MINERAL RESOURCES.

ALMOST all the principal metals of economic value are found in Australasia, and many are common to several Colonies. In dealing with the occurrence and value of mineral deposits, the classification into noble metals, metallic minerals, carbon minerals, soluble and insoluble salts, diamonds and other gem stones, has been adopted.

NOBLE METALS.

Gold.

Gold, the most valuable of noble metals, is found throughout Australasia, and the present prosperity of the Colonies is largely due to gold discoveries, the development of other industries being, in a country of varied resources, a natural sequence to the acquisition of mineral treasure.

Discovery of gold.

Settlement in Australia was still young when many-tongued rumour spoke of the existence of gold, but it was not until the 16th February, 1823, that the Government was officially apprised of a discovery destined to be the precursor of a prosperity seldom surpassed in the history of nations. On the date mentioned Mr. Assistant-Surveyor M'Brien reported that, at a spot on the Fish River, about 15 miles east of Bathurst, he had discovered gold. Mention is made, in the early records of New South Wales, of several other finds, but it remained for Count Strzlecki and the Rev. W. B. Clarke to demonstrate the existence of the precious metal in payable quantities, and to assert their belief in its abundance, an opinion strongly supported in England by several eminent authorities, and substantiated by Hargraves' discovery in the year 1851. The gold-fields of Lewis Ponds and Summer Hill Creek had hardly been opened up when, on the day that witnessed the severance of the Port Phillip district from the mother Colony of New South Wales, Mr. J. M. Esmond discovered gold in Victoria. Shortly afterwards, a rush set in for Ballarat, and the gold fever

took possession of Australia. The following year (1852) saw gold found in South Australia and Tasmania; the rush to Canoona, in what is now Queensland, took place in 1858; and gold was also discovered in New Zealand in the same year, though it was not until 1861 that a large population was, by the prospect of rapidly obtained wealth, attracted to the last-mentioned colony.

Gold in Western Australia.

In Western Australia gold was first found in 1868, although it was not until 1887 that any diggings of importance were discovered. The richest field is at the Yilgarn Hills, 200 miles east of Perth, which has yielded to July, 1891, 10,401 oz. valued at £39,000. Until quite recently this Colony was considered to be destitute of mineral deposits of any value, but now it is known that a rich belt of mineral country extends from north to south.

Value of gold raised.

The following table gives the value of gold raised from the commencement of mining in the various Colonies to the end of the year 1890, and the proportion due to each :—

Production of Gold, 1851–90.

Colony.	Value.	Proportion of value raised by each Colony.
	£	per cent.
New South Wales	38,075,172	11·1
Victoria	227,482,296	66·5
Queensland	26,034,663	7·6
South Australia	1,169,768	0·3
Western Australia	605,535	0·2
Tasmania	2,238,683	0·7
New Zealand	46,425,626	13·6
Australasia	342,031,743	100·0

Effect of gold discovery in Victoria.

It will be readily understood from the foregoing figures how Victoria, although in area the smallest of the group, with the exception of Tasmania, achieved the foremost position amongst the Colonies, and retained that place so long as the powerful attraction of gold continued; but as the alluring dazzle of the

gold-seeker's life was gradually dimmed by privation and frequent disappointment, people turned to safer, if less brilliant, fields of employment. Although the discovery of such extraordinary deposits as those of Mount Morgan, in Queensland, may astonish the world, and give princely dividends to shareholders, the thirst for gold—so powerful in the past—cannot now entice any considerable proportion of the population from other pursuits, and this, notwithstanding that only a small portion of the auriferous area of the continent has been explored, and a still smaller portion fully developed.

Progress of gold-mining.

The production of gold, which had been declining steadily for many years, reached the lowest point in 1886. Since then there has been a marked revival, owing chiefly to the increased production of Queensland. It will be seen from the following figures, showing the quantity and value of gold obtained in 1890, that the annual production of Queensland is now almost equal in value to that of Victoria :—

Australasian production of gold in 1890 :—

Colony.	Weight.			Value.	Proportion of value raised by each Colony.
	Alluvial.	Quartz.	Total.		
	oz.	oz.	oz.	£	per cent.
New South Wales.	58,830	68,931	127,761	460,285	7·7
Victoria	206,159	382,401	588,560	2,354,244	39·2
Queensland	19,069	591,518	610,587	2,137,054	35·6
South Australia ...	.....	.....	26,086	101,577	1·7
Western Australia	.....	.....	22,256	86,664	1·4
Tasmania.....	5,895	17,556	23,451	87,114	1·5
New Zealand	.....	.....	193,193	773,438	12·9
Australasia ...	.....	.....	1,591,894	6,000,376	100·0

Quantity of gold per miner.

The average value of gold to each miner is given below, but, as the conditions under which mining is carried on are by no means the same in every Colony, the figures, which vary considerably,

may be not a little misleading. In those colonies where a revival of mining has lately been experienced, it is natural to expect a fall in the average yield per miner, for mining, as now carried out, is not an industry from which immediate returns can be expected. It is probable that the number of gold miners in New South Wales is largely overstated, otherwise the industry must be carried on at a great loss. Most likely many of the men employ themselves in mining for only a portion of their time, and devote the rest to more remunerative pursuits. But when full allowance is made on this score it will be evident that in some Colonies, at least, the search for gold is not a profitable occupation. The following shows the number of miners at work in 1890, with the quantity and value of gold won per man, for those Colonies for which returns are available :—

Colony.	No. of miners.	Amount won per miner.	Value per miner.
		oz.	£ s. d.
New South Wales	12,589	10·15	36 11 3
Victoria	23,833	24·69	98 15 7
Queensland	8,509	71·76	251 3 1
Tasmania	1,009	23·24	86 6 9
New Zealand	1,971	98·02	392 8 2

Yield of quartz.

Attempts have been made to ascertain the average yield from quartz, but the number of tests made and the quantity of stone treated are inconsiderable ; furthermore, it has not been found possible to obtain material from all the principal mining centres. The results obtained for the last four years ending 1890 were as follows. The high average yield for Queensland is due to the Mount Morgan mines, which, for the last two years, produced one-third the total gold production of the Colony :—

Average yield per ton for quartz :—

	New South Wales.	Victoria.	Queensland.	Tasmania.
	oz. dwt. grs.	oz. dwt. grs.	oz. dwt. grs.	oz. dwt. grs.
1887	0 9 5	0 9 10	1 15 10	1 5 21
1888	1 0 18	0 9 18	1 14 11	1 5 2
1889	1 0 2	0 9 19	1 17 20	0 17 16
1890	0 15 8	0 9 4	1 7 15	0 16 12

It is not pretended that the above figures have any great statistical value, but they may, nevertheless, be accepted as giving an approximate idea of the average yield of quartz-reefs. Alluvial deposits are generally richer than those in reefs ; but the precious metal is so unevenly distributed that any attempt to obtain a reliable average would be futile.

Deep mines in Victoria.

The greatest development of quartz-reefing is found in Victoria, some of the mines being of a great depth. Lansell's, at Sandhurst, is down 2,640 feet, the "Magdala-Moonlight," at Stawell, is worked to a depth of 2,409 feet, whilst the "Victorian Quartz Mine," the "Victory and Pandora," and the "New Chum and Victoria" have, respectively, shafts extending 2,302, 2,300, and 2,228 feet below the surface, and several others might be mentioned with almost equal depths.

The value of machinery on the gold-fields of those Colonies from which returns were obtainable, was during 1890 :—

Colony.	Value.
	£
New South Wales	459,246
Victoria	1,849,112
Queensland	1,103,427
Tasmania	154,145
New Zealand	395,985

Large nuggets.

