

## AGRICULTURE, MINING, &amp;c.

The latest return from the Lands Department shows the total area of the State to be 56,245,760 acres. Of this, 24,058,181 acres are private lands, 20,618,981 acres being alienated in fee simple, and 3,439,200 acres in process of alienation. The balance, 32,187,579 acres, comprises the following:— Roads in connexion with lands alienated and in process of alienation, 1,587,289 acres; agricultural college reserves, &c., 446,737 acres; State forests and timber reserves, 4,679,540 acres; State education endowment, temporarily reserved, 1,592,400 acres; other reserves, 595,631 acres; unsold land in towns, &c., 2,476,682 acres; in occupation under grazing area leases, 3,209,321 acres; Mallee pastoral lands, 8,257,142 acres; all other leases, 120,139 acres. The land available for occupation on 31st December, 1902, was 9,222,698 acres, and is thus described by the officers of the department:—Good grazing or agricultural, 50,000 acres; agricultural and grazing combined, 140,000 acres; grazing, 1,860,000 acres; inferior grazing, 73,000 acres; pastoral (large areas), 3,544,700 acres; swamp or reclaimed, 20,510 acres; lands that may be sold by auction (not including swamp or reclaimed lands), 12,474 acres; auriferous, 1,017,800 acres; and Mallee lands, 2,504,214 acres.

Private and  
Crown  
lands.

During 1898, 305,697 acres were alienated in fee simple, including land selected in previous years; 694,508 acres in 1899; 494,752 acres in 1900; 406,145 acres in 1901; and 523,477 acres in 1902; the purchase money being £318,474 of that in 1898; £727,493 in 1899; £526,650 in 1900; £438,363 in 1901; and £555,538 in 1902. The Crown lands absolutely or conditionally sold during the last five years were:—65,319 acres in 1898; 74,353 in 1899; 232,783 in 1900; 523,464 in 1901; and 306,806 acres in 1902. The Crown lands under pastoral occupation on 31st December, 1902, are thus described:—

Number of Licences and Leases	...	...	20,771
Area (acres)	...	...	17,196,092
Annual Rental	...	...	£54,662

The "Torrens System," whereby persons acquiring possession of land may receive a clear title, was introduced into Victoria in 1862. The system was originated previously in South Australia by the late Sir R. R. Torrens, and has been the means of simplifying procedure in connexion with the transferring of land; gives a title to the transferee free of any latent defect; and cheapens the cost of dealing in real estate by reason of the simplicity of the procedure. All land parted with by the Crown since 1862 is under the operation of the "Transfer of Land Act," and the Crown grant issues

"Transfer of  
Land Act."

through the Titles Office; but to bring under the Act land that was parted with prior to that year, application must be made accompanied by strict proofs of the applicant's interest in the property. During 1902 there were 663 applications to bring under the Act land amounting to 70,145 acres in extent, and to £1,003,834 in value, whilst the land brought under the Act during the year by application amounted to 51,702 acres in extent, and to £791,637 in value.

“Statistics  
Collection  
Act 1902.”

In December, 1902, the “Statistics Collection Act” authorized the collection by the police of agricultural and manufacturing statistics, which had previously been done by the municipalities. The new system has been fruitful of good results, even in the year of its inception. It will probably work still more satisfactorily in the future. To prevent omissions and duplications, copies of maps showing the boundaries of the various police sub-districts are now provided for the collectors.

Area under  
cultivation

The area under cultivation, exclusive of permanent artificial grass, increased from 441,929 acres in 1862-3 to 765,250 acres in 1872-3; 1,756,271 in 1882-3; 2,737,001 in 1892-3; and 3,738,873 in 1902-3; of which 162,008 acres in 1862-3, 326,564 in 1872-3, 969,362 in 1882-3, 1,342,504 in 1892-3, and 1,994,271 in 1902-3 were under wheat for grain alone.

Cultivated  
holdings.

The number of cultivated holdings returned during the last five years was 39,877 in 1898-9, 40,160 in 1899-00, 39,831 in 1900-1, 41,153 in 1901-2, and 40,859 in 1902-3. In addition, the number of holdings where dairying exclusively was carried on was 2,605 in 1901-2, and 2,913 in 1902-3.

Cultivation  
per head  
in Austral-  
asia.

The average area in cultivation (exclusive of artificial grasses) to each person, in each of the Australian States and New Zealand, on 31st December, 1902, was as follows:—

Victoria	...	3·10 acres	Western Australia	...	1·06 acres
New South Wales	...	1·99 „	Tasmania	...	1·56 „
Queensland	...	·93 „	New Zealand	...	2·04 „
South Australia	...	8·61 „			

Principal  
crops.

The principal crops grown are wheat, oats, barley, potatoes, and hay.

Wheat.

Wheat was first grown in 1836. There was a continual increase in the area under this cereal to 1899-1900, when 2,165,693 acres were sown. In 1900-1, there was a decrease

to 2,017,321 acres, and in the following year to 1,754,417 acres. In 1902-3, however, there was a recovery to 1,994,271 acres. The yield during the last five years shows a decrease from 19,581,304 bushels in 1898-9 (the highest on record) to 2,569,364 bushels in 1902-3, the fall from 1901-2 to 1902-3 being over nine and a half million bushels—a result of the disastrous drought of the latter year, which particularly affected the principal wheat-growing districts. A previous devastation through drought occurred in the four years preceding 1898-9. The total in 1893-4 was 15,255,200 bushels, 11,445,878 in 1894-5, 5,669,174 in 1895-6, 7,091,029 in 1896-7, and 10,580,217 in 1897-8.

The area under oats in 1902-3, 433,489 acres, is the largest, Oats. that of 1896-7 being next, with 419,460 acres. The average yield per acre in 1902-3 was, however, the lowest since 1896, being only 10·16 bushels per acre. The yield for the year was 4,402,982 bushels.

Although an increase is shown in the area under barley, Barley. the average yield was only 14·88 bushels per acre in 1902-3, as against 21·40 in the preceding year. The total yield for 1902-3 was 561,144 bushels.

Potatoes yielded in 1902-3 168,759 tons from an area of Potatoes. 49,706 acres. In only five previous years has the area under potatoes been greater, viz., 1886-7, 1890-1, 1891-2, 1894-5, and 1899-1900. Higher results were obtained in only six years, 1886-7, 1887-8, 1890-1, 1891-2, 1894-5, and 1899-1900—the yield of 204,155 tons in 1891-2 being the greatest.

That potatoes should have given so splendid a return this year, when so many other crops failed, is due to the fact that the potato-growing districts are situated on the south side of the Dividing Range, where the drought was not so severely felt.

Although the area under hay in 1902-3, 580,884 acres, was Hay. the highest, with the exception of 1901-2, the average, 1·04 tons per acre, was the lowest since 1896. The yield was 601,272 tons. The land under maize and other crop used as green fodder was 30,720 acres.

The following is a return showing the area under each of these crops, and the gross and average produce during the last five years:—

Year.	AREA.				
	Wheat.	Oats.	Barley.	Potatoes.	Hay.
	Acres.	Acres.	Acres.	Acres.	Acres.
1898-9 ... ..	2,154,163	266,159	47,859	41,252	565,345
1899-00 ... ..	2,165,693	271,280	79,573	55,469	450,189
1900-1 ... ..	2,017,321	362,689	58,853	38,477	502,105
1901-2 ... ..	1,754,417	329,150	32,423	40,058	659,299
1902-3 ... ..	1,994,271	433,489	87,716	49,706	580,884

  

Year.	TOTAL YIELD.				
	Bushels.	Bushels.	Bushels.	Tons.	Tons.
1898-9 ... ..	19,581,304	5,523,419	1,112,567	161,142	723,299
1899-00 ... ..	15,237,948	6,116,046	1,466,088	173,381	596,193
1900-1 ... ..	17,847,321	9,582,332	1,215,478	123,126	677,757
1901-2 ... ..	12,127,382	6,724,900	693,851	125,474	884,369
1902-3 ... ..	2,569,364	4,402,982	561,144	168,759	601,272

  

Year.	AVERAGE YIELD PER ACRE.				
	Bushels.	Bushels.	Bushels.	Tons.	Tons.
1898-9 ... ..	9.09	20.75	23.25	3.91	1.28
1899-00 ... ..	7.04	22.55	18.42	3.13	1.32
1900-1 ... ..	8.85	26.42	20.65	3.20	1.35
1901-2 ... ..	6.91	20.43	21.40	3.13	1.34
1902-3 ... ..	1.29	10.16	14.88	3.40	1.04

In connexion with the export of wheat, information was collected in 1901 showing the prices realized for this grain in London from 1898 to 1901, the cost of its shipment by sailing vessels from the port of Melbourne to the United Kingdom, and the proportion per bushel of charges upon realizing. These are here given:—

#### MARK LANE PRICES OF VICTORIAN WHEAT, 1898 TO 1901.

Year.	Highest Price per Bushel.	Lowest Price per Bushel.	Average Price per Bushel.	Remarks.
1898 ... ..	6s. 4d.	3s. 4d.	4s. 5 $\frac{3}{4}$ d.	Abnormal price— Cuban War
1899 ... ..	3s. 8d.	3s. 3d.	3s. 4 $\frac{1}{2}$ d.	Normal
1900 ... ..	3s. 10d.	3s. 4d.	3s. 6 $\frac{1}{4}$ d.	„
1901 ... ..	3s. 8d.	3s. 4d.	3s. 5 $\frac{1}{4}$ d.	„

Area under principal crops.

Export of wheat.



**COST PER BUSHEL OF REALIZING ON VICTORIAN WHEAT BY SAILEP,  
FROM THE PORT OF MELBOURNE, IN THE UNITED KINGDOM.**

Year.	Rate of Freight per Ton by Sailer, with 5 per cent. Primage.	Rate of Insurance per £100.	Selling Commission per £100.	All Other Incidental Charges per £100.	Total Charges of Selling One Bushel of Wheat.	Net Return for One Bushel of Wheat.
1898 ...	21s.	22s. 6d.	50s.	22s.	9½d.	3s. 8½d.
1899 ...	26s. 3d.	20s.	50s.	22s.	10½d.	2s. 6¼d.
1900 ...	35s. 3d.	20s.	50s.	22s.	13¼d.	2s. 5d.
1901 ...	21s.	20s.	50s.	22s.	8¾d.	2s. 8½d.
Four Years' Average...					10¾d.	2s. 10d.

**PROPORTION OF CHARGES UPON REALIZING ON ONE BUSHEL  
OF WHEAT.**

Particulars.	1898.	1899.	1900.	1901.
	d.	d.	d.	d.
Freight per Bushel ...	6 75	8 43	11 33	6 75
Insurance " ...	0 6	0 39	0 42	0 41
Commission " ...	1 3	1 01	1 04	1 03
All other Charges " ...	0 6	0 42	0 47	0 45
Total Charges for realizing on One Bushel of Victorian Wheat in London }	9 25	10 25	13 26	8 64

Although the gain in weight on Victorian wheat shipped to the United Kingdom from Melbourne varies from one-half to one and three-fourths per cent., the average gain may be computed at one per cent. in weight. This is accounted for by the wheat being shipped from a dry to a humid climate. From the dryness of the Victorian wheat, the value in the London market is reckoned at about 4 per cent. above the average Mark Lane quotations for the wheat of other countries.

The occupations of persons settled on the land have heretofore been collected only in the census years. In 1891, the number engaged in agricultural pursuits was 82,482; in 1901, 95,920 persons. In the former year there were 15,296 persons engaged in pastoral and dairying pursuits, and 30,920 in 1901.

Occupations of persons settled on the land.

The number of persons ordinarily employed on agricultural and dairying farms was 109,325, viz., 70,319 males, and 39,006 females.

With the exception of 1895, the breadstuffs produced in the twenty-six years ended 1902 have been more than enough

Population and breadstuffs.

to supply home consumption. Wheat has, therefore, been exported each year, with the one exception. The maximum export was 10 2-3 million bushels in 1899. The following table shows, for 1898 and each subsequent year, the mean population of Victoria; the stocks of old wheat and flour on hand at the beginning of each year; the quantity of wheat grown; the quantity (after deducting imports) of wheat, flour, and biscuit exported; and the breadstuffs left over and available for home consumption. In addition to the quantity required for food consumption, a stock is required for seed purposes, equal, on an average, to three-quarters of a bushel per acre:—

Year.	Mean Population.	Stocks of Old Wheat and Flour on hand (1st January).	Wheat harvested for season ended March in each year.	Wheat, Flour, and Biscuit.	
				Exported, after deducting Imports.	Available for Home Consumption.
		Bushels.	Bushels.	Bushels.	Bushels.
1898 ...	1,172,950	330,224	10,580,217	1,855,951	9,054,490
1899 ...	1,186,265	1,282,902	19,581,304	10,662,011	10,202,195
1900 ...	1,193,338	2,121,700	15,237,948	7,011,242	10,348,406
1901 ...	1,202,960	1,872,000	17,847,321	10,248,093	9,471,228
1902 ...	1,207,110	1,525,288	12,127,382	3,899,246	9,753,424
1903 ...	1,205,335 (30th June).	903,616	2,569,364	(Not Available.)	(Not Available.)

Consumption of breadstuffs.

The manner in which the breadstuffs available for home consumption have been disposed of in each of the years under review is as follows:—

Year.	WHEAT AND FLOUR.				
	Quantity Available for Home Consumption.	How Disposed of—			
		Stocks on Hand on 31st December.	Required for Seed.	Used for Food, &c.	
			Total.	Per Head.	
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1898 ...	9,054,490	1,282,902	1,770,941	6,000,647	5.12
1899 ...	10,202,195	2,121,700	1,772,602	6,307,893	5.32
1900 ...	10,348,406	1,872,000	1,696,000	6,780,406	5.68
1901 ...	9,471,228	1,525,288	1,529,249	6,416,691	5.33
1902 ...	9,753,424	903,616	1,616,946	7,232,862	5.99

The following return shows the yield of the principal crops in the various Australian States and New Zealand for each of the five years ended March, 1903:—

Yield, Australian States and New Zealand.

