caused by the war, and largely also to the decline in the gold-mining industry:—

PROPORTION OF PERSONS ENGAGED IN MINING, 1891, 1901 and 1915.

| State. | 1891. | | 1901. | | 1915. | |
|------------------------|---------------------|---|---------------------|---|---------------------|---|
| | 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 | 31,411 | 1,679 |
| Victoria | 24,649 | 2,151 | 28,670 | 2,381 | 10,393 | 729 |
| Queensland | 11,627 | 2,934 | 13,352 | 2,664 | 9,631 | 1,402 |
| South Australia ... | 2,683 | 834 | 7,007 | 1,931 | 3,300 | 750 |
| Western Australia ... | 1,269 | 2,496 | 20,895 | 11,087 | 12,253 | 3,801 |
| Tasmania | 3,988 | 2,695 | 6,923 | 4,017 | 3,908 | 1,960 |
| Northern Territory ... | ... | ... | ... | ... | 476 | ... |
| Commonwealth ... | 74,820 | 2,341 | 113,462 | 2,992 | 71,372 | 1,442 |

2. **Wages Paid in Mining.**—Particulars regarding wages paid in the mining industry, which in earlier issues of the Year Book were given in this section, have now been transferred to the section dealing with Labour and Industrial Statistics.

3. **Accidents in Mining, 1915.**—The following table gives particulars of the number of men killed and injured in mining accidents during the year 1915:—

NUMBERS KILLED AND INJURED IN MINING ACCIDENTS, 1915.

| Mining for— | N.S.W. | Victoria. | Q'land. | S. Aust. | W. Aust. | Tas. | N. T. | Cwlth. |
|-----------------------|-----------|-----------|------------|------------|------------|-----------|----------|--------------|
| KILLED. | | | | | | | | |
| Coal and shale | 23 | 3 | 4 | ... | 2 | ... | ... | 32 |
| Copper | 3 | ... | 7 | 3 | ... | 5 | ... | 18 |
| Gold... | ... | 10 | 1 | ... | 31 | ... | ... | 42 |
| Silver, lead and zinc | 9 | ... | ... | ... | 1 | ... | ... | 10 |
| Tin | 2 | ... | 1 | ... | ... | ... | ... | 3 |
| Other minerals | ... | ... | 1 | ... | ... | 1 | 1 | 3 |
| Total | 37 | 13 | 14 | 3 | 34 | 6 | 1 | 108 |
| INJURED. | | | | | | | | |
| Coal and shale | 49 | 20 | 37 | ... | 81 | 2 | ... | 189 |
| Copper | ... | ... | 44 | ... | ... | 46 | ... | 90 |
| Gold... | 1 | 34 | 16 | ... | 840 | 2 | ... | 893 |
| Silver, lead and zinc | 29 | ... | ... | ... | ... | 7 | 1 | 37 |
| Tin | 3 | ... | 5 | ... | ... | 10 | ... | 18 |
| Other minerals | 2 | ... | 3 | ... | 2 | ... | ... | 7 |
| Total | 84 | 54 | 105 | ... | 923 | 67 | 1 | 1,234 |

§ 16. State Aid to Mining.

1. **Introduction.**—The terms and conditions under which the States granted aid in mining were alluded to at some length in previous issues (see Year Books IV. and V.), but owing to considerations of space they have been omitted from this issue. A résumé of what is being done in this direction at the present time is given hereunder.

2. **New South Wales.**—The chief aid given in this State is in the direction of assistance to prospectors. Up to the end of 1915 the total sum expended in this manner amounted to £465,189, of which £10,009 was advanced in 1915. During the year the Government subsidy to the Miners' Accident Relief Fund amounted to £11,497.

3. **Victoria.**—Under the Mining Development and Surplus Revenue Acts the sum of £450,097 was expended from revenue, and £262,832 was provided out of votes during the period 1897 to 1915 as follows:—

| | |
|--|----------------|
| | £ |
| Advances to mining companies | 201,163 |
| Advances to prospectors | 85,847 |
| Boring for gold and coal | 233,221 |
| Construction of roads and tracks | 62,777 |
| Erection of testing plants, batteries, etc. | 79,632 |
| Miscellaneous, cyanide patents, Schools of Mines, etc. | 50,289 |
| Total | 712,929 |

The expenditure in 1915 was £55,620, of which £21,489 was advanced to companies; £12,128 was loaned to miners; £432 was spent on constructing roads, etc.; £13,310 on boring for gold, coal, etc., and £8,261 on testing plants and miscellaneous. The Government batteries number 28, several of which are managed by local trusts without expense to the Department so far as cost of working is concerned. For the year 1915 the net cost to the Department of the Government batteries was returned as £2,608. The repayment by companies of loans amounted to £21,244, by miners £2,489, and for cost of boring £9,016. The State's contribution to the Coal Miners' Accident Relief Fund amounted to £3,794.