A notice of gold-mining would be incomplete without some reference to the remarkably large finds made at various times. Information on this point is meagre, and not altogether reliable, as doubtless many nuggets were unearthed the weight and

value of which were never published. Victoria's record is the best, and includes the following nuggets:— Victorian nuggets.

	lb.	oz.	dwt.
"The Welcome Stranger," found 9th February, 1869...	190	0	0
"The Welcome," found 9th June, 1858	184	9	16
One found at Canadian Gully, 31st January, 1853.....	134	11	0
And others of the following weights	98	1	17
	93	1	11
	84	3	15
	69	6	0
	52	1	0
	30	11	8
	30	11	2

New South Wales can boast of having produced some splendid specimens. In 1851 a mass of gold was found on the Turon, weighing 106 lb.; another, from Burrandong, near Orange, produced, when melted at the Sydney Mint, 1,182 oz. 6 dwt. of pure gold; and a third, the "Brennan," was sold in Sydney, in 1851, for £1,156. During 1880–82 several nuggets were discovered at Temora, weighing from 59 to 1,393 oz., and others, of 357, 347 (the "Jubilee"), 200, 47, and 32 oz. respectively, were found during the year 1887 in various parts of the Colony. Veins of gold of extraordinary richness have been worked in New South Wales. In January, 1873, at Beyers and Holterman's claim, at Hill End, 1·02 cwt. of gold was obtained from 10 tons of quartz, and a mass of ore, weighing 630 lb., and estimated to contain £2,000 worth of gold, was exhibited. The Mint returns during the year 1873, for this mine, were 16,279·63 oz., valued at £63,234 12s., obtained from 415 tons of stone. From Krohman's claim, at Hill End, gold, to the value of £93,616 11s. 9d., was obtained during the same year. The foregoing figures are, however, insignificant when compared with the enormous yield of the Mount Morgan Mine, in Queensland, which has already paid over £2,750,000 in dividends, and may be designated one of the wonders of the world. It is a huge mound of ore, highly ferruginous, and contains gold to the extent of several ounces to the ton, the peculiar formation, in the opinion of the Government Geologist of Queensland, being due to the action of thermal springs.

Nuggets found in New South Wales.

The Mount Morgan mine.

Platinum and Iridosmine.

Platinum and iridosmine, though not specially sought for by miners, have been found in New South Wales and New Zealand, but no effort has been made to ascertain whether either mineral can be extracted with satisfactory commercial results. The same remarks apply to the noble metal tellurium which is found in New Zealand, associated with gold and silver (petzite) and with silver only (hessite).

Tellurium.

Silver.

Silver has been discovered in all the Colonies, either alone or in the form of sulphides, antimonial, and arsenical ores; chloride, bromide, iodide, and chloro-bromide of silver, or argentiferous lead ores, the largest deposits of the metal being found in the last-mentioned form.

New South Wales silver mines.

The leading Silver mines are in New South Wales, the returns from the other Colonies being comparatively insignificant. Up to the year 1882 the quantity of Silver raised in New South Wales was very small, but in that and the following years extensive discoveries of this metal, associated principally with lead and copper ore, were made in various parts of the Colony, notably at Boorook, in the New England district, and, later on, at Sunny Corner, near Bathurst, also at Silverton, and Broken Hill at the Barrier Ranges in the Western District. The Sunny Corner Silver mines in 1886 paid handsome dividends, and produced £160,000 worth of silver, but since that period the yield has largely fallen off. For the half-year ending 31st October, 1891, the company treated 20,842 tons of ore, the production from which was valued at £50,185.

The Silverton silver mines.

The field of Silverton has proved to be of immense value. Discoveries have been made along the Barrier Range at Broken Hill, Umberumberka, The Pinnacle, and many other points. The yield of minerals in the Broken Hill and Silverton districts during 1890 showed a total value of £2,785,398, while the machinery employed is valued at £406,885.

Barrier Ranges and Broken Hill silver-lead mines.

The argentiferous lead ores of the Barrier Ranges and Broken Hill districts of New South Wales have, more than any other, attracted attention. This rich silver-field, which was discovered in 1883 by Charles Rasp, a boundary-rider on Mount Gipps Run, extends over 2,500 square miles of country, and has developed into one of the principal mining centres of the world. It is situated beyond the river Darling, and on the confines of the neighbouring Colony of South Australia. In the Barrier Range district the lodes occur in Silurian metamorphic micaceous schists, intruded by granite, porphyry, and diorite, and traversed by numerous quartz-reefs, some of which are gold-bearing. The Broken Hill lode is the largest as yet discovered. It varies in width from 10 feet to 200 feet, and may be traced for several miles, the country having been taken up all along the line of the lode, and subdivided into numerous leases, held by mining companies and syndicates.

Broken Hil Proprietary Company.

The Broken Hill Proprietary Company hold the premier position. They have erected on their lease a complete smelting plant on the latest and most approved principles, and have enlisted the services of competent managers, whose experience has been gained in the celebrated silver-mining centres of the United States. From the commencement of mining operations in 1885 to the end of November, 1891, the Company treated 803,500 tons of silver and silver lead ores, producing 30,757,500 oz. of silver and 125,102 tons of lead, valued in the London market at £7,059,175. They have paid dividends to the amount of £3,304,000, and bonuses amounting to £592,000, besides the nominal value of shares from the several "Blocks," sold to other Companies, amounting to about £1,744,000, or a total return from the mine of £5,640,000. The sum spent in the erection and construction of plant, from the opening of the property, was £428,147. During the year 2,545 men were employed, of whom 1,412 were engaged under ground. The net profit for the half-year ending November 30th, 1891, was £633,738. The nominal value of this mine at the time these dividends were declared was £6,530,000

Silver and silver lead ore exported

The quantity and value of silver and silver lead ore exported to the end of 1890 from New South Wales is shown in the following table :—

Year.	Silver.		Silver lead Ore.			Total Value.
	Quantity.	Value.	Quantity.		Value.	
			Ore.	Metal.		
Up to	oz.	£	Tons cwt.	Tons cwt.	£	£
1881	726,779	178,405	191 13	.....	5,025	183,430
1882	38,618	9,024	11 19	.....	360	9,384
1883	77,065	16,488	136 4	.....	2,075	18,563
1884	93,660	19,780	9,167 11	.....	241,940	261,720
1885	794,174	159,187	2,095 16	190 8	107,626	266,813
1886	1,015,433	197,544	4,802 2	.....	294,485	492,029
1887	177,308	32,458	12,529 3	.....	541,952	574,410
1888	375,064	66,668	11,739 7	18,102 5	1,075,737	1,142,405
1889	416,895	72,001	46,965 9	34,579 17	1,899,197	1,971,198
1890	496,553	95,410	89,715 15	41,319 18	2,667,144	2,762,554
Total.....	4,211,549	846,965	177,358 19	94,192 8	6,835,541	7,682,506

Increase in production of silver.

It will be seen that the production of silver in New South Wales has, during the past few years, considerably increased, until that of last year exceeded the largest annual production of gold, even in the palmiest days of the diggings. Since the important discoveries of silver deposits were made sufficient time has hardly elapsed to enable all the principal mines to be properly developed; and it may be confidently expected that, as new deposits are opened, and the mines first discovered are brought into full working order, the production of this metal will rapidly increase. The number of miners engaged in silver and lead mines in 1890 was 6,044, and the average value of mineral won, per miner engaged, amounted to £457 1s. 5d.

Silver in other Colonies.

Although indications of silver abound in all the other Colonies, no fields of great importance have yet been discovered. The value of the yield of Australasia to the end of 1890, exclusive of that of New South Wales, was only £841,726, of which amount Queensland contributed more than one-half. The leading silver mines of

Queensland are south-west of Cairns, in the Herberton district, and it is from these fields that the largest proportion of the total production was raised. The number of miners engaged in this industry during 1890 throughout Queensland was 326, of whom 150 were employed in the above-named districts.

Number of silver-miners.

In New Zealand silver is found in various localities throughout the Colony, principally in the Te Aroha, Thames, and Coromandel fields, but it is generally worked for in conjunction with gold-mining.

Silver in New Zealand.

The silver-mining industry in Tasmania is steadily developing, principally in the Mount Zeehan and Dundas districts, from which almost the whole quantity produced in the Colony is obtained. In the first-named district, argentiferous lead ore has been found over 30 square miles of country, and the Mount Dundas field, almost adjoining, extends north as far as the Pieman River. The extent of ground taken up in the Zeehan and Dundas districts for silver-mining in 1890 was 87,000 acres. The total area leased for silver-mining in Tasmania during the same year was 119,000 acres.

Silver in Tasmania.

There are no silver mines in Victoria or Western Australia, the small silver production of the former Colony being found associated with gold. Sixteen persons were returned as fossicking for this mineral in the Beechworth and Gippsland districts during 1890.

Silver in Victoria and Western Australia.

The production of silver in South Australia is very limited, and it is remarkable that the argentiferous lead-ore fields of Broken Hill and Silverton, which are almost on the border of the two Colonies, are exclusively confined within the boundaries of the mother Colony.