Year Ended March.	Victoria.	New South Wales.	Queensland.	South Australia.	Western Australia.	Tasmania.	New Zealand.
<i>Wheat.</i>	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1899 ...	19,581,304	9,276,216	607,012	8,778,900	870,909	2,303,512	13,073,416
1900 ...	15,237,948	13,604,166	614,414	8,453,135	966,601	1,101,303	8,581,898
1901 ...	17,847,321	16,173,771	1,194,088	11,253,148	774,653	1,110,421	6,527,154
1902 ...	12,127,382	14,808,705	1,692,222	8,012,762	956,886	963,662	4,046,589
1903 ...	2,569,364	1,585,097	6,165	6,354,912	970,571	876,971	7,457,915
<i>Oats.</i>	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1899 ...	5,523,419	278,007	4,047	304,002	55,854	2,271,070	16,511,388
1900 ...	6,116,046	627,904	10,712	218,331	73,556	1,148,160	16,325,832
1901 ...	9,582,332	593,548	7,855	366,229	86,433	1,406,913	19,085,837
1902 ...	6,724,900	687,179	42,208	469,254	163,653	1,702,659	15,045,233
1903 ...	4,402,982	351,758	520	620,823	161,714	1,752,745	21,766,708
<i>Barley.</i>	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1899 ...	1,112,567	64,094	34,865	234,135	29,295	184,225	1,677,908
1900 ...	1,466,088	132,476	118,443	188,917	56,587	142,721	1,585,145
1901 ...	1,215,478	114,228	127,144	211,102	29,188	116,911	1,027,651
1902 ...	693,851	103,361	277,037	243,362	34,723	167,483	855,993
1903 ...	561,144	18,233	3,595	317,155	45,778	201,133	1,136,232
<i>Potatoes.</i>	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1899 ...	161,142	61,900	16,413	14,445	5,698	88,166	298,561
1900 ...	173,381	81,337	22,675	19,716	8,373	101,670	222,124
1901 ...	123,126	63,253	20,014	14,566	4,835	93,862	169,042
1902 ...	125,474	39,146	22,402	15,059	5,739	114,704	206,815
1903 ...	168,759	30,732	3,257	28,312	6,200	163,518	193,267
<i>Hay.</i>	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1899 ...	723,299	334,297	70,235	258,518	77,297	82,448	151,240
1900 ...	596,193	546,850	103,409	229,800	70,078	51,123	136,468
1901 ...	677,757	526,260	78,758	353,662	103,813	94,198	136,046*
1902 ...	884,369	472,621	122,039	346,467	89,729	88,125	125,968*
1903 ...	601,272	243,289	23,181	308,825	91,593	89,210	†

Of every 1,000 acres under cultivation during 1902-3, 533 acres were under wheat, 116 under oats, 10 under barley, 13 under potatoes, 156 under hay, and 172 under other crops and

Proportion of land under each crop.

land in fallow. The proportion of the land under each crop to the total area under tillage during the last five years, was:—

Year ended March—	Proportionate Area to Total Cultivated Land under:— (Exclusive of Area under artificial grass.)					
	Wheat.	Oats.	Barley.	Potatoes.	Hay.	Other Tillage.
1899	57.78	7.13	1.28	1.11	15.17	17.53
1900	59.05	7.39	2.17	1.51	12.27	17.61
1901	54.28	9.75	1.58	1.08	13.51	19.85
1902	48.09	9.02	.89	1.11	18.07	22.82
1903	53.34	11.59	1.01	1.33	15.54	17.19

Proportion of land under tillage.

For the years 1899-1903, the total area under cultivation, and its proportion to the area of the State, 56,245,760 acres, were:—

Year ended March—	Area under Tillage (exclusive of area under artificial grass).		Proportion to Area of Victoria.	
	Acres.		Per Cent.	
1899 ... ..	3,727,765		6.63	
1900 ... ..	3,668,556		6.52	
1901 ... ..	3,717,002		6.61	
1902 ... ..	3,647,459		6.48	
1903 ... ..	3,738,873		6.65	

Hops.

In 1883-4 there were 1,758 acres planted under hops, when the yield was 15,714 cwt. This is the highest on record. The industry, however, shows a steady decline since that time, and in 1902-3 there were only 44 growers of hops in the State, 210 acres cultivated, and the produce 1,572 cwt.

Tobacco.

The following is a return showing the number of growers of tobacco in the State; the area of land cultivated; and the produce for the five years, 1898-9 to 1902-3:—

Year.	Number of Growers.	Area.		Produce.	
		Acres.		Cwt.	
1898-9 ... ..	31	78		190 (dry).	
1899-1900 ... ..	28	155		1,365 "	
1900-1 ... ..	16	109		311 "	
1901-2 ... ..	17	103		345 "	
1902-3 ... ..	24	171		781 "	

For several years past, a parasitic fungus, locally called "blue mould," has caused serious damage to the tobacco crop, compelling many growers to abandon the industry. It is considered by experts that if this scourge were removed, and the

farmers instructed in the proper method of curing the leaf, a prosperous future would be in store for the industry, more especially as there are large tracts of land in the north-eastern and other parts of the State which are well suited for tobacco cultivation. The maximum quantity grown was in 1880-1, when 17,333 cwt. of dry leaf was produced. In the years 1895-6, 1896-7, and 1897-8 the produce was respectively 15,223 cwt., 7,890 cwt., and 3,419 cwt., but since 1898 the industry has shrunk very considerably, until in 1903, when the number of growers was only 24, the area cultivated 170 acres, and the produce 781 cwt.

The area under vines shows a steady increase from 4,284 Vines. acres in 1879-80 to 30,307 in 1894-5. In 1900-1, the area under vines was 30,634 acres, but in the last two years a decline is shown. The check in the development of this industry was caused by the outbreak of the phylloxera disease. The result of five years' operations is as follows:—

Year.	Number of Growers.	Area.	Produce.			
			Grapes Gathered.	Wine Made.	Raisins Made.	Currants Made.
			Cwt.	Galls.	Cwt.	Cwt.
1898-9	2,453	27,568	468,887	1,882,209	17,979	1,033
1899-0	2,382	27,550	298,920	933,282	17,847	3,315
1900-1	2,486	30,634	631,912	2,578,187	29,370	3,715
1901-2	2,469	28,592	497,269	1,981,475	27,533	2,546
1902-3	2,347	28,374	444,966	1,547,188	35,534	3,722

The grapes gathered steadily increased in quantity up to the year 1896-7, when the crop was 601,053 cwt. In the three following years a decline took place, but in 1900-1 the return was 631,912 cwt. A falling off again occurred in the two last years, when the yields of grapes were respectively 497,269 and 444,966 cwt. The largest quantity of wine produced was in 1896-7, when 2,822,263 gallons were made. The making of raisins and currants, although dependent upon the crop of grapes, continues to make steady progress, the produce last season being the largest recorded.

The wine industry received a temporary check some years since, in consequence of an outbreak of the disease called phylloxera vastatrix,\* which was then found to be confined to one district in the State (Geelong), where it was promptly stamped out by the eradication of all vines for a distance ranging from 20 to 30 miles from the centre of that district. The disease has unfortunately obtained a footing in other parts of the State, with the result that many valuable vineyards have, in terms of the "Vine Disease Act," been destroyed,

\* An account of the visitation of the phylloxera in Victoria, and of the measures taken for its suppression, will be found in the "Victorian Year-Book, 1888-9."

and for which compensation has been paid by Government amounting to £36,794. Payment of compensation has now been abolished. Experimental stations have been established in various parts of the State to test the adaptability of phylloxera resistant stocks to our soils and climatic conditions, as well as to discover their grafting affinities. These data will be of immense value in the reconstitution of vineyards in the near future. Large quantities of these vines have already been distributed amongst vignerons of the State. In older viticultural countries, reconstitution with resistant vines has apparently proved the only solution of the phylloxera difficulty.

The area under orchards growing fruit for sale increased steadily from 5,800 acres in 1872-3, 10,048 in 1882-3, 31,370 in 1892-3, to 44,502 acres in 1902-3. The area in 1901-2 was the largest, with 45,885 acres. Details of the produce from orchards growing fruit for sale are as follow:—

Orchards  
growing  
fruit for  
sale.

Year.	Number of Fruitgrowers.	Area Under Gardens and Orchards.	LARGE FRUITS GATHERED.			
			Apples.	Pears.	Quinces.	Plums.
		Acres.	Cwt.	Cwt.	Cwt.	Cwt.
1898-9 ...	4,868	37,033	199,265	47,634	25,630	49,788
1899-00 ...	5,208	40,714	217,128	39,571	19,383	51,019
1900-1 ...	5,400	44,688	279,193	89,780	25,574	64,675
1901-2 ...	5,693	45,885	203,914	42,408	22,909	75,484
1902-3 ...	5,301	44,502	282,454	88,582	32,733	57,792

  

Year.	LARGE FRUITS GATHERED.—Continued.						
	Cherries.	Peaches.	Apricots.	Oranges.	Lemons.	Figs.	Others.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.
1898-9 ...	30,096	58,992	70,433	7,796	15,456	7,267	4,032
1899-00 ...	25,042	81,395	70,022	10,658	12,433	6,589	2,437
1900-1 ...	35,636	54,614	77,590	12,948	19,633	7,403	3,373
1901-2 ...	37,963	96,463	79,427	20,945	22,038	6,153	3,226
1902-3 ...	34,781	58,837	57,118	8,082	15,421	6,519	2,734

  

Year.	SMALL FRUITS GATHERED.					NUTS GATHERED.			
	Rasp- berries.	Straw- berries.	Goose- berries.	Currants. (Red, Black and White).	Others.	Al- monds.	Wal- nuts.	Fil- berts.	Chest- nuts.
	Cwt.	Cwt.	Cwt.	Cwt.	Cwt.	Lbs.	Lbs.	Lbs.	Lbs.
1898-9 ...	9,892	1,889	6,541	845	1,001	67,164	17,694	2,987	4,392
1899-00 ...	12,831	3,109	7,832	1,078	1,423	90,025	10,432	3,698	6,670
1900-1 ...	20,396	4,246	12,431	1,794	882	66,837	25,294	6,818	6,469
1901-2 ...	13,610	4,435	10,436	1,383	968	72,528	18,435	3,469	6,990
1902-3 ...	20,185	3,101	11,573	1,456	1,126	41,551	19,378	3,437	8,262



In addition, large quantities of melons, rhubarb, and tomatoes were produced in orchards, and the following were the quantities returned for 1902-3:—Melons, 14,786 cwt.; rhubarb, 65,786 doz. bundles; and tomatoes, 23,079 cwt.

The area under market gardens for the year 1902-3 was 7,937 acres. In view of the fact that these gardens are generally situated near large centres of population, and the producers are consequently able to dispose of the bulk of their goods with a minimum of loss from waste, &c., an average return of £25 per acre is regarded as a fair estimate. On this basis, the total value of the produce may be stated as close upon £200,000. This does not include crops grown upon land of greater area than one acre, such crops being returned separately. Market gardens.

In addition, there are 5,976 acres laid down in private fruit gardens. No return of the produce of this area is made. Private orchards.

The quantity of dried fruit (weight after drying) was for the first time collected in 1895-6, when 179,460 lbs. were returned, and it increased to 305,857 lbs. in 1897-8. The details for the last five seasons are:— Dried fruit.

Season.	Apples.	Prunes.	Peaches.	Apricots.	Figs.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1898-9 ...	6,289	8,026	59,222	275,026	39,175	387,738
1899-00 ...	11,876	12,595	133,680	290,224	101,948	550,323
1900-1 ...	28,944	35,931	97,254	411,526	62,639	636,294
1901-2 ...	42,218	33,789	90,328	328,599	66,472	561,406
1902-3 ...	27,113	28,996	70,759	110,666	69,069	306,603

The quantity of apples returned in 1902-3 includes 8,935 lbs. of pears, and the quantity of peaches includes 1,575 lbs. of nectarines. Of the total quantity gathered, 96 per cent. in 1898-9, 92 per cent. in 1899-00, 86 per cent. in 1900-1, 77 per cent. in 1901-2, and 87 per cent. in 1902-3, was dried at Mildura.

#### ECONOMIC ENTOMOLOGY.

BY C. FRENCH, F.L.S., F.R.H.S., GOVERNMENT ENTOMOLOGIST.

In the year 1889 the Government of the day, the Hon. J. L. Dow being then Minister of Agriculture, decided to follow the American system and appoint an entomologist to take charge of a new branch of the Department of Agriculture, and I had the honour to be selected from many other applicants both from Australia and from foreign parts. It was decided to term the new office "the Entomological and Ornithological Branch of the Department," and as there was no building

available, some offices were rented from the Exhibition Trustees, and inside these walls may be said to have been made the first systematic attempt to deal with the various insect and bird pests of the State, the nucleus of the library and collections having been lent by me until such time as a departmental collection could be got together.

As times progressed, and after much trouble had been experienced by careful growers, a Vegetation Diseases Act was, in 1896, brought into force, and inspectors appointed to supervise the orchards through the State, and also to advise growers as to the best methods to be employed in combating the pests in the orchards and elsewhere, and, as showing the strides made, it may be mentioned that in 1889 there was but one small spray pump in the State, and I had to journey to South Australia to purchase a small hand spray pump for the use of the branch. Spraying materials can now be obtained from many makers, and large sums have been spent by orchardists and others in their purchase.

The discovery by Professor Coquillet, of America, that cyanide gas could be successfully used against scale on citrus trees especially, has revolutionized former treatment for insect pests generally, and in some instances this treatment has largely superseded the spraying. The department has a complete plant of this material working here and there, and as circumstances require, it is used in various parts of the State.

One great advantage of the "Vegetation Diseases Act" is that its provisions compel the careless grower to take reasonable precautions to keep his orchard free from pests, as the presence of the latter is always a menace to the careful man who does his best to present his fruit wares in a sound condition to the purchasing public. We have had many prosecutions, but so far there has been comparatively little, if any, friction between the department and the grower, the object of the Government being to educate, and advise growers as to the necessity of marketing sound fruit.

The inspection of all nursery stock has been the means of compelling many of the more careless nurserymen to send out none other than clean trees, the certificate being withheld if the nursery will not pass muster; this is a great boon to orchardists, as once a pest is introduced on a tree or other plant the chances of its permanent introduction and establishment in the orchard are great, far more so than by means of fruit, no matter from whence it came.

The fruit imports and exports are of late years assuming large proportions, and three inspectors are permanently engaged in attending to this work, all citrus fruits from New

South Wales now having to be fumigated at the port of shipment. Those terrible pests, the "fruit flies," have fortunately not so far made their appearance in Victoria. We use every care and precaution in the inspection and examination of oranges, peaches, and bananas, as these are the chief fruits by which the fruit fly may be introduced, whilst in the larval stages, and we hope that by this means we may escape a visitation of the pest. All suspected fruit is rejected, and is either destroyed or towed outside Port Phillip Heads and thrown overboard.

Experiments, with the view of assisting growers to deal with their insect pests, are constantly being made, the latest being with the codlin moth trouble, and we have proved to the satisfaction, alike of ourselves and the growers, that by following out our advice, which plan is both cheap and effective, growers can save from ninety to ninety-five per cent. of marketable fruit, and as a consequence of this teaching, spraying work may be seen regularly going on in every well-regulated orchard throughout the State.

The economic collection of insects and birds is both large and valuable, and each of the latter are probably more extensive than anything of the kind in Australia. The great value of an economic collection is to the entomologist what the museum is to the pathologist, and is of course indispensable.

The publication of important literature bearing on the work of the branch has been kept well up to date; three volumes of text with beautifully coloured plates have been issued, and met with a large and ready sale; Vols. I. and II., of which 8,000 copies were issued, having been nearly sold out. Pamphlets, too, have been circulated far and wide with good results, the latest publications on the subject being embodied in the "Journal of Agriculture," published by the department, and contributed to by various officers of the department and others.

Lectures have been delivered by the inspectors and myself in various parts of the State, and have been well attended and greatly appreciated, this being a direct and convenient method of imparting, in a plain and easily understood manner, information on the subject generally.

Field work, owing to pressure of other matters, has not had the attention which so important a subject deserves, still between myself and my assistant much good work in this direction has been done. I am glad to be able to say that friendly correspondence is still kept up between entomologists

in the States, also in other parts of the world, and myself, and with, I trust, mutual advantage.

As my annual reports, together with figures, &c., of imports and exports of fruit, plants, &c., &c., have just been finished, I will not take up more space, but would like to say, in conclusion, that we endeavour to be up to date, and as the various exchanges of books and ideas are constantly going on, it must follow that the work of the past, no matter how good it may have been, must if possible be improved, in accordance with all new thoughts and writings on the subject.

Ensilage.