4. **Queensland.**—State assistance to the mining industry in 1915 amounted to £30,294, of which £13,382 consisted of loans in aid of deep sinking; £2,169 grants in aid of prospecting; £3,349 in aid of roads and bridges to gold and mineral fields; £817 advance under Mining Machinery Advances Act 1906; £10,167 purchase of boring plant and boring for oil at Roma, and £410 purchase of Assay Office at Cloncurry.

5. **South Australia.**—Aid is given to the mining industry under the terms of the Mining Act of 1893, and previous measures. Up to the end of 1915 the total amount of subsidy paid was £62,555, of which £7,660 has been repaid, leaving a debit of £54,895. Portion of this amount is represented by machinery that has fallen into the hands of the Government. Repayments are made from profits, but in only two instances have the profits enabled a full return to be made.

6. **Western Australia.**—Under the Mining Development Act of 1902 assistance was granted in 1915 in accordance with the subjoined statement.—Advances in aid of mining work and equipment of mines with machinery, £5,091; advances in aid of erection and equipment of crushing plants, including subsidies on stone crushed for the public, £2,228; advances in aid of boring, £224; providing means of transport, £755. In addition, amounts totalling in all £4,001 were expended from the Mining Development vote on various matters such as water supply, roads, cartage, and subsidies for development below the 100 feet level in small mines. Included in the amount of £2,228 is a sum of £591 paid to owners of plants crushing for the public. The receipts under the Act came to £2,322, of which £1,811 consisted of refunds of advances.

In 1915 there were 34 State batteries in operation. The amount expended thereon up to the end of 1915 was £91,981 from revenue and £265,958 from loan, giving a total of £357,939. During the year receipts amounted to £41,665, and working expenditure to £47,006.

The total value of gold and tin recovered to the end of 1915 at the State plants was £4,572,000, resulting from the treatment of 1,067,155 tons of gold ore and 70,027 tons of tin ore.

7. **Tasmania.**—Under the terms of the Aid to Mining Act 1912 the expenditure for the year 1915 amounted to £78¹/₂, and the total up to the end of that year to £18,655. The bulk of this was expended in mining, prospecting, and development work undertaken by or under the direction of the Department of Mines. Under the Mining and Public Works Appropriation Act 1913, a sum of £23,750 was expended during 1915, while the outlay to the end of that year was £50,810. Of the latter sum, £21,273 consisted of advances on the security of ore produced from any mine in the State, and £11,210 was absorbed by expenses in connection with the State Argent Flat Mine, Zeehan. Under the Public Works Appropriation Act 1913, a sum of £1,581 was expended in 1915, the total expenditure under this Act being £6,990. Further, a sum of £6,608 was expended under the Mining Appropriation Act of 1915 in respect to the State Mine at Zeehan. The practice of granting £5 per month to an approved prospector has resulted in the efficient investigation of mining possibilities over a wide area.

8. **Northern Territory.**—Prior to 1912, prospectors were helped by grants of rations and some monetary assistance, but it was found that these privileges were occasionally abused, and steps have now been taken to ensure the bona fides of all seeking aid. Provision is made for generous grants to discoverers of metalliferous ores. The total aid granted to prospectors and others in 1915 amounted to £9,223.

§ 17. Commonwealth Government Control of Industrial Metals.

1. **General.**—Prior to the declaration of war by Great Britain, the Australian base metal production was controlled by the German metal organisation. The outbreak of hostilities threw the industry into chaos, and steps were immediately taken to free it from enemy control, and to establish the industry on a sound and permanent foundation, consistent with British interests.

The following legislative and administrative acts may be cited:—

- (i.) Cancellation of all mineral and metal contracts with enemy companies and firms.
- (ii.) Dissolution of the Lead Convention controlled by Germans which determined output and price to consumer and producer of all Australian lead.
- (iii.) Dissolution of the Zinc Combine—a purely German combine which controlled the world's spelter market, determining price, output, and manipulating the market as it pleased in the interests of Germany.
- (iv.) Elimination of the German interests which dominated the copper industry in Australia.
- (v.) Elimination of all enemy agencies controlling tin, molybdenite, wolfram, and other metals.

The policy of the Government is to have all metallic ores, as far as possible, treated within the Commonwealth, so that the resultant metals can be marketed in a refined state.