Silver in South Australia.

Up to the end of 1890 New South Wales had produced 90 per cent. of the total value of silver raised in Australasia, Queensland followed, with 5·6 per cent., the remaining small proportion being distributed among the other Colonies, New Zealand claiming

Percentage of silver production to each Colony.

the largest share. The total production of silver in Australasia, during 1890, and up to the end of that year, was :—

Australasian Production of Silver.

Colony.	During 1890.		Total production to 31st December, 1890.	
	Value.	Proportion due to each Colony.	Value.	Proportion due to each Colony.
	£	Per cent.	£	Per cent.
New South Wales	2,762,554	96·3	7,682,506	90·1
Victoria	4,869	0·2	88,922	1·0
Queensland	56,639	2·0	476,711	5·6
South Australia	12,819	0·4	101,727	1·2
Tasmania	26,487	0·9	39,369	0·5
New Zealand	6,162	0·2	134,997	1·6
Australasia	2,869,530	100·0	8,524,232	100·0

It will be seen that the silver production of the group during 1890 was fully one-third of the total production of Australasia to the end of that year.

METALLIC MINERALS.

Lead.

Lead is found in all the Colonies, but is worked only when associated with silver. In the Colony of Western Australia the lead occurs in the form of sulphides and carbonates of great richness, but the quantity of silver mixed with it is very small. The lodes are most frequently of great size, containing huge masses of galena, and contain so little gangue that the ore can be very easily dressed to 83 or 84 per cent. The Government offered £10,000 for the first 10,000 tons of lead smelted in the Colony. Works were erected, but up to the present with not much success. Western Australia has, since 1845, exported 34,000 tons of lead ore, valued at about £169,000. The chief mining centres for this mineral are in the Northampton district, between Geraldton and Murchison.

Mercury, in the form of sulphides or cinnabar, is found in New South Wales, Queensland, and New Zealand. Few attempts, however, have been made to ascertain whether the deposits are of sufficient value to warrant the expenditure of capital in this direction. Mercury.

Copper is known to exist in all the colonies, but has been mined for most extensively in South Australia, New South Wales, and Queensland. The discovery of copper had a marked effect upon the fortunes of South Australia at a time when the young and struggling Colony was surrounded by difficulties. The Kapunda mine, opened up in 1842, is the oldest copper-mine in South Australia. Unfortunately information regarding the total quantity of ore raised is not available, but the average yearly output has been estimated at 2,000 tons. Three years later than Kapunda the celebrated Burra Burra mine was discovered. This mine proved to be very rich, and paid about £800,000 in dividends to the original owners. For a number of years the mine has been suffered to remain unworked, partly in consequence of the low price of copper, but principally because the deposits originally worked were found to be depleted. For many years the average yield was from 10,000 to 13,000 tons of ore, yielding from 22 to 23 per cent. of copper. During the twenty-nine and a half years that the mine was worked, the output of ore amounted to 234,648 tons, equal to 51,622 tons of copper, valued at £4,749,224. The Wallaroo and Moonta mines were discovered in 1860 and 1861. Up to the year 1886 these two mines had put out 927,196 tons of ore, valued at £6,609,240. The yield of copper ranged from 10 to 20 per cent. The Moonta mine at one time employed upwards of 1,600 hands, and up till 1891 employed fully 1,100 men, but shortly after that date the industrial operations were disturbed, owing to labour and other difficulties, which were only terminated during the opening month of 1892. Copper. South Australian copper mines.

The principal mines in New South Wales are those of Cobar and Nymagee, situated in the Central Division, and within Principal copper-mines of New South Wales.

80 miles of each other. The former employed over 500 men and boys, but is now idle; the deepest shaft is 566 feet, and the width of the lode from 2 to 50 feet. From the date of the commencement of operations in 1876, that company treated 205,005 tons of ore, giving a return equal to 22,943 tons of refined metal, an average production of 11·2 per cent. of copper per ton of ore, and the sum of £154,000 has been paid in dividends to the shareholders. Nymagee employs a complement of 250 persons, and its ores contain an average proportion of copper equal to 11·42 per cent. Since its formation, in 1883, this mine has paid large dividends. The yield for 1890 of this mine was 7,865 tons of sulphide ore, which when melted yielded 794 tons of copper, valued at £43,868. The refined Nymagee copper is superior to that of Cobar, and commands a higher price in the market. A depth of 734 feet has been reached in sinking through the lode. The New Mount Hope and the Great Central Copper-mines are also said to be rich in payable ores. The first mentioned employed 56 men and 6 boys in 1889, and raised 1,143 tons of ore, equal to 318 tons of copper, valued at £15,900. The total yield of the Cobar district during 1890 is estimated at 1,162 tons of copper, valued at £62,268. The Burraga Mine yielded during 1889, 476 tons of copper, valued at £36,625; and during 1890, 420 tons, worth 24,150. The deepest shaft is 300 feet, and the lode is said to be 15 feet wide.

Copper in Queensland.

Cupriferous deposits abound in the Colony of Queensland, and at one time there was considerable speculation in copper-mining stock. Peak Downs and Mount Perry acquired great celebrity in the Australian mining market, but afterwards suffered reactionary depression, and were ultimately abandoned, the result, in a large measure, of over speculation. In Northern Queensland copper is found throughout the Cloncurry district, in the upper basin of the Star River, and the Herberton district. The returns of the copper-fields in this Colony are at present small, owing to the lack of suitable fuel for smelting purposes, which renders the

economic treatment of the ore difficult; and the development is greatly retarded for the want of easy and cheaper communication with the coast, but it is expected that these disabilities will be overcome at no distant date, and a revival of the industry is hoped for, as some of the abandoned fields contain very extensive deposits of copper-ore. The copper mines of Chillagoe, situated in the Herberton district produced in 1890 two thirds of the value of the present very limited production of copper in Queensland.

Copper in Western Australia.

In Western Australia copper deposits have been worked for some years, and form with lead the principal elements of the mineral production of that Colony. Very rich lodes of both metals have been found in the Northampton, Murchison, and Champion Bay districts, and also in the country to the south of these districts on the Irwin River. The copper industry, however, is almost at a standstill, at present, through the low ruling price of copper, and the heavy expense of cartage, but it is anticipated that the cost of carriage will be reduced, and then several of these mines may be worked at a profit. The total export of copper since 1845 was 8,500 tons, valued at £140,000.

Victorian copper.

Copper mining has not attained any great proportions in Victoria, although deposits have been found in several parts of the Colony, particularly in the Beechworth district, where they have been traced over an area of some 50 square miles. The production during 1890 was valued at only £100.

New Zealand and Tasmanian copper.

The copper deposits of New Zealand and Tasmania have been worked to a small extent only.

Virgin copper.

The metal is sometimes found in the Australasian mines in a virgin state, of which beautiful specimens have been exhibited at different times, but occurs generally in the form of oxidized copper ores, carbonates, sulphates, phosphates, and silicates of copper. The museums of South Australia, Victoria, and New South Wales contain striking samples of azurite and malachite,

magnificent blocks of which have been shown from time to time at exhibitions, not only in the colonies, but also in Europe and America.

Stannine.

Copper sulphides and arsenides of copper are generally found in deep sinkings. The metal has also been found associated with tin in the form of *stannine*.

Number of copper miners.

The number of men employed in copper-mining in New South Wales, during 1890, was 702, in Queensland and Tasmania, 28 and 6 respectively.

The total value of copper produced in Australasia during and up to the end of 1890, and the proportion furnished by each Colony are given below :—

Colony.	During 1890.		Total Production to 31st December, 1890.	
	Value.	Percentage of each Colony.	Value.	Percentage of each Colony.
	£	per cent.	£	per cent.
New South Wales ...	84,107	26·4	3,362,728	13·2
Victoria	100	....	191,207	0·8
Queensland	3,000	0·9	1,957,247	7·7
South Australia	231,592	72·7	19,751,450	77·7
Western Australia...	136	.....	140,000	0·5
Tasmania	17	.....	617	.....
New Zealand	.....	.....	17,862	0·1
Australasia.....£	318,952	100·0	25,421,111	100·0

In 1872, copper realised as much as £172 per ton, whilst in December, 1886, the lowest price on record was touched, and only £38 7s. 6d. could be obtained for Chili bars. At the end of 1887 the price had risen to £74 per ton, and in August, 1888, to £81 5s. In January, 1892, the quotation had fallen to £47 per ton.