The quantity of ensilage made has seriously declined during the past five years. In 1898-9, ensilage was returned as having been made on 224 farms, using 8,764 tons of material; in 1899-1900, on 139 farms, using 9,116 tons; in 1900-1, on 131 farms, using 5,834 tons; in 1901-2, on 125 farms, using 5,065 tons; and in 1902-3, on 111 farms, using 4,703 tons. This means of preserving food for stock in dry seasons is very important. A substantial recovery and extension of this most useful and necessary adjunct of the farming and dairying industries is earnestly to be hoped for.

Manure.

The quantity of manure used for fertilization has, in the last five years, considerably increased. In 1898, 7,318 farmers used 143,586 tons of natural, and 16,052 tons of artificial manure, on 225,830 acres of land; in 1901, 11,439 farmers used 153,611 tons of natural, and 23,535 tons of artificial manure, on 556,777 acres; whilst in 1902, the increase was still greater, 18,537 farmers using 206,676 tons of natural, and 36,630 tons of artificial manure, on 1,099,686 acres.

Bee-keeping.

The returns for 1902-3 show that there were 4,402 beekeepers, owning 15,532 frame and 16,594 box hives, and producing 911,691 and 287,640 lbs. of honey respectively, and 23,061 lbs. of beeswax.

The number of bee hives has increased from 17,729 in 1900-1, to 32,126 in 1902-3.

In 1891-2, the quantity of honey returned was 1,128,283 lbs. After a decline in the next two years, the quantity gathered in 1894-5 was 1,323,982 lbs. A further falling off is recorded from that year to only 195,163 lbs. in 1897-8. A fair recovery has since been made, the return for 1902-3, the third largest, indicating that the industry is now making good progress.

Prices of agricultural produce.

This information is procured by the collectors, when making their annual visits, in January, February, and March. The prices are those prevailing in the localities where the

crops are grown. The following is the average price for each of the last five years:—

Year.	Average Price in February and March.													
	Wheat.		Oats.		Barley.				Maize.		Hay.		Potatoes.	
	s.	d.	s.	d.	Malting.		Other.		s.	d.	s.	d.	s.	d.
1899 ...	2	2	1	7 $\frac{3}{4}$	4	2 $\frac{1}{2}$	2	2 $\frac{1}{4}$	2	11 $\frac{1}{2}$	34	5	73	0
1900 ...	2	5	2	1	3	2 $\frac{1}{2}$	2	3 $\frac{1}{4}$	2	4 $\frac{1}{4}$	40	9	41	11
1901 ...	2	5 $\frac{3}{4}$	1	6 $\frac{1}{2}$	2	10 $\frac{3}{4}$	1	11 $\frac{1}{4}$	2	8	39	4	73	11
1902 ...	2	10 $\frac{1}{4}$	2	4	3	9 $\frac{1}{4}$	2	9 $\frac{1}{4}$	2	10 $\frac{1}{2}$	55	5	77	7
1903 ...	6	0	3	2 $\frac{3}{4}$	4	5 $\frac{3}{4}$	3	8	5	1 $\frac{3}{4}$	100	1	91	3

Of the total farmers (43,768) in the State in 1902-3, 36,000 were interested in the dairying industry, of whom 2,909 were engaged exclusively in dairying. Each of the 36,000 dairy farmers had on an average 14 cows, 6 calves, and 4 pigs, and obtained 3,884 gallons of milk—an average of 273·9 gallons per cow. One farmer in every five had a cream separator.

The average yield per cow steadily increased from 236 gallons in 1895-6 to 335 gallons in 1900-1, but it fell to 322·3 gallons in 1901-2, and to 273·9 gallons in 1902-3—a result in all probability due to droughts.

The total yield in 1902 was 30 per cent. larger than in 1898-9, but 13 per cent. smaller than in 1900-1, when the maximum yield was attained.

The following are the particulars respecting dairy farms Dairy farms. in each of the last five years:—

Year.	Number of Cow-keepers.	Number of—			Milk Yield in Last Calendar Year.		Number of Cream Separators in use.
		Dairy Cows (wet and dry).	Calves Under 12 Months.	Pigs.	Average per Cow (wet and dry).	Total Quantity (000's omitted).	
1898-9 ...	29,633	357,078	179,207	143,666	Gallons. 301·0	Gallons. 107,535,	2,799
1899-00 ...	31,132	465,469	243,593	227,309	316 6	147,367,	3,446
1900-1 ...	30,787	472 940	257,429	234,572	335·5	158,677,	4,131
1901-2 ...	33,070	483,650	264,434	173,553	322·3	155,880,	5,626
1902-3 ...	36,000	510,546	233,110	147,029	273·9	139,838,	7,308



The numbers of horses, cattle, sheep, and pigs in the various Australian States and New Zealand, according to the latest returns, are:—

—	Horses.	Cattle.		Sheep.	Pigs.
		Milch Cows.	Other.		
Victoria ... ..	392,237	521,612	1,080,772	10,841,790	350,370
New South Wales ... ..	450,125	351,287	1,389,939	26,649,424	193,097
Queensland ... ..	399,122	2,543,471		7,213,985	77,202
South Australia ... ..	164,625	75,011	138,332	4,880,540	82,777
"    Northern Territory	14,788	627	303,193	42,122	1,014
Western Australia ... ..	80,114	437,588		2,697,897	52,765
Tasmania ... ..	33,465	33,316	135,069	1,679,518	52,092
New Zealand ... ..	286,955	428,773	1,031,890	20,342,727	193,740

It has not been the practice in Victoria to collect the numbers of the live stock, except in those years in which the census was taken; and the figures now supplied are those returned at the census of 1901. In the new agricultural and pastoral schedule, which will be brought into use for the collection of the 1903-4 statistics, provision is made for this collection annually.

#### GENERAL REMARKS ON LIVE STOCK OF VICTORIA.

BY JOHN R. WEIR, ESQ., CHIEF INSPECTOR OF STOCK.

In by far the major portion of this State, the outlook for stock generally at the opening of the present year was gloomy, and would have been much worse had it not been for Gippsland and the Western Districts affording sustenance for several months to the stock from not only the dry portions of this State, but to well nigh 2,000,000 sheep and 50,000 cattle and horses from the southern portions of Riverina. In fact, it may be safely asserted that 75 per cent. of the Riverina flocks and herds were introduced into Victoria during the period which elapsed between August of last year and March of the present. Then came rains in New South Wales, and the stock was conveyed back by train to the border crossings for export once more. Our own dry areas received fresh life from showers which fell in the autumn, and the apparently grassless and wind-swept lands soon were clothed with a plentiful supply of grass. The losses which had been going on through the past dry seasons had in many cases reduced the stock on holdings so much that but few are left to participate in the renewed life the herbage seems to have gained, the result being that what has been left on such holdings will this year have a chance to recuperate.



The continuous drain upon the horse market during the Boer war, while it brought big prices to the sellers, has served to deplete this State of a large number of horses. In the case of geldings this was not a matter of much moment, but with mares the case was different, as so large a number of useful animals was taken away, that it will be many years before there will be sufficient of the right stamp from which to breed. To the numbers that were taken away for military purposes for South Africa, must be added also the higher class mares that are yearly sent to India for remount purposes. When it is remembered that there are not nearly so many persons now engaged in horse breeding as in former years, and that even with careful selection of sire and dam the progeny is not always to be depended on to turn out up to the expectations of the breeder, it is clearly evident that horses of a good class must command a high figure for several years to come. Many of our most fashionable sires that would mate with a fair mare are also purchased and taken out of, not only the State, but the Commonwealth.

Light horses

Draught horses are not bred in such numbers as they were some years ago, and while the quality of this class of stock has improved within the past decade, the price has likewise advanced in proportion. Large numbers of our nuggety draughts, both colts and fillies, are shipped yearly to Western Australia, and recently some fine animals have been exported to New Zealand.

Draught horses

The horses from the Wimmera district are held in high repute by West Australian buyers, and deservedly so, as some magnificent specimens of wiry useful animals, accustomed to shifty herbage, and endowed with plenty of vigour, are bred on our western limestone plains.

With the advent of the factory system of dairying, and the cutting up of the large estates, the breeds of cattle in this State have undergone great changes during the past twenty years.

Dairy cattle

Our old-time breeds of Shorthorn and Hereford, with an occasional mob of Polled Angus, have to a great extent been supplanted by the Ayrshire, Jersey, and other dairying breeds, or crosses from one or other of the dairying types with the Shorthorn, and recent importations of milking strains of Shorthorns have been made by several gentlemen in the State.

In Jerseys, the Messrs. Chirnside have recently introduced some splendid specimens of this famous dairy breed. The introduction of high-class animals, noted at once, not only for their milk-producing qualities, but at the same time for the amount of butter fat contained in such milk, must have a

beneficial effect on the dairying breeds taken as a whole. With the limited areas now at the disposal of the diaryman, only animals which will give the best returns are suited to his requirements, and he finds the cow which gives but a poor return is just as hard to keep as that which gives a good profit on the food she consumes. This means the keeping possibly of fewer animals, and at the same time ensures better treatment for those kept, in the shape of accommodation from the winter's cold, and providing food capable of maintaining the milk supply when the natural pastures fail. Furthermore, the system of payment by results adopted by the butter factories induces a spirit of healthy rivalry among suppliers thereto, to produce milk containing a high percentage of butter fat. While it is not in any sense aimed to assert the superiority of one type of cattle over another, for the purpose of milk producing, it is well to point out that in every breed of cattle kept there has been a marked improvement in our dairy herds, unprofitable strains have been culled out, and the class of animals now kept, while, perhaps, not yet perfect, are well suited to a country which, like Victoria, has such widely varying climatic conditions. In addition to the previously mentioned breeds, chiefly used for dairying purposes, there are a few small herds of Kerry, Dexter Kerry, Devon, Friesian, and Holstein Friesian, but these are small in number and in the hands of a few proprietors.

As previously stated, the large estates, having been cut up and subdivided for dairying purposes, the rearing of cattle suited only for their beef-producing qualities has received a check. Where formerly pastures were devoted solely to fattening for the owner, under the present conditions many families are earning comfortable livelihoods dairying, and while not so many fat cattle are turned off these lands, and the quality of such as are sold as fat is not as good as formerly, the national wealth has been augmented by the increased riches obtained from the land. This is notably the case in the Western District, where, in past years, large numbers of high-class shorthorn and Hereford bullocks were fattened. Though some of the large landed proprietors still use their estates for fattening in various parts of the State, and splendid animals are sent from them, the tendency to rear animals adapted solely for beef producing is declining—the reason being that the land is too valuable to be used for fattening purposes only. The result is that the greater proportion of the cattle sold as fats now are of a nondescript class, and the preponderance of old cows to be found in our markets is very noticeable.

The heavy-weight bullocks, common enough in years past, are the exception now, and in their place lighter animals are

to be found, which, while prime enough in quality, would never attain a heavy weight. High prices for fat stock have ruled during the past two years, and these prices must continue; as, while there may not be a great disparity in the numbers offered for sale, the gross weight of meat offered is much less. Our export trade relieves any slight surplus which, under other circumstances, would accumulate and lower the price of fat stock.

The sheep breeders in this State may fairly claim to have kept abreast of those in any portion of the Commonwealth or of the world by the care and discrimination with which they have mated their flocks. Steadily, and with fixed purpose, they have striven to produce a higher class of animal, whether for fleece or carcase. The principal breeds in Victoria are the merino, crossbreeds of Lincoln, and Leicester, and Shropshire, with a few small lots of Southdown, Romney Marsh, and Hampshire. Sheep.

Judging the merino of to-day by his prototype of a quarter of a century back, one is sensibly astounded by the great change in the animals. That such a change could be brought about by judicious selection seems almost incredible, but by being constantly united with fresh strains possessing in a more or less marked degree the qualities which the various flock-masters thought would produce animals of a type suited to their requirements, that is, by increasing not only the weight and density of fleece with fineness of combing and fulness of staple, they have at the same time bred an animal with greater weight of carcase, without impairing its juicy qualities.

The Victorian merino seen on some of our noted breeders' estates is an animal of which their owners may justly feel proud. The crossbreeds before mentioned have many admirers, being not so timid as the merino, and consequently better adapted for lands close to towns or roads where there is great traffic.

Within the past few years large numbers of Shropshires from some of the best strains in the United Kingdom have been introduced, with a view to the breeding of lambs suitable for export. This strain is crossed generally with one of the other breeds, and the result is a lamb which grows rapidly, is hardy, and highly valued by exporters in the frozen meat trade.

Prices for pigs of all classes have, during the past year, been exceptionally high. In the early part of the year the failure of the milk supply, owing to the drought, in all the north and north-eastern areas, precluded breeders from keeping Swine.

up their usual numbers, and in many instances the breeding sows were fattened off and sold. In consequence of this, feeders were unable to keep up their ordinary number through no stores being available. Following this, the disease known as contagious pneumonia, hog cholera, pig typhoid, or swine fever, assumed an epidemic form, causing the deaths of a great number of suckers, slips, and well-grown stores. It is to be noted in passing that all the eastern States were attacked almost simultaneously by this form of disease, and later South and Western Australia also. That this contributed in a slight degree to the continued high prices there is but little doubt, as owing to necessary restrictions the movement of store pigs was checked to a very great extent, for a considerable time.

The breeds most favoured in this State are Berkshire and Yorkshire, or a cross between the two.

Within the past few years the quality of the pigs kept on farms has sensibly improved, and breeders of this animal have not been slow to improve the type kept by them. The Tamworth has its fanciers, and Mr. Chirnside, whose strains of this particular breed are noted throughout the Commonwealth, has recently added three fine specimens of this class to his herd at Werribee. Happily there seems every prospect of the trouble mentioned among swine subsiding in the State, and as they are such prolific breeders, their numbers will, it is to be hoped, be in a year or two again on a par with requirements. In the meantime, high prices will rule, and breeder and fatterer alike will reap the benefit of the shortage in numbers.

Summary.

At present the outlook for stock owners is bright, on account of abundance of feed for all classes of stock, and the high prices ruling for anything fit for disposal. In horses, India and Java (the former for light animals of the better class, and the latter inferior ones) are the principal markets coveted by exporters, while Tasmania, New Zealand, and West Australia absorb the surplus draughts. Butter commands profitable prices for the exporter, as also does frozen meat, and this serves to keep down the quantity of fat stuff on the local market, and regulates prices to a great extent for beef and mutton, as when a surplus is threatened, the carcasses, instead of being boiled down, as was formerly the case, are now exported in a frozen state, thus benefiting the consumers who patronise this class of meat, by supplying them with a good article at a reasonable rate, and at the same time acting as a potent agent in keeping up fair prices, at all times, for fat meat locally.

Hides of a proper class command good prices, and the wool market is opening well, with every prospect of being well

sustained throughout the sales, good shafty merino especially evoking spirited competition from both English and continental buyers.

The crop of wool will certainly be lighter on account of the hardness of the season, and the privations endured by the sheep, to say nothing of the losses sustained through deaths, but this will be balanced in some degree by the higher rates obtained for what is placed upon the market.

#### GENERAL REMARKS ON DISEASES PREVAILING IN THE LIVE STOCK OF VICTORIA.

BY A. A. BROWN, ESQ., M.B., B.S., INSPECTOR OF FOOD FOR EXPORT,  
DEPARTMENT OF AGRICULTURE.

Horses are particularly free from malignant infectious disorders. Glanders and farcy do not prevail anywhere in Australia. Pneumonia and strangles are the principal infectious disorders to which they are subject. Tuberculosis does not have a place in the category of Victorian horse-diseases. Stringhalt, a condition concerning which no definite pathological knowledge at present exists, is prevalent in many districts. Horses.