2. **Lead.**—Steps taken by the Commonwealth Government resulted in the formation and extension of the Broken Hill Associated Smelters Proprietary Limited, which has taken over the Broken Hill Proprietary Works at Port Pirie, South Australia. The new company is a co-operative institution for the smelting of silver-lead ores and concentrates, and the refining of the silver-lead bullion. It has one of the largest silver-lead smelting works in the world, with a capacity for an output of 160,000 tons of pig lead, and 5,000,000 to 6,000,000 ounces of silver per annum.

The Sulphide Corporation Limited continues to improve and enlarge its lead smelting works at Cockle Creek, near Newcastle, New South Wales. The refinery plant is nearly completed, and when it is in operation the output of some 60,000 tons of lead per annum will be refined, and silver and gold contents made available locally. The works cater for all the smaller mines of New South Wales, Victoria, Queensland and Tasmania, in addition to two of the Broken Hill mines.

The Fremantle Smelters, Fremantle, Western Australia, are owned by the Fremantle Trading Company Limited. The plant running at its full capacity is capable of an annual output of 15,000 tons of pig lead or silver-lead bullion from usual grade lead concentrates. The Company is at present smelting only the Northampton lead ores, which contain little or no silver, and the present output is at the rate of 5,000 tons soft pig lead per annum. The plant in operation has a capacity for an annual output of about 7,000 tons of pig lead.

3. **Zinc.** A new company, the Zinc Producers' Association Proprietary Limited, has been formed to control and dispose of the output of zinc concentrates produced within the Commonwealth. All the principal zinc-producing companies are members, and the Association is founded on a co-operative basis. One of the fundamental principles is "equality of treatment" to all members, irrespective of tonnage of output. The Commonwealth Government is represented on the Board, thus safeguarding the interests of the general community.

The output of zinc concentrates within the Commonwealth for the twelve months ended 30th June, 1917, was 295,000 tons, and arrangements have been made whereby 40 per cent. of the normal output may be reserved for local treatment. The Electrolytic Zinc Company of Australasia Proprietary Limited has been formed, and the first unit of the refinery is in the course of erection. A contract for electrical power has been arranged with the Tasmanian Government, and technical experts have been engaged to install the plant and work the process. In order to facilitate the early establishment of Australian zinc industries, the Imperial Government has undertaken to advance £500,000, if required, to finance Australian zinc works, interest on such advances to be at the same rate as is paid by the Imperial Government. The Mount Lyell Mining and Railway Company Limited, having acquired mines on the West Coast of Tasmania containing large bodies of complex sulphide ores, has formed a new company (The Mount Read and Roseberry Mines Limited) to take over these properties. The new company promises to be a substantial producer of electrolytic zinc. The enlargement of the Broken Hill Associated Smelters' zinc distillery at Port Pirie is also receiving attention.

4. **Copper.**—The policy of encouraging the treatment in Australia of all copper ores produced within the Commonwealth has been pursued, and considerable extensions of the treatment and refining works at Port Kembla, New South Wales, and Wallaroo, South Australia, have been made. Practically all copper ores and products are now refined within the Commonwealth. A new company, called the "Metal Manufactures Limited" has been formed for the production of copper wire, tubes, sheets, etc., and when the works are completed, will be in a position to meet all Australian requirements.

5. **Tin.**—Encouragement is also given to the refining of tin ore and tin concentrates within the Commonwealth. The principal tin smelters are the Mount Bischoff Company, Tasmania, The Sydney Smelting Company (Pymont Works), New South Wales, and the Irvinebank Company, Queensland.

6. **Molybdenite, Wolfram and Scheelite.**—The Commonwealth Government entered into an agreement with the Imperial Government for the acquisition of all wolframite, molybdenite, etc., produced in Australia. Under this agreement practically the whole of these minerals produced in Australia are being acquired for the Imperial Government, the prices fixed from the 1st July, 1917, being—

| | | |
|-----------------------|------------------|--------------------------------------|
| Wolfram and Scheelite | ... 65 % WO_3 | 50s. per unit at producing centres. |
| Molybdenite | ... 85 % MoS_2 | 100s. per unit at producing centres. |

7. **Formation of Metal Exchange.**—Another action of the Government towards the elimination of German influence was the creation of an Australian Metal Exchange at Melbourne and Sydney. No metals or minerals can be exported from Australia unless first registered through the Exchange by an active member, and, during the war, with the consent of the Minister for Trade and Customs. The members of the Exchange must be natural-born British subjects, and the Attorney-General has the right of veto with regard to membership during the war and twelve months after.