Tin.

Tin was known to exist in Australasia almost from the first years of colonization, the earliest mention of the mineral appearing in a report of a discovery by Surgeon Bass on the north coast of Tasmania. In the form of cassiterite (oxide of tin) it occurs

in all the colonies, but the richest deposits have been found in Tasmania—the Mount Bischoff being the most celebrated tin-mine in Australasia. The wealth of Queensland and the Northern Territory of South Australia in this mineral, according to the reports of Mr. Jack, the Government Geologist of the former colony, and the late Rev. Tenison-Woods, appears to be very great.

Tin in New South Wales.

In New South Wales this mineral occurs principally in the granite and basaltic country in the extreme north of the Colony, near Tenterfield and Vegetable Creek, now called Emmaville, and in other districts of New England. Tin has also been discovered in the Barrier Ranges, at Poolamacca; near Bombala, in the Monaro district, and in the Valley of the Lachlan, but none of these deposits have as yet been utilised to any extent. The deposits occur in the shape of stream and lode tin, and are worked by European and Chinese miners. Although this mineral was discovered by the Rev. W. B. Clarke as far back as the year 1853 the opening of the tin-fields of New South Wales only took place in the year 1872, and since that date the output from the mines has been considerable. The chief tin-mining centres are at Emmaville and Tingha in the northern portion of the Colony. The production of these fields has been until lately from alluvial deposits which are now said to be practically exhausted. In the former district several lodes have been opened up, the principal of which is at the Ottery Mines, the yield from which was 67 tons during 1890. At Tingha little or nothing has yet been done to develop the numerous lodes abounding in the neighbourhood.

Chief tin-mining centres.

Tin in Tasmania.

In Tasmania, as in New South Wales, nearly all the tin hitherto produced has been from alluvial deposits, the lodes in the vicinity of Heemskirk, Mount Bischoff, and Ben Lomond have remained almost untouched. Considerable areas of alluvial tin ground in the eastern and north-eastern divisions are now worked out, and the miners will perforce be obliged to turn their attention to the development of the other branch of tin-mining, when it is expected, that, with a systematic testing of the ground valuable lodes will

be discovered. The Mount Bischoff Mine and the Ringarooma Mines in the north-eastern and north-western divisions respectively yield more than three-fourths of the total annual production of Tasmania.

The Queensland tin-mines.

The most important tin-mines in Queensland are in the Herberton district, south-west of Cairns, at Cooktown on the Annan and Bloomfield Rivers, and at Stanthorpe on the borders of New South Wales. The Herberton is the chief tin-mining centre of Queensland, and the output for 1890 was valued at £104,050; the tin in this district is chiefly obtained from lodes, for out of the 2,031 tons for that year only 341 was alluvial. The fields at Herberton and Stanthorpe have produced more than three-fourths the total production of Queensland to the end of 1890.

Tin in Victoria.

The yield of tin in Victoria is very small, and until lately no fields of importance had been discovered, but towards the latter end of 1890 extensive deposits were reported to exist in the Gippsland district at Omeo and Tarwin; 220 men are now engaged mining on these fields; small deposits have likewise been found in the Beechworth district at Indigo and Mitta Mitta. The total yield for these fields during 1890 was 909½ tons of tin-ore, valued at £3,836.

In South Australia and Western Australia tin-mining is unimportant, the yields up to date being slight, while in New Zealand no production is officially recorded. During 1890 some small fields were reported to have been found in Stewart Island.

Fluctuations in the price of tin.

The tin-mining industry has been subject to frequent fluctuations, especially of late years. The value of the metal in the European market was £159 per ton in 1872, £52 in 1878, £114 in 1880, and 1882, and fell to £72 in 1884. The highest price—£168 per ton—was attained in the year 1887 owing to the operations of French syndicates. In January, 1892, Australian tin was quoted in the London market at £90 10s. per ton.

The value of the production of tin during 1890, and up to the end of that year, was as follows :—

Colony.	During 1890.		Total Production to 31st December, 1890.	
	Value.	Percentage of each Colony.	Value.	Percentage of each Colony.
	£	per cent.	£	per cent.
New South Wales...	179,057	31·5	5,541,700	37·6
Victoria	3,836	0·6	674,019	4·6
Queensland.....	154,963	27·2	3,808,923	25·8
South Australia.....	6,140	1·1	18,320	0·1
Western Australia..	5,400	1·0	5,700	.....
Tasmania.....	219,868	38·6	4,711,424	31·9
Australasia.....	569,264	100·0	14,760,086	100·0

Number of tin-miners.

The number of persons engaged in tin-mining in 1890, was as follows :—In New South Wales, 2,345, of whom 1,251 were Chinese ; Tasmania, 1,592 ; Queensland, 1,020 ; and Victoria, 238.

Titanium.

Titanium, of the varieties known as octahedrite and brookite, is found in New South Wales, with diamonds, in alluvial deposits.

Wolfram.

Wolfram (tungstate of iron and manganese) occurs in some colonies, notably New South Wales, Victoria, and New Zealand. Scheelite, another variety of tungsten, is also found in the last-mentioned colony. *Molybdenum*, in the form of molybdenite (sulphide of molybdenum), is found in New South Wales and Victoria, associated in the former colony with tin or bismuth in quartz-reefs. None of these minerals—titanium, tungsten, and molybdenum—have been systematically mined for.

Zinc.

Zinc ores, in the several varieties of carbonates, silicates, oxide, sulphide, and sulphate of zinc, have attracted little attention.

Iron.

Iron is distributed throughout Australasia, but for want of capital in developing the fields this industry has not progressed. In New South Wales there are important deposits of rich iron-ores, together with coal and limestone in unlimited supply, suitable for smelting purposes, and for the manufacture of steel of certain descriptions abundance of manganese, chrome, and tungsten ores

are available. The most extensive fields are in the Mittagong, Wallerawang, and Rylstone districts, which are roughly estimated to contain in the aggregate 12,944,000 tons of ore, containing 5,853,000 tons of metallic iron. During 1890 a mining expert from England was sent out in the interest of English capitalists to inspect the iron, coal, and limestone deposits of New South Wales, and to report upon the probable cost of manufacturing iron in the Colony.

Iron manufactories in N.S. Wales.

The only works for the manufacture of iron from the ore are situated at Eskbank, near Lithgow, where the metal treated is red siliceous ore, averaging 22 per cent., and brown hematite, yielding 50 per cent. metallic iron. Abundance of coal and limestone are found in the neighbourhood. This establishment, however, has for some time abandoned the manufacture of pig iron, for which it was originally built. The principal work now carried on is the re-rolling of old rails, the manufacture of iron bars, rods, and nails, and of ordinary castings.

Magnetite, or magnetic iron, the richest of all iron ores, is found in abundance near Wallerawang in New South Wales. The proximity of coal-beds now being worked should accelerate the development of the iron deposits, which contain 41 per cent. of metal.

Iron smelting in New Zealand.

Works for the treatment of local titanic iron ore were erected some years ago at Taranaki, on the west coast of New Zealand, but it was found that the cost of smelting left no margin for profit, and the works were consequently abandoned.

Extent of deposits of iron ore.

Goethite, *limonite*, and *hematite* are found in New South Wales, at the junction of the Hawkesbury sandstone formation and the Wianamatta shale, near Nattai, and are enhanced in value through being in proximity to coal beds Near Lithgow extensive deposits of limonite or clay-band ore are interbedded with coal. *Siderite* or *spathic* iron (carbonate of iron) and *vivianite* (phosphate of iron) are found in New Zealand. The latter also occurs in New South Wales, intermingled with copper and tin ores.

Sulphuretted iron ores (pyrites) are of little intrinsic value, but are often of considerable worth on account of the other minerals with which they are associated, common pyrites being often auriferous. Mispickel differs from other pyrites inasmuch as it contains arsenic, sometimes gold and silver, and is frequently associated with tin and copper ores; but the extraction of gold is rendered difficult on account of the presence of the arsenic. These minerals (pyrites) are common to all the Colonies. Pyrites.

Nickel, so abundant in the island of New Caledonia, has, up to the present, been found in none of the Australasian Colonies except Queensland; but no attempt has been made to prospect systematically for this valuable mineral. Nickel.