The common parasitic diseases of our horses are:—  
(1) Bots—The larvae of the gad fly (*Gasterophilus Equi*) inhabit the stomach, and another variety (*Gasterophilus Haem* or *Loidalis*) inhabit the rectum. (2) Round worms—The *Spiroptera Megastoma* produces tumours in the stomach of the horse. The *Strongylus Armatus* is found in the mature state in cysts in the intestines, and in an immature state in aneurisms of arteries of the abdominal cavity, particularly the anterior mesenteric. A large round worm (*Ascaris megaloccephala*), and a small thread worm (*Oxyuris curvula*), inhabit the intestines. (3) A tape worm (*Taenia Perfoliata*) is frequently observed.

The infectious diseases observed in our cattle are Tuberculosis, Actinomycosis, Anthrax, Symptomatic Anthrax (black-quarter), and Pleuro-Pneumonia. Cattle and swine.

Rinderpest, Eczema. Epizootica (foot and mouth disease), Texas Fever, or tick fever (a disease dependent upon a malarial organism), *Pyrosomnum Bigeminum*, and introduced into the blood of cattle by the cattle tick (*Ixodes Bovis*), do not exist in the State.

Tuberculosis does not prevail to any great extent in our cattle. Not more than 6 per cent. suffer from tubercle. Mr. Robertson, the superintendent of the City of Melbourne abattoirs, who has had vast facilities for observing the disease



in cattle brought for slaughter, maintains that not more than 4 per cent. are tuberculous. Of the affected animals not more than 1 per cent. are condemned as unfit for food.

In oxen and swine the disease has a tendency, from mildness of climate, if the animals are properly fed and sheltered, to undergo spontaneous cure. The cattle practically live constantly in the open, and this continuous existence in the open is conducive to health and to the cure of the disease. Tubercle is extremely rare in calves. It occurs in pigs, but not more than 2 per cent. are affected. It prevails to a limited extent in poultry—the birds contracting the disease from their surroundings, and, in every case observed, the cause has been assigned to the ingestion of infective material.

Parasitic diseases are rare in Victorian cattle. The stomach fluke (*Amphistoma conicum*), and liver fluke (*Distomum Hepaticum*), are occasionally seen. Measles (*Cysticercus Bovis*), the hydatid stage of the *Taenia Mediocanellata* (a large tape worm in man), and warbles, caused by the *Hypoderma Bovis*, or ox gad fly, do not exist in our herds.

Sheep.

The infectious diseases prevailing are Multiple Abscess, or Pseudo-tuberculosis, Malignant Oedema, Foot-rot, Tetanus, and Anthrax. Tuberculosis does not occur in our sheep.

The parasitic diseases are fluke (*Distoma Hepaticum D. Lanceolatum*), stomach worms (*Strongylus Contortus*), lung worms (*Strongylus Rufescens* or *Filaria*), and tape worm (*Taenia Expansa*). Scab (*Dermatodectes ovis*) and sheep gad fly (*Oestrus ovis*) do not exist.

Swine.

Swine Fever, Tuberculosis, and Actinomycosis, are the contagious diseases in our swine. As regards parasitic diseases hydatids (*Echinococcus Veterinorum*) are occasionally seen. Trichinosis (*Trichina Spiralis*) and measles (*Cysticercus Cellulosae*), the hydatid stage of the tape worm *Taenia solium* of man, do not exist here.

Dogs.

Rabies (*Hydrophobia*) does not exist in Victoria. Distemper is the chief infectious disorder prevailing. Worms (round and tape varieties) are common parasites.

Poultry.

Tuberculosis, Roup, Avian Diphtheria, and Fowl Cholera are the infectious disorders.

The common parasitic diseases are hen mite (*Dermanyssus Avium*) round worms (*Ascaris Inflexa*), and tape worms (*Taenia Proglottina* and *T. Infundibuliformis*).

Fowl tick (*Argas Americanus*) prevails in limited areas.



There are no infectious diseases prevailing in goats in Goat Victoria.

The return of the stock slaughtered, which is furnished by the municipal authorities, has not hitherto been complete, as some municipalities failed to furnish an estimate of the number slaughtered privately on farms and stations. The numbers returned by the municipalities for the last five years are:—

Year.	Numbers Slaughtered.		
	Sheep and Lambs.	Cattle and Calves.	Pigs.
1898 ... ..	2,352,694	244,319	164,505
1899 ... ..	2,557,858	249,177	193,095
1900 ... ..	2,371,415	248,797	231,752
1901 ... ..	2,469,797	251,477	261,479
1902 ... ..	2,827,938	233,206	224,431

The purposes for which the carcasses of the slaughtered animals were used were:—

Year.	For Butcher and Private Use.			For Freezing.			For Preserving and Salting.			For Boiling Down.		
	Sheep.	Cattle.	Pigs.	Sheep.	Cattle	Pigs.	Sheep.	Cattle	Pigs.	Sheep.	Cattle	Pigs.
1898 .. ..	2,102,654	243,213	77,596	215,639	141	1,020	22,520	588	85,884	11,881	377	5
1899 .. ..	2,035,706	246,534	88,254	475,579	2,418	450	26,200	..	103,831	20,373	225	560
1900 .. ..	1,921,284	244,571	119,137	437,332	3,808	..	9,181	115	112,604	3,618	303	11
1901 .. ..	2,106,863	249,079	134,276	431,740	980	..	10,087	937	127,145	11,107	481	58
1902 .. ..	2,337,262	229,728	106,390	378,029	2,293	..	13,211	485	117,984	99,436	700	67

Active operations for the destruction of rabbits on Crown lands were first undertaken by the Government in 1880, and from that date to the middle of 1902 sums amounting to £398,181 had been expended with that object. The following are the amounts spent in each year:—

£			£		
1879-80	...	1,280	1891-2	...	39,535
1880-81	...	2,600	1892-3	...	30,595
1881-2	...	12,890	1893-4	...	12,514
1882-3	...	9,883	1894-5	...	8,909
1883-4	...	10,063	1895-6	...	11,831
1884-5	...	22,177	1896-7	...	13,425
1885-6	...	24,833	1897-8	...	14,303
1886-7	...	21,065	1898-9	...	14,753
1887-8	...	20,551	1899-00	...	14,480
1888-9	...	17,621	1900-01	...	15,300
1889-90	...	24,860	1901-2	...	16,800
1890-91	...	37,913			

Rabbit extermination.

The whole of the State, with the exception of portions of Gippsland, is more or less infested with rabbits and other vermin. In addition to the expenditure of £398,181, referred to above, a loan of £150,000 was allocated to shires in 1890 for the purchase of wire netting to advance to landholders, repayable in ten years, and in 1896 a loan of £50,000 was advanced on similar terms, except that 3 per cent. interest was added. The expenditure for 1901-2 was £16,800, portion of which represented the salaries of 28 rabbit inspectors.

Rabbits and wildfowl sent to market in Melbourne.

The number of couples of rabbits and brace of wildfowl received at the Melbourne fish market, the number sold, and the number condemned, during the last five years, were as follow:—

Year.	Number of Couples of Rabbits.			Brace of Teal and Duck.		
	Sold.	Condemned.	Total.	Sold.	Condemned.	Total.
1897-8 ... ..	373,452	23,209	396,661	35,372	209	35,581
1898-9 ... ..	324,598	4,350	328,948	39,902	490	40,392
1900 ... ..	480,519	5,727	486,246	35,610	728	36,338
1901 ... ..	596,610	2,717	599,327	59,156	930	60,086
1902 ... ..	471,964	4,472	476,436	32,756	232	32,988

In 1902 there were also received at the Melbourne market 2,401 brace of hares—of which 37 brace were condemned, and the others sold. In addition, the following passed through the Melbourne Council's refrigerating works during the twelve months ended 31st December, 1902, for export only:—2,085,520 pairs of rabbits, 5,416 brace of hares, and 1,183 brace of game.

Wool production—Victoria.

The total production of wool, being the quantity made up in manufacturing in the State, and that returned by the Customs Department as having been exported, is given for the years 1898-1902. The quantity and value of wool imported and exported, and the quantity and value of that used for home consumption, are also shown:—

Year.	Wool Imported.		Wool Exported.		Wool Used in Manufacture in the State.			Wool Production—Greasy and Scoured.	
	Quantity.	Value.	Quantity.	Value.	Quantity.	Rate per lb.	Value.	Quantity.	Value.
	lbs.	£	lbs.	£	lbs.	s. d.	£	lbs.	£
1898 ..	65,626,395	1,808,492	131,850,560	4,036,968	2,685,803	0 9	100,717	68,909,968	2,329,193
1899 ..	63,067,135	2,351,059	121,877,604	5,701,410	2,867,884	1 0	143,394	61,678,353	3,493,745
1900 ..	62,527,987	1,927,677	102,205,965	4,217,018	3,045,292	0 6	76,132	42,723,270	2,365,163
1901 ..	61,796,450	1,840,066	131,623,062	4,350,285	3,408,526	0 6	85,213	73,235,138	2,595,432
1902 ...	38,008,765	1,141,715	100,516,094	3,473,372	3,473,835	0 8	115,794	65,981,164	2,447,451

The quantity and value of wool produced in 1902 in the various Australian States and New Zealand, estimated on the same principle, were:—

Wool pro-  
duction—  
Australasia

	Quantity.		Value.
	(Greasy, Washed, and Scoured.)		
	lbs.	£	
Victoria ...	65,981,164	2,447,451	
New South Wales ...	188,277,477	7,341,072	
Queensland ...	29,655,078	1,304,200	
South Australia ...	34,566,500	1,075,395	
Western Australia ...	12,932,271	458,078	
Tasmania ...	9,512,564	301,051	
New Zealand ...	161,113,523	3,377,713	



Bonuses for the promotion of the agricultural, dairying, and other industries were provided by the Government, and, up to the end of June, 1898, the sum of £313,370 had been expended out of the general revenue, as shown in a previous portion of this work. In 1898-9 there was a further expenditure of £27,333, in 1899-00 of £29,750, in 1900-1 of £1,556, and in 1901-2 £1,146, making a total up to the end of June, 1902, of £373,155. The balance available for expenditure on 1st July of the last-named year was £3,137, which was made up as follows, viz.:—£2,157 for the importation of new varieties of seeds and plants, and £980 for other miscellaneous votes. In addition to the above expenditure, there was a sum of £35,000 authorized under the "Treasury Bonds Act 1896," £100,000 authorized under Act 62 Vict. No. 1566, and £100,000 under Act 59 Vict. No. 1440. Of the £35,000 above referred to, the sum of £29,976 had been spent up to the 30th June, 1902, leaving a balance available on that date of £5,024. The amounts authorized out of that sum (£35,000) for green fruits exported; honey exported; raisins, currants, and figs made; assistance to wineries, and for viticultural education, have been practically exhausted; but there still remains £2,682 to promote the growth of broom corn, £1,436 as bonuses for the production of vegetable oils, and £757 as bonuses for manufacture of flax, and hemp fibres. Of the £100,000 authorized under Act No. 1566, the expenditure up to the 30th June, 1902, amounted to

Expenditure  
on agricul-  
ture and  
other  
bonuses.

£50,961, and of that under Act No. 1440 to £62,000. Particulars appear in the following table in respect to all bonuses granted under various Loan Acts:—

Subject of Bonus.	Period during which Bonus operated.	Rate of Bonus.	Amount Authorized.	Expenditure to 30.6.1901.	Expenditure to 30.6.1902.
<i>Under Treasury Bonds Act 1896.</i>					
			£	£	£
Green fruit exported	{ prior to 24.7.96 after 6.11.96	2s. per case	5,500	3,863	5,404
Honey exported ...		1s. „			
Raisins, currants, and figs made	prior to 9.11.95 1895	1d. per lb.	61	61	61
Vegetable oil manufactured		£5 per ton	2,134	2,134	2,134
Flax and hemp fibre produced	...	1s. per gall.	1,500	50	63
General vegetable products grown	1895	£5 per ton	1,000	236	243
Wineries (assistance in building machinery and appliance producing 60,000 gallons of wine in three years)	...	£2 per acre	5,000	3,081	3,318
Viticultural education	...	£2,000 each	8,000	8,000	8,000
Fruit pulp exported	...	...	8,000	7,999	7,999
	...	...	3,805	...	2,754
<b>Total ...</b>	...	...	<b>35,000</b>	<b>27,283</b>	<b>29,976</b>
<i>Under Act 62 Vict. No. 1566.</i>					
			£	£	£
District Co-operative Wineries and Viticulture Industry			20,000	7,481	11,560
Dairy Schools, Experimental Stations, purchase of Live Stock, Machinery, Implements and other Appliances and Technical Agricultural Education			30,000	18,994	29,006
Development of the Export trade	...	...	32,500	3,175	5,773
Bonuses for the encouragement of the Cultivation, Manufacture, and Export of Fruit, Tobacco, Flax, Hemp, Silk, and of other Rural Industries	...	...	17,500	3,384	4,622
<b>Total ...</b>	...	...	<b>100,000</b>	<b>33,034</b>	<b>50,961</b>
To Beet Sugar Factory under Act No. 1440	...	...	100,000	62,000	62,000
<b>Grand Total ...</b>	...	...	<b>235,000</b>	<b>122,317</b>	<b>142,937</b>

Gold miners,  
1898 to 1902.

The number of miners actually at work on the goldfields is estimated annually by the Mining Department, and the figures for the five years ended with 1902 are subjoined:—

Year.	Alluvial Miners.	Quartz Miners.	Total.
1898 ...	15,308	15,496	30,804
1899 ...	14,123	15,991	30,114
1900 ...	12,836	16,199	29,035
1901 ...	12,886	14,891	27,777
1902 ...	11,963	14,140	26,103

There has been a gradual falling off in the number of gold miners in the last decennium—the difference between the first year of that period and the last amounting to no less than 4,700 men. Decrease of gold miners.

According to the estimate of the Mining Department, the gold raised in Victoria in 1902 was 777,738 ozs., which is less than the quantity obtained in 1901 by 11,824 ozs., representing, at £4 per oz., a decreased value of £47,296. The following are the figures for the two years:— Gold raised, 1901 and 1902.

QUANTITY AND VALUE OF GOLD RAISED IN 1901 AND 1902.

Year.	Gold raised in Victoria.	
	Estimated Quantity.	Value, at £4 per oz.
1901 ...	ozs. 789,562	£ 3,158,248
1902 ...	777,738	3,110,952
Decrease ...	11,824	47,296

From 1871 to 1891 the quantity of gold raised gradually diminished, with little intermission, from over 1,300,000 ozs. to only 576,000 ozs., but since then there has been a steady annual increase, until 854,500 ozs. was raised in 1899, which was the largest production since 1882. However, since 1899, the production has decreased each year to 777,388 ozs., in 1902. The subjoined figures give an estimate of the quantity of gold raised in 1871 and each subsequent year:— Gold raised, 1871 to 1902.

ESTIMATED QUANTITY OF GOLD RAISED, 1871 TO 1902.

1871 ...	1,368,942	1879 ...	758,947	1887 ...	617,751	1895 ...	740,086
1872 ...	1,331,377	1880 ...	829,121	1888 ...	625,026	1896 ...	805,087
1873 ...	1,170,397	1881 ...	833,378	1889 ...	614,838	1897 ...	812,766
1874 ...	1,097,643	1882 ...	864,610	1890 ...	588,560	1898 ...	837,257
1875 ...	1,068,417	1883 ...	780,253	1891 ...	576,399	1899 ...	854,500
1876 ...	963,760	1884 ...	778,618	1892 ...	654,456	1900 ...	807,407
1877 ...	809,653	1885 ...	735,218	1893 ...	671,126	1901 ...	789,562
1878 ...	758,040	1886 ...	665,196	1894 ...	716,954	1902 ...	777,738

Carrying on to the end of 1902, the calculations given in previous years, the following may be estimated as the total quantity and value of the gold raised in Victoria from the period of its first discovery, about the middle of 1851. The figures give an average per annum during the whole period of Gold raised 1851 to 1902.

about 1,267,575 ozs., which is over 60 per cent. more than the quantity raised in 1902:—

ESTIMATED TOTAL QUANTITY AND VALUE OF GOLD RAISED IN VICTORIA, 1851 TO 1902.

Gold Raised in Victoria.	Estimated Quantity.	Value.
Prior to 1902 ...	ozs. 65,136,174	£ 260,544,700
During 1902 ...	777,738	3,067,204
Total ...	65,913,912	263,158,467

Gold raised in Australasian States.

Since the first discovery, in 1851, of gold in Australasia, more than 123 million ozs. have been raised in the various States, over one-half of which was got in Victoria. Prior to 1898, Victoria was almost invariably the leading gold-producing State of the group, but in 1902 its yield was about 83,000 ozs. less than in Queensland, and 1,400,000 ozs. less than in Western Australia, which has in recent years increased its production by leaps and bounds, from 110,000 ozs. in 1893 to over two million ounces in 1902. The following is a statement of the quantity recorded as having been raised in the respective States at different periods:—

GOLD RAISED IN AUSTRALASIAN STATES, 1851 TO 1902.

Period.	Victoria.	New South Wales.	Queensland.	South Australia.	Western Australia.	Tasmania.	New Zealand.
	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.	ozs.
1851-55...	10,281,303	1,920,200	...	...	...	...	...
1856-60...	13,052,960	1,360,763	4,127	...	...	...	35,845
1861-65...	8,694,194	2,233,001	52,580	...	...	...	2,288,088
1866-70...	7,582,372	1,309,911	512,803	...	...	3,504	3,218,916
1871-75...	6,036,776	1,612,227	1,319,952	24,685	...	25,296	2,412,446
1876-80...	4,119,521	639,435	1,668,819	59,910	...	154,883	1,596,899
1881-85...	3,992,077	624,835	1,327,366	88,366	...	235,973	1,237,456
1886-90...	3,111,371	546,726	2,598,254	130,218	46,967	169,017	1,028,571
1891 ...	576,399	153,336	576,439	35,533	30,311	48,769	251,996
1892 ...	654,456	156,870	615,558	30,218	59,548	45,110	238,079
1893 ...	671,126	179,288	616,940	42,905	110,891	37,230	226,811
1894 ...	716,954	324,787	679,511	42,795	207,131	58,059	221,615
1895 ...	740,086	360,165	631,682	37,054	231,513	54,964	293,491
1896 ...	805,087	296,072	640,385	31,504	281,265	62,591	263,694
1897 ...	812,766	292,217	807,928	33,900	674,994	71,131	251,645
1898 ...	837,257	340,493	920,048	31,961	1,050,184	74,233	280,175
1899 ...	854,500	496,196	946,894	23,122	1,642,877	83,992	389,558
1900 ...	807,407	345,650	963,189	24,087	1,580,950	81,175	373,616
1901 ...	789,562	267,061	835,553	36,958	1,879,390	74,835	455,561
1902 ...	777,738	190,316	860,453	28,199	2,177,442	70,996	508,045

Gold produce of Australasia, 1851 to 1902.

According to the foregoing table, the total quantity of gold raised in each State, from 1851 to 1902, has been as follows:—



## SUMMARY OF GOLD RAISED IN AUSTRALASIA, 1851 TO 1902.

	ozs.
Victoria ... ..	65,93,912
Queensland ... ..	16,578,481
New Zealand ... ..	15,572,507
New South Wales ... ..	13,649,549
Western Australia ... ..	9,974,463
Tasmania ... ..	1,351,758
South Australia ... ..	701,415
Total ... ..	123,742,085

At Bendigo eight mine shafts were over 3,000 feet in depth on 31st March, 1903, namely, the Victoria Quartz, 3,750 feet; the Lazarus New Chum, 3,777 feet; the New Chum Railway, 3,408 feet; the Shenandoah, 3,226 feet; the New Chum and Victoria, 3,200 feet; Lansell's 180, 3,354 feet; New Chum Consolidated, 3,099 feet; and the Eureka Extended, 3,060 feet. Mining—  
deep shafts.

There was a large increase in the number of men employed in coal mines in 1902, as compared with the four preceding years. This will be seen by the following figures:— Coal miners,  
1898 to  
1902.

Year.	Number of Miners at Work.
1898 ... ..	857
1899 ... ..	880
1900 ... ..	807
1901 ... ..	877
1902 ... ..	1,303

The coal raised in Victoria in 1902 amounted to 225,164 tons, as compared with 242,860 tons in 1898, showing a decrease in 5 years of 17,696 tons, making a total yield up to the end of 1902 of 2,173,057 tons, valued at £1,198,208. The following statement shows the progress of the industry since 1898, also, for comparison, the quantity and value of coal imported in the five years:— Coal.

Year.	Raised in State.		Imported.		
	Quantity.	Value.	Quantity.	Value.	
				Official.*	Actual.†
	tons	£	tons.	£	£
1898	242,860	103,099	562,329	257,688	393,630
1899	262,380	113,522	532,676	276,137	352,898
1900	211,596	101,599	690,567	403,723	578,350
1901	209,329	147,191	710,918	446,058	595,394
1902	225,164	155,850	656,656	428,904	533,533

\* Value according to Customs Return found by adding 10 per cent. to value in New South Wales as given by importers.

† Estimated value found by adding to cost at Newcastle the actual freight, insurance, Primage, &c.

Coal raised  
in Austral-  
asian  
States.

At the present time, with the exception of South Australia, coal is raised in all the States in the Commonwealth, and in the colony of New Zealand. The total increase in the production of coal for the last five years was 2,360,672 tons. The following are the quantities returned as brought to the surface in each of those States and colony of New Zealand during a series of years:—

Year.	Tons of Coal raised in—					
	New South Wales.	Queensland.	Western Australia.	Tasmania.	Victoria.	New Zealand.
1876	1,319,918	50,627	...	6,100	1,095	...
1877	1,444,271	60,918	...	9,470	2,420	...
1878	1,575,497	52,581	...	12,311	Nil	162,218
1879	1,583,381	55,012	...	9,514	Nil	231,218
1880	1,466,180	58,052	...	12,219	3	299,923
1881	1,769,597	65,612	...	11,163	Nil	337,262
1882	2,109,282	74,436	...	8,803	10	378,272
1883	2,521,457	104,269	...	8,872	428	421,764
1884	2,749,109	129,980	...	7,194	3,280	480,831
1885	2,878,863	209,698	...	5,334	800	511,063
1886	2,830,175	228,656	...	10,391	86	534,353
1887	2,922,497	238,813	...	27,763	3,357	558,620
1888	3,203,444	311,412	...	41,577	8,573	613,895
1889	3,655,632	265,507	...	40,300	14,596	586,445
1890	3,060,876	338,344	...	53,812	14,601	637,397
1891	4,037,922	271,603	...	45,524	22,834	668,794
1892	3,780,968	257,803	...	35,669	23,363	673,315
1893	3,278,328	264,403	...	34,042	91,726	691,548
1894	3,672,076	270,705	...	30,922	171,660	719,546
1895	3,738,589	323,068	...	33,349	194,227	740,827
1896	3,909,517	371,390	...	43,548	226,562	792,851
1897	4,383,591	358,407	...	42,530	236,277	840,713
1898	4,706,251	407,934	3,250	49,116	242,860	907,033
1899	4,597,028	494,009	54,336	43,113	262,380	975,234
1900	5,507,497	497,132	118,410	50,811	211,596	1,093,990
1901	5,968,426	539,472	117,836	49,176	209,329	1,227,638
1902	5,942,011	501,531	140,884	49,898	225,164	1,362,702

Melbourne  
water-  
works.

In 1891 the waterworks for the supply of the City of Melbourne and suburbs, which comprise an area of 71,300 acres, with a population, on the 5th April, 1891, of 477,891, and rateable property of the annual value of about £6,600,000, were transferred to the control of the Melbourne and Metropolitan Board of Works. The main source of supply is the Yan Yean Reservoir, in which are stored the waters of the eastern branch of the Plenty River and Jack's Creek, from the southern slopes of the Great Dividing Range, and those of Wallaby and Silver Creeks, brought over the range in an aqueduct from the northern slopes. These streams are collected in the Toorourong Reservoir and taken thence in a pitched channel to the

Yan Yean Reservoir. A minor supply is brought to Melbourne by means of the Maroondah aqueduct, which conveys water from the Maroondah River, the Graceburn, and Donnelly's Creek, but without, at present, any provision for storing the surplus winter waters thereof, except the small service reservoirs in the suburbs at Preston, Essendon, Caulfield, Kew, and Surrey Hills. By means of these systems Melbourne is provided with an ample supply of pure water at a high pressure. The Yan Yean is an artificial lake situated 22 miles from the city, 602 feet above sea level. It covers an area of 1,300 acres, or rather more than two square miles, and receives water from a drainage area of 29,000 acres. The total length of aqueduct and mains is 263 miles, and of reticulation pipes (under 12-inch diameter) 940½ miles. The storage capacity of the main reservoir is 6,400 million gallons, and of the eight subsidiary reservoirs 108 million gallons.

The total expenditure to the 30th June, 1902, on the construction of the Melbourne Waterworks was £3,731,256. The gross revenue received since the opening of the works at the end of 1857 has amounted to £5,005,952, whilst the expenses of maintenance and management amounted to only £827,323 and interest to £2,145,526. During 1901-2 the revenue received amounted to £171,889 as against £163,212 in the previous year; and the expenditure on maintenance and management (exclusive of repayments) to £40,156, as against £38,548 in the previous year. The net revenue in 1901-2 was thus £131,733, being equivalent to 3·5305 per cent. of the mean capital cost, as compared with £124,664, or 3·3555 per cent., in 1899-1900. The loans outstanding (£2,632,336) for the construction of the works now bear an average nominal rate of only 3·87 per cent. The aggregate net profits up to the end of 1901-2, after paying all interest and expenses, has amounted to £2,033,103.

Revenue and expenditure of Melbourne waterworks.

The following is the average daily consumption of water for all purposes for each month of the last five years in the water district of Melbourne and suburbs. In 1901, during which the highest figures for consumption have been reached, the mean daily consumption per head for the whole year was

Water consumption in Melbourne, 1898-1902.

59 gallons, varying from 48 gallons in July to 77 gallons in December, as against an average in the last five years of 58 gallons:—

Month.	1898.	1899.	1900.	1901.	1902.
	Gallons.	Gallons.	Gallons.	Gallons.	Gallons.
January ...	37,821,998	33,125,839	36,760,484	32,280,097	37,719,710
February ...	41,630,304	38,943,644	37,619,571	34,396,071	37,264,428
March ...	32,332,218	33,339,968	31,146,903	31,781,548	33,610,839
April ...	25,707,596	24,491,527	22,983,633	26,181,767	28,562,900
May ...	22,866,125	21,054,260	21,290,290	27,147,129	24,732,194
June ...	22,477,404	19,429,806	21,272,000	24,986,933	22,342,064
July ...	21,048,262	20,707,049	22,245,484	23,901,258	24,349,226
August ...	20,634,585	22,486,903	26,580,548	26,561,387	25,342,064
September ...	20,815,493	23,210,708	26,942,833	27,135,733	23,386,000
October ...	25,610,150	22,742,968	27,027,161	29,047,355	27,185,032
November ...	31,389,021	29,346,967	31,711,533	31,666,700	34,956,667
December ...	37,593,705	36,710,677	33,773,451	38,276,258	30,073,097
Mean for Year	28,327,238	27,132,526	28,279,491	29,446,853	29,127,018

The maximum consumption for one day in 1898 was 57,000,000 gallons, and the minimum was 17,000,000 gallons. These records have not been exceeded up to the end of 1902.

Rainfall in  
Victoria.

The average rainfall over the whole surface of Victoria for the last five years was:—

Year.	Rainfall over Surface of Victoria.		Monthly Average.			
	Average.	Volume of Water Represented by—	Highest.		Lowest.	
			Month.	Rainfall.	Month.	Rainfall.
1898 ...	Inches. 21·22	Cubic Miles. 29·5	June	Inches. 3·68	January	Inches. 0·25
1899 ...	24·34	33·8	June	4·47	December	0·64
1900 ...	25·22	35·0	August	3·57	February	0·25
1901 ...	22·02	30·6	June	3·37	February	0·38
1902 ...	19·32	26·8	Dec.	3·94	April	0·39

### GENERAL REMARKS ON THE METEOROLOGICAL YEAR, 1902.

BY P. BARACCHI, ESQ., GOVERNMENT ASTRONOMER.

General  
remarks.

The predominant meteorological characteristic of the year 1902 was a disastrously long period of drought, which extended from March to December, with consequent loss of stock, failure of crops, and great suffering among the settlers of many districts, especially those in the far northern areas, who were

brought to the verge of a water famine, and to whom water for necessary domestic purposes had to be carried from great distances on the railways, even throughout the winter months. Among other remarkable occurrences which did serious damage in various parts of the State may be mentioned the fierce gales and bush fires in January and February, the unusually severe storms in June, the Gippsland floods in October, and the great dust storms of November, which were accompanied by a display of ball lightning on such an extraordinary scale that a panic was caused by it in some districts. In other respects the climatic conditions throughout the year were exceedingly favourable for the enjoyment of health and out-door life. The summer was generally cool, the winter mild, sunny, and dry; the autumn and spring approached closely to the ideal conditions of a normal year, in regard to all meteorological elements excepting rainfall. There were no extremes of severe heat and cold, and the duration of fine settled weather was above the average of previous years.

In regard to rainfall, the year commenced well, with fair promise of copious rains. By the end of March the general rainfall over the southern half of the State was far above the average, the excess amounting to 5 per cent. for the western districts, 37 to 66 per cent. for the whole of Gippsland and South Gippsland, 70 per cent. for the counties around Port Phillip Bay and all other districts between the ranges and the sea. Over the northern areas, the monthly average was generally exceeded in March; but only partially in the other two months, and the totals for the first quarter brought out a slight deficiency of from 9 to 13 per cent. The April rains are, as a rule, the most important in determining the success or failure of the year in regard to pastoral and agricultural interests in Victoria. In some years scarcity of rain in this and earlier months has been to a certain extent remedied by a wet May; but when the drought extends beyond May, a bad year is the almost certain result. Unfortunately this was the case in the year under review. The April rains failed almost entirely in every part of the State. There was a deficiency of 8 per cent. in the western districts, 50 per cent. on the Tambo and Snowy River watersheds, 64 to 73 per cent. in the remaining southern districts, and 95 per cent. in all the northern regions, between the ranges and the Murray.

The drought continued throughout the month of May with equal severity. An improvement occurred late in June; but with the exception of some parts of Gippsland, where the average rainfall for June was exceeded by 23 per cent., a general deficiency was experienced of from 1 to 27 per cent. The total rainfall for the second quarter of the year ranged from 25 to 62 per cent. below average.