Cobalt occurs in New South Wales and Victoria, and efforts have been made in the former Colony to treat the ore, the metal having a high commercial value; but the results have not been of an encouraging nature, and the development of this industry is in abeyance. The manganese ores of the Bathurst district often contain a small percentage of cobalt, sufficient, indeed, to warrant further attempts in this direction. Cobalt.

Manganese probably exists in all the Colonies, deposits having been found in New South Wales, Victoria, Queensland, and New Zealand, the richest specimens being in New South Wales and New Zealand. Little, however, has been done to utilise the deposits, the demands of the colonial markets being extremely limited, but in event of the extensive iron ores of New South Wales being worked on a large scale the manganese, plentiful as it is in that Colony, will become of commercial importance. The ore generally occurs in the form of oxides, manganite, and pyrolusite, and contains a high percentage of sesquioxide of manganese. The production of manganese in New Zealand during 1890 was valued at £1,004, and the total yield up to the end of that year £51,291. New South Wales is the only other Colony producing even a small quantity of this mineral. Manganese.

Chrome iron.

Chrome Iron or chrome ore has been found in New Zealand and Tasmania, but the only attempt to work this mineral in this part of the world is that made at New Caledonia.

Sulphur.

Sulphur exists in large quantities in the volcanic regions of New Zealand, where it will doubtless some day become an article of commerce. Professor Liversidge, in his work on the minerals of New South Wales, states that sulphur occurs in small quantities at Mount Wingen, in the Upper Hunter district of that Colony, and also at Tarcutta, near Wagga Wagga, and on Louisa Creek, near Mudgee.

Arsenic.

Arsenic, in its well known and beautiful forms, orpiment and realgar, is found in New South Wales and Victoria. It usually occurs in association with other minerals, in veins.

Antimony.

Antimony is widely diffused throughout Australasia, and is sometimes found associated with gold. Extensive fields have been discovered in the northern tablelands of New South Wales, especially at Hillgrove, in the vicinity of Uralla. In Victoria the production for the last few years was small compared to former periods; there are now, however, signs of a revival of the industry, as 238 men were engaged mining for this metal during 1890. The principal mine is at Castlemaine, but several fields are being explored in the Sandhurst and Beechworth districts. In Queensland and New Zealand the fields are all showing development, as the output of 1890 proves, there being a considerable increase compared with that of late years.

Value of Antimony produced in Australasia.

Colony.	Value.	Percentage produced.
	£	
New South Wales	93,741	28·1
Victoria	172,572	51·8
Queensland	30,787	9·2
New Zealand	36,190	10·9
Australasia	333,290	100.0

The antimony produced by New South Wales in 1890 was valued at £20,240; that produced by New Zealand was worth £11,121; Queensland, £4,816; and Victoria, £3,120.

Bismuth is known to exist in all the Australian Colonies, but up to the present time has been mined for in New South Wales alone. It is usually found in association with tin and other minerals, but in one instance a mass of native bismuth, weighing 30 lb., was found in the Colony mentioned. The principal mine is situated at Kingsgate, in the New England district, where this mineral is generally associated with molybdenum and gold. This mine, however, is at present closed. The value of bismuth produced up to the end of 1890, in New South Wales and Queensland, was £36,142, and £10,261 respectively. Bismuth.

Of all the mineral forms of carbon the diamond is the purest, but as it is usual to class this precious substance under the head of gems that custom will be followed in the present instance. The Diamond.

Graphite, or plumbago, which stands second to the diamond in point of purity, has been discovered in New Zealand, in the form of detached boulders of pure mineral. It also occurs in impure masses where the coal measures come into contact with the graphite. This mineral, up to the present time, has not been found in any of the other colonies except New South Wales, where in 1889 a lode 6 feet wide was discovered near Undercliff, in the New England district. Graphite.

The Australasian Colonies have been bountifully supplied by Nature with mineral fuel. Five distinct varieties of black coal, forming well characterised types, may be distinguished, which form, with the two extremes of brown coal, or lignite, and anthracite, a perfectly continuous series. For statistical purposes, however, they are all included under the generic name of "coal," and therefore these minerals will be considered here under the three main heads—lignite, coal, and anthracite only. Mineral fuel.

Brown coal or *lignite* occurs principally in the Colonies of New Zealand and Victoria. Attempts have frequently been made to Lignite.

use this mineral for ordinary fuel purposes, but its inferior quality has prevented its use extending beyond the mere locality where it is produced. In Victoria, during 1890, 9,857 tons were raised in the Ballarat district, valued at £2,500. The fields of lignite in New Zealand are roughly estimated to contain about 500 million tons.

Ordinary coal.

Black coal forms one of the principal mineral resources of New South Wales, and in New Zealand the rich deposits of this valuable substance are rapidly being developed. That they will form an important source of commercial prosperity cannot be doubted, as the known areas of the coal-fields of this class have been roughly estimated to contain about 500 million tons of coal in New Zealand, and 78,198 million tons in New South Wales. New Zealand also possesses a superior quality of bituminous coal, which is found on the west coast of the Middle Island. An estimate of the probable contents of these coal-fields is given as 200 million tons. Coal has been discovered in Victoria, and raised in small quantities for some years past; but the industry is still in its experimental stage. Excellent steam coal has been found in Tasmania, and coal-mining in that Colony is becoming a well established industry. From time to time reports have been raised of the discovery of coal in South Australia, but no very definite or satisfactory information on the subject has been brought forward, such as would warrant the employment of capital, except in the direction of prospecting researches. Coal of a very fair description was discovered in the basin of the Irwin River, in Western Australia, as far back as the year 1846. It has been ascertained from recent explorations that the area of carboniferous formation in that Colony extends from the Irwin northwards to the Gascoyne River, about 300 miles distant, and probably all the way to the Kimberley district. Coal has recently been discovered at Wyndham, and should it possess good steaming properties, the find will prove of great value, as it occurs close to one of the best harbours of the Colony. Mr. Jack, the Government Geologist

Tasmanian coal.

of Queensland, considers the extent of the coal-fields of that Colony practically unlimited, and is of opinion that the carboniferous formations extend to a considerable distance under the Great Western Plains. It is roughly estimated that the coal measures at present practically explored extend over an area of about 24,000 square miles. Coal-mining has been an established industry in Queensland for some years, and is progressing satisfactorily.

Discovery of coal.

Coal was first discovered in New South Wales in the year 1797, near Mount Keira, by a man named Clark, the supercargo of a vessel called the "Sydney Cove," which had been wrecked in Bass's Straits. Later in the same year Lieutenant Shortland discovered the River Hunter with the coal-beds situated at its mouth. Little or no use, however, was made of the discovery, and in 1826 the Australian Agricultural Company obtained a grant of 1,000,000 acres of land, together with the sole right, conferred upon them by charter, of working the coal-seams that were known to exist in the Hunter River district. Although the Company held this valuable privilege for twenty years, very little enterprise was exhibited by them in the direction of winning coal, and it was not until the year 1847, when the Company's monopoly ceased, and public competition stepped in, that the coal-mining industry began to show signs of progress and prosperity. From the 40,732 tons extracted in 1847 under the monopoly of this Company, the quantity raised had in 1890 expanded to the large figure of 3,060,876 tons, valued at £1,279,089.

Coal-fields of New South Wales.

The coal-fields of New South Wales are situated in three distinct regions—the Northern, Southern, and Western districts. The first of these comprises chiefly the mines of the Hunter River districts; the second includes the Illawarra district and, generally, the coastal regions to the south of Sydney together with Berrima, on the tableland; the third consists of the mountainous regions on the Great Western Railway, and extends as far as Dubbo. The total area of the carboniferous strata of

Thickness of coal seam at Greta.

New South Wales is estimated at 23,950 square miles. The seams vary in thickness. One of the richest has been found at Greta, in the Hunter River district; it contains an average thickness of 41 feet of clean coal, and the quantity of coal underlying each acre of ground has been computed to be 63,700 tons.

Coal-mines registered in New South Wales.

The number of coal-mines registered in New South Wales during 1890 was 94, as compared with 99 in the previous year. These gave employment to 10,469 persons, of whom 8,311 were employed under ground, and 2,158 above ground. The average quantity of coal extracted per miner was 368 tons, as against an average of 438 tons for the previous year. In 1882 the weight per miner stood at 578 tons; but the yield has since gradually declined, and the average for 1890 was less than that of any of the preceding ten years, owing to the collieries standing idle for several months during the year on account of the general strike.