In ordinarily good years the rainfall of the third quarter is of little consequence to the land. As a rule, a relatively dry winter is not to any considerable extent injurious to either stock or crops, and is exceedingly salubrious and pleasant to all; but when it follows a drought of three months, owing to which water-holes, tanks, and reservoirs are empty, rivers and creeks dry, and water even for mere domestic necessities scarce and expensive, rain becomes a very pressing need whatever be the time of the year. The northern half of Victoria was in this need by the beginning of the third quarter of the year 1902, but the drought continued throughout the coldest months. The rainfall over this part of the State was from 70 to 73 per cent. below average in July, 65 to 83 per cent. in August, and 50 to 59 per cent. in September. The total for the whole of the third quarter showing a deficiency of 65 to 70 per cent.

The only districts which had a surplus of rain in the month of July were those comprised between the La Trobe and Mitchell rivers, where the average was exceeded by 25 per cent.; but this was followed by a deficiency of 70 per cent. in August, and of 4 per cent. in September. In the western districts and all other regions south of the Dividing Ranges, the rainfall was from 25 to 64 per cent. below average in July and August, and from 13 to 19 per cent. in September; South Gippsland being close to the average in this month.

It is well known that in any year, including those years in which rainfall has been abundant and well distributed during the first 9 months of the year, failure of the early spring rains may entirely ruin the grain crops. This is one of the reasons why the month of October is considered as the turning point in the year, in which rain is most anxiously awaited by the farmers. At this time of the year 1902, all prospects of any kind of harvest had long vanished. The country, however, was in extreme need of rain for other more urgent necessities. The difficulty and cost of keeping starving stock alive, and of providing water for the northern settlers, had by now become very great. But no break of the drought came in October nor in November. These two months were indeed among the driest on record in any year, for all districts north of the ranges.

The rainfall in October was 7 per cent. below average over the watersheds of the Tambo and Snowy rivers, and from 24 to 51 per cent. below average in all other parts of the State. The deficiency of the November rains was general and most severely felt, being from 37 to 64 per cent. below average for the southern, and 75 per cent. below average for the northern

divisions. Copious rains came at last in December, and reduced the deficiencies for the whole of the last quarter of the year to less than 20 per cent.

In the total rainfall for the year 1902, the watersheds of the Tambo and Snowy rivers just reached the average, all other southern districts being from 7 to 22 per cent. below average, and the northern regions 44 per cent. below average.

The year's rainfall for the whole State was 19·32 inches, 7·36 inches below the average of the previous 47 years of record. This is equivalent to a loss of  $10\frac{1}{4}$  cubic miles of water, or about 9·4 billions of gallons. Total rainfall.

For eight successive years, since 1894, the annual rainfall has not reached the average, and the deficiency of the year 1902 was the greatest. The year commenced well and ended well, but the long intervening period of 9 months will be remembered for many years as one which forms the worst record of rainfall for northern Victoria.

A fuller account of the monthly distribution of rainfall over 26 watersheds and regions into which the State is appropriately divided for the purpose of rainfall statistics, together with the computed percentages above and below the average for each month, quarter, and year, the annual rainfall recorded over these watersheds for the successive years of the decade, 1893-1902, will be found in the Statistical Register of 1903. The information is based on returns from 800 stations, which are well distributed over the whole area of the State. Complete rainfall statistics.

The true explanation of the causes of drought cannot as yet be given. Investigators of this subject, from leading scientific men and meteorologists of the first rank, down to the reckless adventurous speculators, and incompetent persons who trade on popular credulity, have from time to time advanced theories in which the fluctuations of rainfall are ascribed to specified conditions of the sun or of the moon, or other influences outside our atmosphere. Many attempts have been made to discover a law of periodicity by comparing rainfall statistics with solar or lunar phenomena; but the conclusions arrived at have in no case been sufficiently convincing to command general acceptance. Were it possible to ascertain satisfactorily the periodicity of dry and wet periods and its causes, we would be able to forecast the seasons at long range, and meteorology would then have gained one of the most important of its ultimate objects. We may be approaching towards this ideal, but it does not seem that we have yet come within reach of it. Causes of droughts.

As has already been remarked above, the summer temperatures of the year 1902 were generally below average. This Temperature.

was in great part the consequence of the abundant rain of the first quarter of the year, a greater frequency of southerly winds, and a shorter duration of heated land winds, than is usually experienced in normal years. The highest readings registered in the shade, so far as can be ascertained from official returns, were  $110^{\circ}$  in January,  $117^{\circ}$  in February,  $105^{\circ}$  in March,  $112^{\circ}$  in November, and  $114^{\circ}$  in December, which are, respectively,  $10^{\circ}$ ,  $3^{\circ}$ ,  $10^{\circ}$ ,  $0^{\circ}$ , and  $1^{\circ}$  Fahr. lower than the extreme values on record for the corresponding months.

The table below gives the highest temperature of air for the five warmest months of the year 1902, and the extremes on record for the corresponding months:—

Region.	Highest Readings in 1902.					Extremes on Record.				
	Jan.	Feb.	Mar.	Nov.	Dec.	Jan.	Feb.	Mar.	Nov.	Dec.
Eastern Ranges (Mount St. Bernard)	78	82	76	80	86	94	89	78	80	86
Highlands ...	100	101	93	92	90	108	107	103	101	105
Coast ...	103	86	92	96	93	109	105	105	103	105
Intermediate Districts ...	103	95	95	101	106	112	110	106	102	111
Northern Plains ...	110	117	105	112	114	120	120	115	112	115

The lowest temperature registered at night in the coldest month of the year, July, was  $19^{\circ}$  Fahr. at Mt. St. Bernard,  $20^{\circ}$  in the highlands,  $23^{\circ}$  in the northern plains,  $33^{\circ}$  on the coast, and  $31^{\circ}$  in the intermediate districts, being respectively  $2^{\circ}$ ,  $3\frac{1}{2}^{\circ}$ ,  $0^{\circ}$ ,  $4^{\circ}$ , and  $4^{\circ}$  above the absolute minimum on record for those localities.

The table below gives the lowest temperatures registered in the four coldest months of the year 1902, and the extremes on record for the corresponding months:—

Region.	Lowest Readings in 1902.				Extremes on Record.			
	May.	June.	July.	Aug.	May.	June.	July.	Aug.
Eastern Ranges ...	21	21	20	20	18	17	16	19
Highlands ...	25	22	19	20	17	19	17	19
Coast ...	34	35	33	36	31	27	27	30
Intermediate Districts ...	37	35	31	30	31	28	27	28
Northern Plains ...	30	28	23	26	28	25	23	24

The temperature of the autumn and spring months approached very closely to the average readings of normal years. A more complete account of heat and cold, humidity and rainfall, for 14 stations which may be regarded as representative

of the various different climates of the State, the monthly mean and extreme temperatures for 1902 with corresponding averages and extremes, based on all previous years of record, the monthly percentage and average of humidity, and the amount and average of rainfall, whereby some idea may be gained of the principal climatic conditions of the year 1902, as well as of their relative value in regard to normal and extreme years, will appear in the Statistical Register of 1903.

Table I. gives for each month of the year 1902:—

Meteorological conditions,  
Melbourne.

1. The mean and extremes of atmospheric pressure.
2. The mean temperature of air in shade, the averaged highest temperature of the day and averaged lowest temperature of the night in each month, technically called "Mean Maxima" and "Mean Minima"; the average daily range, and the absolute highest and lowest temperatures recorded in each month, with the dates on which these extremes occurred.
3. The average and extreme monthly reading of "Solar Radiation," as shown by the black bulb thermometer in vacuo, popularly known as "heat of the sun," with the date on which the absolute maximum occurred.
4. The average and extreme monthly readings of "Terrestrial Radiation," or the temperature to which the air near the ground falls shortly before sunrise, popularly known as "ground temperature at night," with the date on which the absolute minimum occurred.
5. The average humidity or percentage of water vapour contained in the air, assuming that when this moisture is 100, the air is fully saturated.
6. The amount of water which evaporated in each month, at a free water surface in the open.
7. The average daily amount of cloud relatively to a conventional scale in which 10 represents a fully overcast sky, 5 is equivalent to the extent of cloud which is just sufficient to cover one-half of the visible hemisphere, and 0 means that the whole sky was perfectly clear.
8. Monthly rainfall and number of wet days.
9. The number of days on which fog occurred.
10. The actual monthly number of hours during which the sun was not covered by clouds, known as "the duration of sunshine."
11. The number of hours in each month during which the wind blew from eight points of the compass, with its average velocity in miles per hour.

The headings of the various columns, and the following additional explanations, will enable anyone to understand the full significance of the information supplied in this table.

(a) In regard to temperature of air in shade, the highest and lowest readings of the thermometer registered in any one day, are called, respectively, the maximum and the minimum for that day. One-half the sum of these two readings gives approximately the "mean" temperature of that day (at the Melbourne Observatory this "mean" is derived from three daily observations made at 9 a.m., 3 p.m., and 9 p.m.), and their difference gives the daily "range."

(b) If we write in four separate columns, the values of the mean, the maximum, the minimum, and the range for each day in a given month, then add all the 30 or 31 values in each column, and divide the sum by the number of days, the results are, respectively, the "mean," the "mean maximum," the "mean minimum," and "mean daily range" for that month. These are the values entered for each month in Table I. under the corresponding columns.

(c) The absolute extremes are the highest and lowest readings of the thermometer registered throughout the month. Each of the six columns dealing with temperature of air in shade, represents a distinctive and important characteristic of climate.

Under the "Amount of Spontaneous Evaporation" is given the height, in inches, of a layer of water which was lost in each month of the year, through evaporation, at the free surface of water contained in a cistern, fully exposed in the open, slightly below the level of the ground. The figures serve to give an approximate idea of the amount of water which passes from the free surface of rivers, lakes, &c., into the atmosphere, in the state of water vapour, under the conditions of the Melbourne climate.

The column "Mean Humidity" shows the average monthly amount of invisible water vapour which the atmosphere actually contained, expressed as a percentage of the maximum amount which it could have held under the same conditions of temperature. The values given in the column "Amount of Cloud" may be explained by the following example:—For January, 1902, the Table gives amount of cloud 5.7. This signifies that the average amount of cloudiness in the month of January was equivalent to 57-100ths of the total area of the visible sky remaining overcast throughout the month.

The figures in the last column represent the velocity of a steady flow which, if continued uniformly throughout the



month, would be equivalent to the total actual motion of air in that month.

Thus Table I. is equivalent to a general statement of the meteorological elements which prevailed at Melbourne in the year 1902. It now remains to show how this year compares with other years, and with the normal as well as with the extreme conditions of our climate. All the data required for this purpose are given in Table II., in which will be found the average and extreme values of the climatic elements for each month with their average and extreme fluctuations, based on records extending over an uninterrupted period of 47 years. These values are further summarized and grouped in Table III. to represent the general meteorology of the average Melbourne seasons, their range of variation, and the absolute extremes on record. A comparison of Table I. with Table II. brings out the following prominent characteristics in respect to the year 1902:—

(a) The summer was generally cooler than the average Melbourne summer.

(b) The highest temperature in shade was  $103^{\circ}$ , or some  $8^{\circ}$  lower than the maximum reading on record. During the whole of the first quarter, which contains the hottest months of the year, the thermometer rose only twice above  $100^{\circ}$ , six times above  $90^{\circ}$ , and twelve times above  $80^{\circ}$ , and there were 70 days out of 90 in which the temperature of air in shade never reached  $80^{\circ}$ . The general mean temperature of the whole summer was  $2.1^{\circ}$  lower, and the mean of all the highest daily readings was  $2\frac{1}{2}^{\circ}$  lower than the average of 47 years.

(c) The heating power of the solar rays was also below average. Solar radiation rose 7 times only above  $150^{\circ}$ , and only once above  $160^{\circ}$ , and there were 56 days during which the direct rays of the sun did not raise the thermometer reading above  $140^{\circ}$ . The maximum was  $161.7^{\circ}$ , or nearly  $17^{\circ}$  below the highest on record.

(d) Cool winds blowing from the southern quarters of the compass prevailed to a greater extent than they usually do in normal years, and the duration of winds from the heated interior was below average. This was directly due to a peculiar distribution of atmospheric pressure not frequently experienced at this time of the year, which consisted in very shallow systems of low pressure, separated by long longitudinal stretches of denser air, moving from west to east and passing successively over southern Victoria with unusually great rapidity; or, in other words, to a prevailing "festoon" arrangement of atmospheric eddies along the southern edge of the Australian continent, in which the loops representing

atmospheric depressions were very small in comparison with the elongated intervening spaces of high pressure.

(e) The total number of hours in the first quarter of the year during which the wind blew from the southern quadrants was 1,650, while the warm winds from the land blew for only 352 hours, the remaining 158 hours being accounted for by calms.

(f) Cloudiness exceeded the average by 5 per cent. February was relatively very dry and March very wet. The rainfall for the quarter was 7.92 inches, or 2.16 inches above average.

(g) The winter was relatively dry, with mild sunny days, but the cold in the hours of night was severe in comparison with other years. The lowest temperature of air was registered on the 14th of August, when the thermometer descended to  $29.6^{\circ}$ , which is only  $2\frac{1}{2}^{\circ}$  higher than the minimum reading on record for 47 years. On the same night the temperature near the ground fell to  $21.3^{\circ}$ , or within one degree of the lowest ground temperature ever registered at Melbourne. August was the coldest month of the year. Its mean temperature was  $3^{\circ}$  below average. The thermometer fell on the average  $3\frac{1}{2}^{\circ}$  lower during night than it usually does in normal years. In July and September the temperatures of day and of night approached generally within one degree of the average, excepting that the highest temperature registered in July was  $4^{\circ}$  below the record heat for that month. On the whole, the warmth of the winter days in 1902 was nearly the same as that of normal years, but the cold at night was comparable to that of the coldest winters on record. It must be noted, however, that the thermometer fell below freezing point only on four occasions, and remained above  $40^{\circ}$  on 57 nights, and above  $50^{\circ}$  on 6; which goes far to show the temperate character of the Melbourne winter.

(h) There were 10 foggy days, and 27 wet days. The total rainfall was 4.75 inches, most of which fell in September, and showed a deficiency of 26 per cent. on the winter average. If this rain had been collected in an open tank fully exposed to the sky, the whole of it would have passed out again into the atmosphere in the state of vapour by the end of the winter.

(i) The predominant winds were N.N.E. and S.E. in July, and between S. and W. in August and September.

(k) In autumn the average temperatures, the maxima, the minima, and the mean daily range, closely approached those of an average autumn, excepting that the absolute extremes, which ranged from  $88.2^{\circ}$  at maximum to  $35.3^{\circ}$  at minimum, were, respectively,  $5.8^{\circ}$  lower in the first case, and  $7.3^{\circ}$  higher in the second, than the highest and lowest readings on record for any previous autumn. The thermometer only once rose above  $80^{\circ}$ . It fell below  $50^{\circ}$  on 14 nights in April, 16 nights in May, and 19 nights in June; below  $40^{\circ}$  once only in May, and 10 times in June. The highest reading for solar radiation was  $143^{\circ}$ , or  $9^{\circ}$  lower than the highest record, and the lowest ground temperature at night was  $26.1^{\circ}$ , or  $5.7^{\circ}$  higher than the lowest record for autumn. April and May were dry months. Indeed the amount of rainfall registered in April was only 57 points, this being the lowest on the records of half a century, during which it was equalled only once. The rain of June exceeded the average by 32 per cent.; but there still remained a deficiency of 35 per cent. for the whole of this quarter. Cloud and sunshine were normal in May; there was slightly less cloud and more sunshine in April, more cloud and less sunshine in June, than in average years. Winds from the southern quarters prevailed in April, and north and north-east winds prevailed in June. The winds of May were generally variable.

(l) During the last three months of the year the general average conditions of temperature existed, but the absolute maximum and minimum readings were, as in the autumn, considerably more moderate than the extremes of other years. They ranged from  $101.7^{\circ}$  to  $39.0^{\circ}$ , being  $9^{\circ}$  lower in the first case and  $6.9^{\circ}$  higher in the second case than the highest and lowest readings on record for spring.

The thermometer rose above  $80^{\circ}$  twice in October, 3 times in November, and 6 times in December; above  $90^{\circ}$  7 times in November, and 3 times in December; and above  $100^{\circ}$  only once in December. It fell below  $50^{\circ}$  on 14 nights in October, 8 times in November, and 4 times in December, and below  $40^{\circ}$  only 3 times in October. The maximum temperature of the sun's rays was  $155.2^{\circ}$ , and the minimum grass temperature at night  $31.0^{\circ}$ . These values are respectively  $15.1^{\circ}$  lower in regard to solar radiation and  $6.4^{\circ}$  higher in regard to grass temperature than the extremes on record. The rainfall for this quarter was 6.09 inches, or 1.12 inches below average, showing a deficiency of 15 per cent. Most of this rain, however, was registered in December. Only

76 points fell in October in the course of 7 days, and 98 points in November, also in 7 days, the respective averages being 2·71 inches and 13 wet days for October, and 2·25 inches with 10 wet days for November. These were decidedly droughty conditions; but they seemed insignificant in comparison with the severity of the drought then existing in the country. The duration of sunshine was 550 hours, being 73 hours less than the average. The other meteorological elements, as cloudiness, fog, humidity, and free evaporation, deviated very slightly from the normal values.

It would not be difficult to extend further this analysis of the data supplied by the tables; but what has been said may probably be found sufficient to indicate the leading climatological features of the year 1902.

It has often been asserted, and there seems to be a general impression, that the Melbourne climate is not now what it was thirty or forty years ago. Some people say that the heat of summer was then greater and the cold in winter less intense, that the north winds were more prevalent, and blew invariably for three continuous days before a change came, and so on. These ideas are generally based on personal experiences and sensations which are not always reliable, owing to the difficulty of remembering them correctly at long distances of time, and it is, therefore, advisable to consult instrumental records in order to ascertain whether such changes are real.

These records are embodied in Table II. already referred to, and are further condensed in the simpler table below, which shows at a glance the limits within which the principal meteorological elements of the Melbourne climate have oscillated during the past 47 years. It is only necessary to remark that throughout the whole range of actual values recorded each year, which are all comprised between the limits specified for each element, there appears to be no indication of any order, either progressive or periodical, in their occurrence. They go from maximum to minimum, or vice versa, irregularly, capriciously frequently, per saltum, giving no clue to the laws which govern their variations.

## COMPARISON TABLE OF YEARLY METEOROLOGICAL VALUES.

Melbourne-  
climate.

Meteorological Elements.	Year 1902.	Average for 47 Years.	Extreme Range of Variation of Average Values.	
			Highest Value.	Lowest Value.
Mean atmospheric pressure ... ..	29.971	29.936	...	...
Highest ... ..	30.530	30.678	...	...
Lowest ... ..	29.135	28.868	...	...
Range ... ..	1.395	1.364	1.719	1.169
Mean temperature of air in shade ...	56.9	57.4	58.7	56.3
Mean daily maximum ... ..	67.0	67.3	69.0	65.8
Mean daily minimum ... ..	49.1	49.3	51.2	47.2
Absolute maximum ... ..	103.0	102.6	111.2	96.6
Absolute minimum ... ..	29.6	31.6	33.9	27.0
Mean daily range ... ..	17.9	18.0	20.3	14.6
Absolute extreme range ... ..	73.4	74.3	82.6	66.0
Solar radiation (maximum) ... ..	161.7	139.3	178.5	108.6
Terrestrial radiation (minimum) ...	21.3	33.0	46.2	20.4
Rainfall (inches) ... ..	23.08	25.55	44.25	15.61
Number of wet days ... ..	102	132	165	102
Amount of free evaporation (inches) ...	38.611	37.25	45.65	31.59
Percentage of humidity (sat. 100) ...	73	72	76	67
Cloudiness (scale 10 overcast, 0 clear) ...	6.0	5.9	6.4	5.4
Duration of sunshine (No. of hours) ...	1,847	1,997	2,335	1,738
Number of days of fog ... ..	18	17	39	5

This table shows at once that some elements may be regarded as nearly constant, while others are subject to great variations. The mean temperature of the year has always remained within  $1.3^{\circ}$  of the average, throughout the period of record. This is the most constant element for Melbourne.

The elements next in order of constancy are the relative humidity of the atmosphere, the cloudiness, the mean daily maximum and minimum temperatures, which are the most important factors of climate, in their relation to health and physical comfort. In marked contrast with the relatively uniform regime of the above elements, we find the rainfall oscillating between a maximum of  $44\frac{1}{2}$  inches and a minimum of 15.61 inches, with a variation of more than 18 inches from the average, which average very seldom happens. There have been as many as 165 wet days in some years, and only 102 in others.

The average conditions which favour spontaneous evaporation and fog are also subject to great changes.



Although the mean temperature of the year is nearly constant, the extremes of heat and cold vary considerably. The highest readings recorded each year for 47 years range from  $111.2^{\circ}$  to  $96.6^{\circ}$ , with a deviation of  $14.6^{\circ}$  from the average. The direct heat of the sun's rays shows an amplitude of variation of nearly  $70^{\circ}$ . The frequency and severity of frosts, as indicated by the yearly average values of terrestrial radiation, exhibit very large and irregular changes. The average of these values is  $33.0^{\circ}$ , which is the mean of all the lowest nightly readings registered for 47 years by a thermometer lying on top of short grass. According to this average we should regard frost as an exceptional phenomenon for Melbourne. In fact there have been years when the lowest readings of the ground thermometer did not go below  $46^{\circ}$ , but on the other hand we find years in which it fell  $11.6^{\circ}$  below freezing point. The sun remains some 4,420 hours (in round figures) above the horizon of Melbourne; but is covered by clouds for some 2,423 hours as an average; or, in other words, the average duration of sunshine in a year is 1,997 hours. This average number varies from 2,335 to 1,738 hours, which represents approximately a deviation from the mean value of 15 per cent.

The conclusions are as follow:—

(a) The yearly mean temperature of air is nearly a constant quantity.

(b) Amongst those elements which are more important in their relation to health and physical comfort, those which vary within relatively small limits are the average maximum and minimum temperatures, the absolute minimum temperatures, and the relative humidity of the atmosphere.

(c) Those which show relatively large variations are the absolute maximum and the mean daily range of temperature, the direct heat of the sun's rays, evaporation, and fog. Rainfall is the most changeable element, both as regards amount, frequency, and distribution.

The observed changes are irregular and do not appear to follow any ascertainable law, consequently there is no evidence that the Melbourne climate has been subject to progressive or periodical changes during the last half century.

TABLE 1.—MELBOURNE OBSERVATORY. METEOROLOGICAL MEANS AND EXTREMES FOR EACH MONTH OF THE YEAR 1902.

Month.	Pressure of Air.			Temperature of Air in Shade.								Solar Radiation.			Terrestrial Radiation.		
	Mean.	Highest	Lowest.	Mean.	Mean Max.	Mean Min.	Mean Daily Range.	Absolute Extremes.				Mean.	Highest	Date.	Mean.	Lowest.	Date.
								Highest	Date.	Lowest.	Date.						
January ...	29.742	30.065	29.135	66.0	77.8	55.5	22.3	103.0	31st	46.2	28th	143.5	161.7	25th	48.3	36.3	24th
February ...	29.852	30.102	29.426	62.8	74.7	54.9	19.8	95.3	9th	47.3	5th	138.0	159.6	9th	46.8	36.9	5th
March ...	29.960	30.380	29.375	61.1	70.9	53.5	17.4	95.1	7th	40.3	21st	127.9	150.1	7th	45.0	29.0	21st
April ...	30.086	30.387	29.802	57.8	67.8	50.2	17.6	88.2	19th	43.9	12th	121.8	143.0	19th	42.4	34.0	12th
May ...	30.136	30.434	29.668	54.6	62.2	47.9	14.3	71.7	5th	37.1	20th	109.8	128.0	5th	39.9	29.1	20th
June ...	30.067	30.512	29.362	48.5	56.1	42.3	13.8	60.6	30th	35.3	29-30	101.6	119.9	11th	34.4	26.1	30th
July ...	30.123	30.530	29.653	48.4	56.8	42.1	14.7	64.4	5th	31.0	15th	106.5	119.4	5th	32.9	22.4	16th
August ...	30.177	30.501	29.604	47.3	56.2	39.7	16.5	68.5	29th	29.6	14th	112.2	125.0	29th	31.1	21.3	14th
September ...	29.892	30.211	29.398	52.9	62.1	44.8	17.3	80.0	25th	35.0	17th	122.8	138.9	25th	37.8	27.1	17th
October ...	29.917	30.273	29.556	56.4	67.0	49.0	18.0	82.5	2nd	39.0	16th	125.8	144.1	28th	42.1	31.0	8th
November ...	29.913	30.193	29.291	64.1	76.8	53.7	23.1	101.4	25th	45.0	29th	136.0	155.2	25th	45.3	35.8	21st
December ...	29.782	30.072	29.354	62.9	75.5	55.6	19.9	101.7	5th	48.0	30th	136.1	160.1	5th	49.9	39.8	13th

  

Month.	Mean Humidity per cent. — Satn. = 100	Amount of—			Nc. of Days of—		No. of Hours of Sunshine.	Number of Hours during which the Wind blew from—								Calm.	Mean Velocity in miles per hour.
		Spontaneous Evaporation	Cloud. — Scale 0 to 10.	Rain in inches.	Rain.	Fog.		N.	N.W.	W.	S.W.	S.	S.E.	E.	N.E.		
January ...	0.62	6.125	5.7	1.53	9	0	230	78.5	17.0	94.5	146.5	179.0	121.0	25.5	53.0	29.0	9.3
February ...	0.65	4.979	5.9	0.95	8	0	193	22.0	24.5	130.5	123.5	182.0	115.0	25.0	18.5	31.0	8.6
March ...	0.70	3.998	5.5	5.44	9	1	158	67.5	34.5	52.5	135.0	248.5	122.0	24.5	37.0	22.5	9.5
April ...	0.75	2.153	5.2	0.57	5	0	156	67.0	25.0	62.0	128.0	151.0	119.0	42.5	79.0	46.5	6.5
May ...	0.79	1.405	6.1	1.05	7	4	114	147.5	51.0	115.5	107.5	104.5	28.0	44.5	98.0	47.5	6.4
June ...	0.85	2.314	7.0	2.70	14	4	76	196.0	71.5	79.5	91.5	29.5	21.0	25.0	147.5	58.5	6.8
July ...	0.77	1.274	6.2	0.57	6	5	104	241.0	80.5	53.5	29.0	25.0	126.0	28.0	110.0	51.0	8.0
August ...	0.79	1.158	5.9	0.88	9	2	128	71.5	57.5	119.0	132.5	105.5	30.0	94.0	62.5	71.5	5.7
September ...	0.73	2.345	6.4	3.30	10	1	138	83.0	72.0	168.5	109.0	95.0	40.5	30.0	88.5	33.5	7.9
October ...	0.75	3.059	6.0	0.76	7	1	155	95.5	53.5	78.0	109.0	148.5	89.5	38.0	78.0	54.0	8.4
November ...	0.62	4.913	5.8	0.98	7	0	207	98.5	29.5	92.5	133.5	166.0	86.0	16.0	63.5	34.5	8.8
December ...	0.70	4.888	6.4	4.35	11	0	188	51.0	41.5	66.5	117.5	190.0	121.0	77.5	51.5	27.5	9.2

Agriculture, Mining, &c.

TABLE II.—CLIMATOLOGICAL TABLE (BASED ON THE RECORDS OF THE MELBOURNE OBSERVATORY FOR THE PERIOD 1858-1902) FOR MELBOURNE.

Meteorological Elements.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	Year.
Atmospheric Pressures—	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	
Mean for each month	29·831	29·886	29·966	30·025	30·023	29·995	30·025	29·981	29·922	29·883	29·875	29·820	29·936
Highest recorded in each month	30·265	30·413	30·456	30·502	30·678	30·664	30·640	30·582	30·610	30·489	30·385	30·281	30·678
Lowest recorded in each month	29·135	29·199	29·342	29·233	29·051	29·119	29·165	29·033	29·030	29·002	29·123	28·868	28·868
Range { Average ..	0·764	0·743	0·705	0·805	0·903	0·970	0·974	0·998	0·971	0·919	0·798	0·851	1·364
{ Highest ..	1·071	0·998	1·039	1·143	1·399	1·298	1·399	1·503	1·337	1·346	1·081	1·309	1·719
{ Lowest ..	0·564	0·511	0·489	0·542	0·551	0·667	0·677	0·667	0·665	0·695	0·554	0·645	1·169
Temperature of air in Shade—	°	°	°	°	°	°	°	°	°	°	°	°	°
Mean for each month { Average ..	66·2	66·3	63·7	58·6	53·3	49·7	47·6	50·3	53·1	56·6	60·4	63·7	57·4
{ Highest ..	71·5	73·8	67·8	60·8	56·4	53·4	50·8	53·0	55·5	59·5	64·1	68·5	58·7
{ Lowest ..	60·6	62·7	59·8	54·6	50·9	46·4	45·3	47·1	50·3	53·5	56·8	57·9	56·3
Absolute Maximum for each month { Average	102·6	100·0	95·4	84·6	71·7	64·1	63·0	69·3	74·5	84·4	93·4	99·2	102·6
{ Highest	111·2	109·0	105·5	94·0	82·1	68·1	68·4	77·0	81·8	96·1	105·7	110·7	111·2
{ Lowest	94·7	89·6	86·7	74·0	66·0	57·5	58·7	61·9	71·0	73·8	83·5	86·6	96·6
Absolute Minimum for each month { Average	47·2	47·0	44·3	41·2	36·8	33·6	31·6	33·5	35·6	38·2	41·9	45·3	31·6
{ Highest	52·0	53·5	51·4	45·5	42·0	38·0	39·0	39·6	41·5	42·8	45·5	48·8	33·9
{ Lowest	42·0	40·3	37·1	34·8	31·3	28·0	27·0	28·3	32·1	32·1	36·5	40·0	27·0
Mean of daily { Average	78·1	77·8	74·7	68·6	61·4	56·9	55·5	58·8	62·6	67·0	71·3	75·4	67·3
{ Highest	85·2	86·4	79·2	73·3	67·4	61·8	58·2	61·6	65·4	71·1	78·1	81·2	69·0
{ Lowest	73·0	72·4	69·2	62·5	58·3	52·9	52·2	56·0	59·3	63·5	66·9	70·1	65·8
Mean of daily { Average	56·4	56·6	54·6	50·6	46·5	43·9	41·4	43·2	45·4	48·1	50·9	53·7	49·3
{ Highest	60·4	62·2	61·7	54·7	49·9	49·2	45·6	45·8	48·5	50·8	53·8	57·6	51·2
{ Lowest	53·2	52·5	50·3	47·4	43·4	40·7	38·8	39·7	43·1	45·4	46·6	50·4	47·2
Mean daily range in { Average	21·7	21·2	20·2	18·0	14·9	13·0	14·1	15·7	17·3	19·0	20·4	21·6	18·0
{ Highest	26·2	26·7	24·1	24·2	20·2	17·5	17·6	19·5	20·5	23·2	27·2	27·8	20·3
{ Lowest	16·8	16·4	15·9	12·4	11·1	7·7	10·3	12·7	13·7	15·6	15·1	16·2	14·6
Monthly range { Average ..	55·4	53·1	51·1	43·6	34·9	30·4	31·4	35·8	40·3	46·2	51·5	53·8	74·3
{ Highest ..	63·6	68·6	62·2	58·9	47·0	37·0	37·6	45·3	47·9	59·6	64·2	69·1	82·6
{ Lowest ..	45·2	38·4	39·6	23·8	24·8	25·3	23·4	26·0	34·6	33·4	40·9	41·9	66·0