Production to each miner.

The average quantity of coal extracted per miner, calculated upon the basis of the output for the last ten years, is 467 tons, which, at the mean price of coal at the pit's mouth, is equivalent to £210 3s. This production is certainly very large, and compares favourably with the results exhibited by the principal coal-raising countries of the world, as will be evident from the following figures given by Mulhall :—

Country.	Tons of coal raised per miner.	Value at the pit's mouth per ton.			Total value of coal raised per miner.		
		£	s.	d.	£	s.	d.
New South Wales	467	0	9	0	210	3	0
Great Britain	330	0	6	0	111	0	0
United States	347	0	8	4	139	0	0
Germany	336	0	5	3	78	0	0
France	196	0	9	0	88	0	0
Belgium	168	0	7	6	63	0	0
Austria	270	0	5	0	57	0	0

Earnings of Miners.

In the absence of information as to the average amount of wages paid to coal-miners in other countries an exact comparison is not possible, but it is abundantly clear, that whatever may be the drawbacks to a miner's lot in the Australian Colonies in no other country is it so satisfactory. The foregoing table proves this, for on the improbable supposition that the miner everywhere receives in wages the same proportion of the value of the coal as in New South Wales, that is, about 40 per cent. of the selling price at the pit's mouth, the average earnings in each country would be :—

Country.	Coal per miner.	Wages per ton of coal.			Earnings of miner per annum.		
	tons.	£	s.	d.	£	s.	d.
New South Wales	467	0	3	7	83	13	5
Great Britain	330	0	2	5	39	17	6
United States	347	0	3	4	57	16	8
Germany	336	0	2	1	35	0	0
France	196	0	3	7	35	2	4
Belgium	168	0	3	0	25	4	0
Austria	270	0	2	0	27	0	0

Local consumption.

The Colony was its own chief customer during 1890, when out of a total production above stated, of 3,060,876 tons, the consumption amounted to 1,239,002 tons, or over 40 per cent. Victoria came next, with 778,803 tons, or 43 per cent. of a total export of 1,821,874 tons. The quantity of coal required for local consumption denotes a satisfactory increase during most years.

Consumption per head.

The annual consumption per head increased from 15 cwt. in 1876 to 24½ cwt. in 1888, and stood at 22½ cwt. in 1890. The larger use of steam for railway locomotives, for manufacturing, and other purposes, as well as the multiplication of gas-works, accounts for a great portion of the increase, but it must also be borne in mind that there is a large and increasing demand for bunker coal for

ocean-going steamers, which appears not as an export, but as required for home consumption. The amount of coal taken by the steamers during 1890 was little short of 200,000 tons.

Export of coal from New South Wales.

The progress of the export trade, from 1881 to 1890, is shown in the following table, also the direction of the trade at those periods :—

Export of Coal from New South Wales, 1881 and 1890.

Country.	Quantity.		Value.	
	1881.	1890.	1881.	1890.
	tons.	tons.	£	£
Australasian Colonies	657,135	1,149,544	255,572	608,108
India, Ceylon, and China	136,511	92,273	59,944	50,529
Eastern Seas	44,530	120,454	17,112	69,159
Mauritius	6,249	7,238	2,414	4,028
Pacific Islands	19,526	56,335	8,011	32,883
United States	150,002	182,692	68,172	102,205
South America	8,017	198,178	3,243	109,487
Other Countries	7,874	15,160	3,062	10,774
Total	1,029,844	1,821,874	417,530	987,173

Export of coal from New Zealand.

New Zealand is the only other Australasian Colony capable of exporting coal to any large extent. The export trade of that Colony for 1881 and 1890 was :—

Export of Coal from New Zealand, 1881 and 1890.

Country.	Quantity.		Value.	
	1881.	1890.	1881.	1890.
	tons.	tons.	£	£
Australasian Colonies	6,049	14,775	5,022	10,098
United Kingdom	.....	42,984	.....	47,824
Fiji and Norfolk Island	21	6,442	25	4,745
Pacific Islands, &c.	551	5,413	563	4,336
Total	6,621	69,614	5,610	67,003

The exports to the United Kingdom, both from New South Wales, and from New Zealand, in all probability consisted of bunker coal, for the steamers.

Coal produced in New Zealand.

Most of the coal-beds of New Zealand are on the West Coast of the South Island. The chief mines are at Westport, Greymouth, and Otago. The total quantity of coal produced in 1890 was 637,397 tons, for the whole colony, of which Westport contributed 170,406 tons, Greymouth 118,847 tons, and Otago 176,428 tons. The only important coal measures of the North Island are those of the Waikato, which produced 64,729 tons.

Coal in Queensland.

The total production of coal in Queensland for 1890, was, 338,344 tons, most of which came from the mines at Ipswich and at Burrum, in the Maryborough district. Queensland exported in 1881, 2,742 tons, valued at £1,783; and in 1890, 39,450 tons, valued at £26,155. The miners' strike in New South Wales in 1890 gave an impetus to the coal-mining industry in the Northern Colony.

The quantity of coal extracted annually in these Colonies has now reached fully 4,100,000 tons, valued at £1,824,200. The proportion due to each Colony for the year 1890 was as follows:—

Colony.	Quantity.	Value.	Proportion of value raised by each Colony.
	Tons.	£	
New South Wales	3,060,876	1,279,089	70·1
Victoria	14,601	13,899	·8
Queensland	338,344	157,077	8·6
Tasmania	53,812	24,215	1·3
New Zealand	635,481	349,936	19·2
Australasia	4,103,114	1,824,216	100·0

Value of coal production.

The total value of coal produced in the Australasian Colonies up to the end of 1890 is shown in the following table :—

Colony.	Quantity.	Total value.	Percentage of each Colony to total.
	Tons,	£	Per cent.
New South Wales	49,526,709	23,891,629	83·1
Victoria	57,962	53,655	·2
Queensland	2,632,314	1,213,360	4·2
Tasmania	.....	229,607	·8
New Zealand.....	6,296,615	3,348,122	11·7
Australasia.....	.....	28,736,373	100·0

Number of miners employed.

During the year 1890 this industry gave direct employment, in and about the mines, to the following number of persons in the several Colonies in which the returns were available :—

	Miners.
New South Wales	10,469
Victoria	205
Queensland	932
Tasmania	191
New Zealand	1,655

Average prices.

The average price of coal per ton varies in the Colonies very considerably. In New South Wales, from 1846 to 1890, the average price obtained was 9s. 7·77d., but the mean of the last ten years is a little below these figures. In 1890 the average price per ton of coal delivered at the mines in the Australasian Colonies was as follows :—

	£	s.	d.
New South Wales	0	8	4
Victoria	0	19	0
Queensland	0	9	3
Tasmania	0	9	0
New Zealand	0	11	0
Australasia	0	8	11

Anthracite.

Anthracite is found on the island of Tasmania. It is a hard and heavy mineral, burning with difficulty, and it possesses very little economical value in countries where ordinary coal abounds.

The following table shows the coal annual production by the principal countries of the world to the latest date obtainable :—

Coal production of the principal countries of the world in 1889 or 1890.

Country.	Quantity.
	Tons.
Great Britain	181,614,288
United States	125,563,704
Germany	67,342,200
France	24,303,509
Belgium	19,869,980
Canada	2,719,478
Australasia	4,103,114

Kerosene shale.

Kerosene Shale (torbanite) is found in several parts of the Colony of New South Wales. It is a species of cannel coal, somewhat similar to the Boghead mineral of Scotland, but it yields a much larger per centage of volatile hydrocarbons than can be obtained from the Scottish mineral. The richest quality of Australian kerosene shale yields upwards of 150 gallons of crude oil per ton, or 18,000 cubic feet of gas, with an illuminating power of 38 or 40 sperm candles. The New South Wales Oil and Mineral Company, at Joadja Creek, not only raise kerosene shale for export, but also manufacture from it petroleum oil and other products. Since the year 1865, when the mines were first opened, the quantity of the kerosene shale raised amounts to 556,682 tons, worth £1,234,453. The average price realised during that interval was £2 4s. 5d. per ton. The prices ruling in 1890, when 56,010 tons were extracted, averaged £1 17s. 2d. per ton, representing a total value of £104,103, for the

production of that year. The export of shale from New South Wales for 1890 was :—

Export of Shale.

Country.	Quantity.	Value.
	tons.	£
Victoria	9,525	21,439
United Kingdom	8,636	25,158
Netherlands	6,595	18,661
Italy	6,136	18,169
United States	2,563	7,379
Spain	2,397	6,232
Other Countries	2,611	6,570
Total	38,463	103,608

Oil Shale in New Zealand.

Extensive formations of oil shale have been found in Otago, and at Orepuki, in Southland. Attempts have been made to develop the oil resources of Waipaoa, but, so far, unsuccessfully. The oil produced does not possess the properties required in illuminating oils, but it is valuable for lubricating purposes.

The net import of kerosene into each of the Colonies in 1890 was :—

Colony.	Quantity.	Value.
	gallons.	£
New South Wales	1,560,352	74,318
Victoria	2,089,399	103,814
Queensland	1,146,757	42,526
South Australia	951,051	29,590
Tasmania	169,968	7,846
New Zealand	1,136,766	49,321
*Australasia	7,054,293	307,415

* Western Australia not distinguished from other oils.

Ozokerite, or mineral wax, is reported to have been found at Coolah, in New South Wales. Ozokerite.

Elaterite, mineral caoutchouc, or elastic bitumen, is said to have been discovered in New South Wales and South Australia. In the last-named Colony a substance very similar to elaterite has been discovered in the Coorong Lagoons, and it has received the name of Coorongite. Up to the present time neither the extent of these finds nor their commercial value has been ascertained. Elaterite.

Bitumen, is known to exist in Victoria, and it is reported to have been found near the township of Coonabarabran, in New South Wales. Bitumen.

Kauri Gum, a resinous substance somewhat resembling amber in appearance, and like that production an exudation from trees, is found only in New Zealand, where it is included under the head of minerals, although more logically entitled to be considered as a vegetable product. In that Colony kauri gum forms the object of an extensive and lucrative commerce. It is computed that the total value of this product obtained from 1853 to the end of 1890, was £5,394,687. In the year 1890 the quantity obtained represented a value of £378,563. Kauri Gum.

SALTS.

Common *Rock Salt* has been found in New South Wales in rock crevices in several parts of the Colony, but it is not known to exist in large deposits so as to be of commercial importance. Rock Salt.

Natron is said to occur in the neighbourhood of the Namoi River, in New South Wales. It appears as a deposit from the mud-wells of that region. Natron.

Epsomite, or epsom salt (sulphate of magnesia), is seen as an efflorescence in caves and overhanging rocks of the Hawkesbury sandstone formation, and is found in various parts of New South Wales. Epsom Salt.

Alum Stone.

Large deposits of alum occur, close to the village of Bulladelah, 30 miles from Port Stephens. About 1,000 tons of stone has been treated, yielding 220 tons of alum. 500 tons of stone have also been sent to England for treatment.

Fluor spar has been found in New South Wales.

EARTHY MINERALS.

Marble.

Marble is found in many parts of New South Wales, South Australia, New Zealand, and Tasmania. In New South Wales marble quarries have been opened in several districts, and some very fine specimens of the stone have been obtained.

Lithographic Stone and Omaru Stone.

Lithographic stone has been found in New Zealand, where another beautiful species of limestone known as the *Omaru stone* is also procured. This stone has a fine, smooth grain, and is of a beautiful creamy tint. It is in great demand for public buildings, not only in the Colony where it is found, but in the great cities of continental Australia, which import large quantities of this stone for the embellishment of their public edifices.

Limestone is being worked on the Myall Lakes, near Bungwall, and small quantities have been forwarded from this district to Sydney.

Gypsum.

Gypsum is found crystallised in clay-beds in New South Wales, and in isolated crystals in the Salt Lakes of South Australia, where a small proportion of sulphate of lime is present in the water. It is also found in portions of Victoria. This mineral is of commercial value for the manufacture of cement and plaster of Paris. It is found in the form of an insoluble salt in New South Wales, Victoria, and New Zealand.

Apatite.

Apatite, another mineral of considerable commercial importance, and very valuable as a manure, occurs in several districts of New South Wales, principally on the Lachlan River, at the head of the Abercrombie, and in the Clarence River district.

QUARTZ AND SILICA.

Quartz is of common occurrence in all parts of Australasia. Rock crystal, white, tinted, and smoky quartz are frequently met with, as well as varieties of crystalline quartz, such as amethyst, jasper, and agate, which possess some commercial value. Quartz.

Common *Opals* are frequently found in the basaltic formations of Australasia. The precious, or noble opal, which might be included under the head of precious stones, has been found 60 miles north-west from Wilcannia, at a few feet from the surface, in layers between hard silicious sandstone. As much as £5 per oz. has been offered for good specimens. During 1890 the quantity of noble opal won from these mines was 195 lb., valued at £15,600. This gem has also been found in basalt, near the Abercrombie River, and in sandstone, near Lismore. In Queensland opals are found in the Windorah district, where the labour of twenty men in 1890, produced opals valued at £3,000. Opal-bearing stone is known to exist in the ranges between Adavale and Cooper's Creek, in the Charleville district, Queensland and the northern portions of New South Wales. Opals.

Chalcedony, carnelian, onyx, and *cat's eye,* are found in New South Wales; probably also in the other Colonies, particularly Queensland. Chalcedony, carnelian, &c.

Tripoli, or rotten stone, an infusorial earth, consisting of hydrous silica, which has some value for commercial purposes, has been found in New South Wales, Victoria, and New Zealand. Tripoli.

Meerschaum is reported to have been discovered near Tamworth and in the Richmond River district, in New South Wales. Meerschaum.

Mica is also found in granitic country, chiefly in the New England and Barrier districts. Mica.

CLAYS.

Kaolin and other clays.

Kaolin, *fire-clays*, and *brick-clays* are common to all the colonies. Except in the vicinity of cities and townships, however, little use has been made of the abundant deposits of clay. Kaolin, or porcelain clay, although capable of application to commercial purposes, has not as yet been utilised to any extent.

GEMS AND GEMSTONES.

Diamonds.

Many descriptions of gems and gemstones have been discovered in various parts of the Australasian Colonies, but no systematic search has been made for any but the diamond.

Diamonds are found in New South Wales, Victoria, and Queensland, but only in the first-named Colony have any attempts been made to work the diamond drifts. The principal diamond-fields are situated in the Bingara and Inverell districts, on the New England tableland, and Cudgegong, in the Wellington district. The Government of New South Wales has, on various occasions, obtained the services of experts to report upon the fields, as well as the gems which have been from time to time extracted from them, and these reports have generally been of an encouraging nature.

Yield and quality of diamonds.

The number of diamonds found in the Colony is estimated to be 75,000, the largest one being of $5\frac{5}{8}$ carats, or 16·2 grains. The diamonds occur in old tertiary river drifts, and in the more recent drifts derived from them. The deposits are extensive, and have not yet been thoroughly prospected. The New South Wales diamonds are harder and much whiter than the South African diamonds, and are classified on a par with the best Brazilian gems. During the year 1887 the diamond companies at Cope's Creek, near Bingara, produced about 23,000 diamonds, weighing 5,151 carats; but in 1888, owing to the severe drought which occurred, the search for diamonds had to be temporarily abandoned. In

1889 finds are reported to the extent of 2,196 carats, valued at £878, and in 1890 the diamonds won in this district amounted to about 200 carats, worth from 14s. to 20s. per carat; 530 carats of diamonds, valued at 6s. per carat, were also obtained in the Inverell district. With efficient methods of working this industry bids fair to become a profitable one.

Corundum.

Under the generic name of *Corundum* are included the most valuable gems known to commerce, next to the diamond. The sapphire, which is the most common of these gems, is found in all the Colonies, principally in the neighbourhood of Beechworth, Victoria.

Oriental emeralds are found in New South Wales, and in Gippsland in Victoria. An emerald mine, in which the gem occurs in granitic lode, was opened near Emmaville, in the Glen Innes district, during 1890; 225 carats of emeralds were won from the mine during that year and forwarded to London. Some of the gems were sold at £4 per carat.

The yellow corundum, or Oriental topaz, has been found in New South Wales. Oriental amethysts also have been found in that Colony, and the red corundum, or ruby, the most valuable of all these gems, has been found in Queensland, as well as in New South Wales.

Miscellaneous gems.

According to an authority on the subject of gem-stones, rubies, Oriental amethysts, emeralds, and topaz have been chiefly obtained from alluvial deposits, but have rarely been met with in a matrix from which it would pay to extract them.

Chrysoberyls have been found in New South Wales; spinel rubies, in New South Wales and Victoria; white topaz, in all the Colonies; and yellow topaz, in Tasmania. Zircon, tourmaline, garnet, and other gem-stones of little commercial value, are found in all the Colonies.

Garnets.

In South Australia some very fine specimens of garnet were found, which caused some excitement at the time, as the gems

were mistaken for rubies. The stones were submitted to the examination of experts, whose reports disclosed the true nature of the gems, and dispelled the hopes of those who had invested in the supposed ruby-mines of South Australia.

MINERAL WEALTH OF AUSTRALASIA.

Summary of the mineral resources of Australasia.

Australasia possesses invaluable mineral resources, and though enormous quantities of minerals of all kinds have been won since their first discovery, the deposits, with the exception, perhaps, of gold, have only reached the first period of their exploitation. Vast beds of silver, tin, and copper ore and coal are known to exist, but their exploitation has not reached a sufficiently advanced stage to enable an exact opinion to be expressed regarding their commercial value, though it is confidently held by mining experts that this must be enormous.

Value of minerals raised in 1890.

In the year 1890 the total value of minerals raised, and the proportion due to each Colony, also the value per inhabitant, were as follows:—

Colony.	Total production.	Percentage each Colony.	Per Inhabitant.
			£ s. d.
New South Wales	5,003,903	40·8	4 10 10
Victoria	2,384,130	19·5	2 2 8
Queensland	2,518,030	20·5	6 9 8
South Australia	380,999	3·1	1 3 11
West Australia	94,335	0·8	2 0 0
Tasmania	357,701	2·9	2 9 9
New Zealand	1,523,836	12·4	2 9 1
Australasia	12,262,934	100·0	3 5 7

Value of minerals raised in 1890.

The total value of minerals raised in 1890 exceeds by about £1,294,000 the average annual amount since 1852. It will, however, be easily understood that the proportion of mineral

wealth extracted per head of the population is much less than it was during the prevalence of the gold fever. In comparison with that of the years 1851 to 1871 the production of the precious metals is considerably reduced. Nevertheless the search for gold led to the expansion of the mining industry into other channels, and although the gold-mining population has decreased, the number of miners engaged in the extraction of other minerals has largely increased, and it is a question whether the total number of persons who gain their livelihood by mining pursuits at the present time is not equal to the number who were so engaged at the time when gold and coal alone were the great elements of the mineral wealth of the Australasian colonies. The resources known to exist, and yet to be developed in these colonies, are likely to maintain, for many generations to come, a large and prosperous mining population.

Diversion of the Mining Industry.

Comparing the value of mineral production with the population the largest share is obtained by Queensland, with £6 9s. 8d. per inhabitant, and New South Wales ranks second with £4 10s. 10d. The high average of Queensland is due to the gold mines, while in New South Wales more than half the year's wealth was contributed by the silver fields. The average per inhabitant for Australasia was £3 5s. 7d.

Mineral production per head.

The next two tables show the value of minerals raised in each of the Colonies during 1890, also the total production up to the end of that year, distinguishing the principal minerals. With regard to some of the Colonies the data are defective in respect to "other minerals," but not to so great an extent as to seriously affect the gross total. Coal was the only mineral raised in New South Wales prior to 1852, and its production up to that date was valued at £279,923. Deducting that amount from the total value of Australasian minerals raised up to the end of 1890, the remainder, £427,496,112, represents the value of mineral production from 1852, equal to an average of £10,961,500 per annum for the thirty-nine years.

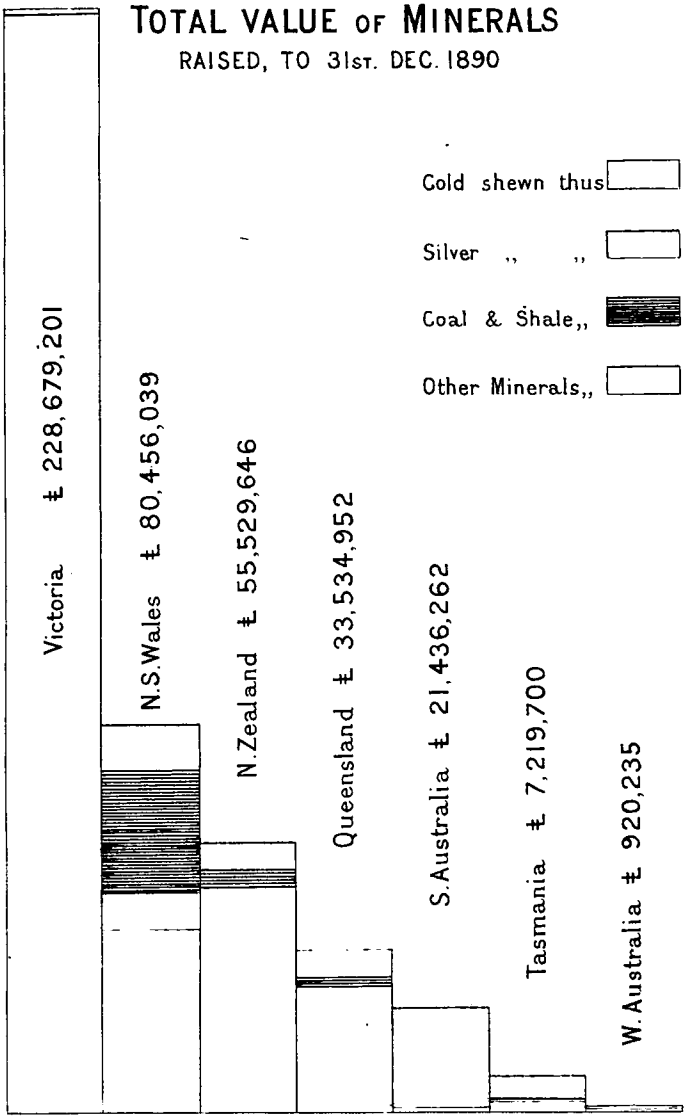
Minerals produced by each Colony.

Total value of Minerals raised during 1890, and to the end of that year.

Colony.	Gold.	Silver and Silver Lead.	Copper.	Tin.	Coal.	Kerosene Shale.	Other Minerals.	Total.
New South Wales—	£	£	£	£	£	£	£	£
During 1890	460,285	2,762,554	84,107	179,087	1,279,089	104,103	134,708	5,003,903
To end of 1890	38,075,172	7,682,506	3,362,728	5,541,700	23,891,629	1,338,552	563,752	80,456,039
Victoria—								
During 1890	2,354,241	4,869	100	3,836	13,899	.....	7,182	2,384,130
To end of 1890	277,482,296	88,922	191,207	674,019	53,655	.....	189,102	228,679,201
Queensland—								
During 1890	21,137,054	56,639	3,000	154,963	157,077	.....	9,297	2,518,030
To end of 1890	26,034,663	476,711	1,957,247	3,808,923	1,213,360	.....	44,048	33,534,952
South Australia—								
During 1890	101,577	12,819	231,592	6,140	.....	.....	28,871	380,999
To end of 1890	1,169,768	101,727	19,751,450	18,320	.....	.....	394,997	21,436,262
Western Australia—								
During 1890	86,664	.....	136	5,400	.....	.....	2,135	94,335
To end of 1890	605,535	.....	140,000	5,700	.....	.....	169,000	920,235
Tasmania—								
During 1890	87,114	26,487	17	219,868	24,215	.....	.....	357,701
To end of 1890	2,238,683	39,369	617	4,711,424	229,607	.....	.....	7,219,700
New Zealand—								
During 1890	773,438	6,162	.....	.....	349,936	.....	*394,300	1,523,836
To end of 1890	46,425,626	134,997	17,862	.....	3,348,122	.....	*5,603,039	55,529,646
Australasia—								
During 1890 ...	6,000,376	2,869,530	318,952	569,264	1,824,216	104,103	576,493	12,262,934
To end of 1890	342,031,743	8,524,232	25,421,111	14,760,086	28,736,373	1,338,552	6,963,938	427,776,035

* Includes Kauri gum, £378,563, during 1890, and £5,394,687 to the end of that year.

TOTAL VALUE OF MINERALS
RAISED, TO 31ST. DEC. 1890



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