Temperature of Air—		°	°	°	°	°	°	°	°	°	°	°	°	
Terrestrial Radiation	Average	39.6	39.3	36.6	34.7	30.8	27.7	25.7	27.5	29.5	31.4	34.9	38.1	33.0
	Highest	45.6	46.2	44.2	41.0	36.0	32.7	29.8	34.2	34.4	39.2	40.6	45.0	46.2
	Lowest	30.2	30.9	28.9	25.0	23.2	20.4	20.8	21.3	25.3	25.9	24.6	34.0	20.4
Solar Radiation	Average	158.7	155.5	150.8	140.4	127.3	116.0	117.1	125.6	133.9	142.7	149.8	153.6	139.3
	Highest	178.5	167.5	164.5	152.0	140.6	128.5	125.3	137.4	141.2	154.3	159.6	170.3	178.5
	Lowest	144.6	143.0	139.9	129.7	117.5	108.6	109.0	115.5	121.1	126.8	139.7	142.3	108.6
Monthly Amount of Registered Rainfall		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Average	1.90	1.70	2.13	2.43	2.13	2.05	1.85	1.82	2.32	2.71	2.25	2.25	25.55
	Highest	6.83	6.78	6.36	6.71	6.94	5.22	7.02	7.62	5.87	7.61	12.13	7.18	44.25
Lowest	0.04	0.03	0.16	0.57	0.45	0.60	0.49	0.79	0.61	0.28	0.25	0.17	15.61	
Number of Days of Rain Recorded in Each Month	Average	7	7	8	10	12	13	15	13	14	13	10	9	132
	Highest	14	15	19	19	20	21	20	18	22	21	16	20	165
	Lowest	1	1	3	5	6	7	7	7	8	7	3	4	102
Amount of Evaporation at a Free Water Surface for Each Month		in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
	Average	6.39	5.01	3.87	2.26	1.50	1.11	1.08	1.48	2.28	3.29	4.50	5.74	37.25
	Highest	8.33	6.38	5.15	2.99	2.69	2.31	1.66	2.11	3.23	5.80	5.79	7.50	45.65
Lowest	4.84	3.34	2.79	1.57	0.97	0.61	0.66	1.03	1.64	2.56	3.19	3.70	31.59	
Percentage of Humidity Saturation = 100	Average	64	65	68	73	79	80	80	75	72	70	67	65	72
	Highest	72	75	75	84	86	88	88	81	81	79	75	72	76
	Lowest	57	54	61	63	70	75	74	65	63	64	59	55	67
Mean Daily Amount of Cloudiness	Average	5.1	5.1	5.5	5.8	6.5	6.6	6.3	6.3	6.1	6.0	5.9	5.6	5.9
	Highest	6.7	6.8	7.4	7.7	8.0	7.7	7.5	8.0	7.4	7.1	7.2	6.9	6.4
	Lowest	3.9	3.2	3.7	3.1	4.7	3.2	5.1	4.7	5.0	4.8	4.7	3.8	5.4
Mean Daily Duration of Sunshine in Hours		h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.	h.m.
	Average	8.17	7.37	5.40	4.40	3.40	2.57	3.20	4.11	4.54	5.40	7.20	7.54	5.31
	Highest	9.57	9.12	8.19	5.56	4.59	4.5	5.16	5.32	6.21	7.18	9.1	9.57	9.57
Lowest	6.33	5.32	4.18	2.13	2.18	1.14	2.3	2.34	3.35	4.13	6.6	6.5	1.14	
Total Number of Hours of Sunshine in Each Month.	Average	257	215	176	139	114	90	104	130	149	181	198	244	1997
	Highest	309	258	241	178	154	123	164	172	191	274	266	308	2335
	Lowest	203	155	133	66	71	37	64	80	107	131	180	188	1738
Number of Days of Fog	Average	0.1	0.4	0.6	1.6	2.8	4.0	4.0	2.0	0.7	0.4	0.2	0.2	16.9
	Highest	2	3	2	7	10	14	11	8	6	2	2	4	39
	Lowest	0	0	0	0	0	0	1	0	0	0	0	0	5

Agriculture, Mining, &c.

TABLE III.

AVERAGES AND EXTREMES OF CLIMATIC ELEMENTS FOR THE SEASONS AND FOR THE YEAR DEDUCED FROM ALL RECORDS OBTAINED IN PAST YEARS AT THE MELBOURNE OBSERVATORY.

Meteorological Elements.	Spring.	Summer.	Autumn.	Winter.	Year.	
<i>Averages—</i>						
Mean pressure of air in inches ...	29·893	29·846	30·003	29·998	29·948	
Monthly range of pressure of air } Inches	0·898	0·789	0·807	0·981	0·867	
Mean temperature of air in shade. Fahr.	59·1	65·4	55·4	50·0	57·4	
Mean daily range of temperature of air in shade } Fahr.	18·9	21·6	17·7	14·3	18·0	
Mean percentage of humidity. Sat. = 100.	70	64	73	79	71	
Mean rainfall in inches ...	7·33	5·84	6·72	5·71	25·59	
Mean number of days of rain ...	37	25	30	42	132	
Mean amount of spontaneous evaporation in inches	10·07	17·17	7·63	3·63	38·31	
Mean daily amount of cloudiness } Scale 0 to 10	6·0	5·3	5·9	6·4	5·9	
Mean daily duration of sunshine ...	5 58	7 56	4 40	3 29	5 31	
Mean total No. of hours of sunshine	528	716	429	324	1997	
Percentage number of hours during which the wind blew from the various points of the compass	North ...	16·0	7·7	16·1	28·5	17·1
	North-West	9·4	4·1	7·6	13·0	8·5
	West ...	15·2	9·5	12·2	14·9	13·0
	South-West	16·8	20·4	12·6	10·8	15·2
	South ...	16·5	24·1	14·9	6·3	15·5
	South-East	9·8	19·2	14·1	5·0	12·0
	East ...	3·7	5·6	5·6	2·7	4·3
	North-East	11·2	8·1	15·2	17·3	12·9
Mean number of days of fog ...	1·3	0·7	5·0	9·9	16·9	

*Extremes—*

Pressure of air.	Inches.	Temperature of air in shade.	Fahr.
Greatest monthly range ...	1·503	Greatest monthly range ...	69·1
Smallest " " ...	0·489	Smallest " " ...	23·4
Greatest yearly range ...	1·719	Greatest yearly range ...	82·6
Smallest " " ...	1·169	Greatest mean daily range ...	27·8
Highest air pressure on record	30·678	Smallest " " " ...	7·7
Lowest " " " "	28·868	Highest temperature on record	111·2
		Lowest " " "	27·0
			Fahr.
Solar radiation—highest on record ...			178·5
Terrestrial radiation—lowest on record ...			20·4
			Inches.
Greatest rainfall on record ...			44·25
Smallest rainfall on record ...			15·61
			Miles per annum.
Horizontal motion of air average ...			92,221
			Miles.
Mean hourly velocity of wind ...			10·5



MANUFACTORIES.

The definition of a factory, according to an agreement Definition of a factory. which was arrived at by the statisticians of the several States, in a conference held at Hobart in 1902, is as follows:—"All establishments employing on the average four hands or upwards, also those with less than four hands where machinery is worked by power other than manual, making or repairing for the trade (wholesale or retail) or for export." It was further agreed that where two or more industries were carried on by one proprietor in one building, each industry, where possible, should be treated as a separate establishment. All the information on this subject which has been tabulated for the year 1902 has been prepared on this basis.

During that year the manufactories of the State were Number and classification of factories. returned as 4,003 in number; 2,211 of these were established in the metropolitan and 1,792 in country districts.

The following table shows the number of factories in each order of industry, the power used, the number of hands, and the value of machinery, plant, land, buildings, and improvements for the year 1902:—

NUMBER OF FACTORIES, &C.

Orders of Industry.	Number of Establishments.	Number using Machinery worked by—				Actual Horse-power of Engines used.			Average Number of Persons Employed.		Approximate Value of—		
		Steam.	Gas.	Oil, Electricity.	Water, Wind, Horse.	Steam.	Gas.	Oil and Electric.	Males.	Females.	Machinery and Plant in use.	Land.	Buildings and Improvements.
<i>Metropolitan District.</i>													
Foods and drinks ... ..	171	98	(7) 53	(4) 4	...	5,330	348	84	5,721	2,086	781,750	563,523	1,014,081
Textile and dress ... ..	778	(1) 23	(3) 102	(3) 46	...	1,039	698	204	5,900	15,661	246,835	531,152	501,807
Furniture ... ..	184	23	(2) 42	(1) 9	...	382	200	29	2,011	269	53,693	162,837	126,042
Building ... ..	55	22	7	3	2	1,072	61	12	1,265	7	87,58	85,954	82,303
Apparatus for transportation ...	177	16	26	5	...	710	71	15	3,048	35	231,183	110,067	626,853
Animal matters (not otherwise classed)	69	41	(1) 6	3	...	1,139	20	5	1,405	64	117,071	53,235	105,861
Wood and other vegetable substances	154	61	(1) 60	8	...	2,146	307	24	2,539	271	151,023	243,194	137,552
Oils and fats (animal and vegetable)	20	16	1	...	...	330	6	...	510	9	93,953	42,811	57,823
Metals and minerals ... ..	292	(2) 88	(1) 144	(7) 12	...	2,221	614	88	5,843	32	515,356	266,362	233,880
Gold, silver, and precious stones ...	44	2	14	7	...	7	38	23	565	30	12,813	48,726	28,139
Ceramics (not otherwise classed) ...	9	1	1	...	...	42	4	...	605	5	22,525	11,497	19,608
Production of heat, light, and energy	23	12	3	(1) 3	...	7,920	55	29	836	47	460,898	105,404	635,319
Explosives, ammunition, &c. ...	4	2	...	1	...	65	...	5	119	132	40,872	5,257	25,092
Art, science, and letters ... ..	187	6	(2) 130	(12) 30	...	381	566	137	3,910	1,156	442,782	299,875	305,201
Miscellaneous ... ..	44	(1) 20	(3) 12	(1) 2	...	659	72	208	970	405	111,633	59,633	123,099
Total ... ..	2,211	(4) 431	(20) 601	(29) 133	2	23,443	3,060	863	35,247	20,209	3,370,002	2,589,527	4,022,660

NUMBER OF FACTORIES, &c.—continued.

Orders of Industry.	Number of Establishments.	Number using Machinery worked by—				Actual Horse-power of Engines used.			Average Number of Persons Employed.		Approximate Value of—				
		Steam.	Gas.	Oil, Electricity.	Water, Wind, Horse.	Steam.	Gas.	Oil and Electric.	Males.	Females.	Machinery and Plant in use.	Land.	Buildings and Improvements.		
<i>Country Districts.</i>															
Foods and drinks ... ..	464	401	(6)	32	(9)	11	8	7,097	60	77	3,342	176	631,657	100,274	468,180
Textile and dress ... ..	255	9		8	...	...	...	1,441	51	...	1,368	2,832	192,146	91,071	143,693
Furniture ... ..	13	3		1	...	...	...	18	3	...	76	3	1,406	5,155	4,985
Building ... ..	113	27	...			3	60	539	...	26	858	29	39,258	21,960	34,175
Apparatus for transportation ...	167	26		9		3	1	149	31	6	1,528	5	36,296	55,705	71,829
Animal matters (not otherwise classed)	66	39	...			3	5	451	...	29	573	5	36,787	14,705	47,174
Wood and other vegetable substances	318	239	(1)	37		29	11	3,263	277	179	2,684	29	187,224	53,229	99,252
Oils and fats (animal and vegetable)	38	30	...			1	...	210	...	3	188	5	12,822	6,922	12,669
Metals and minerals ... ..	212	110	(1)	14		32	11	1,302	39	89	2,633	13	183,266	56,517	75,140
Gold, silver, and precious stones	6	...		1		1	1	...	3	3	21	...	775	1,113	1,290
Ceramics (not otherwise classed)	...	...		...		...	...	...	...	...	...	...	...	...	...
Production of heat, light, and energy	42	6		2	(2)	...	...	832	3	69	184	...	274,332	12,163	88,797
Explosives, ammunition, &c. ...	1	1	...		...	...	...	20	...	...	14	19	6,300	...	2,200
Art, science, and letters ... ..	94	6		50	(2)	13	1	29	105	45	919	79	108,467	35,450	52,425
Miscellaneous ... ..	3	...		...		1	...	...	...	6	23	1	1,285	1,500	1,500
<b>Total ... ..</b>	<b>1,792</b>	<b>897</b>	<b>(8)</b>	<b>154</b>	<b>(13)</b>	<b>97</b>	<b>98</b>	<b>15,351</b>	<b>572</b>	<b>532</b>	<b>14,411</b>	<b>3,196</b>	<b>1,712,021</b>	<b>455,764</b>	<b>1,103,309</b>

Manufactories.

NUMBER OF FACTORIES, &c.—*continued.*

Orders of Industry.	Number of Establishments.	Number using Machinery worked by—				Actual Horse-power of Engines used.			Average Number of persons Employed.		Approximate Value of—				
		Steam.	Gas.	Oil, Electricity.	Water, Wind, Horse.	Steam.	Gas.	Oil and Electric.	Males.	Females.	Machinery and Plant in use.	Land.	Buildings and Improvements.		
<i>State.</i>															
Foods and drinks ... ..	635	499	(13)	85	(13)	15	8	12,427	408	161	9,063	2,262	1,413,407	663,797	1,482,261
Textile and dress ... ..	1,033	(1) 32	(3)	110	(3)	46	...	2,480	749	204	7,268	18,493	438,981	622,223	645,500
Furniture ... ..	197	26	(2)	43	(1)	9	...	400	203	29	2,087	272	55,099	167,992	131,027
Building ... ..	168	49		7		6	62	1,611	61	38	2,123	36	126,843	107,914	116,478
Apparatus for transportation ...	344	42		35		8	1	859	102	21	4,576	40	267,479	165,772	98,682
Animal matters (not otherwise classed)	135	80	(1)	6		6	5	1,590	20	34	1,978	69	153,858	67,940	153,035
Wood and other vegetable substances	472	300	(2)	97		37	11	5,409	584	203	5,223	300	338,247	296,423	236,804
Oils and fats (animal and vegetable)	58	46		1		1	...	540	6	3	698	14	106,775	49,733	70,492
Metals and minerals ... ..	504	(2) 198	(2)	158	(7)	44	11	3,523	653	177	8,476	45	698,622	322,879	309,020
Gold, silver, and precious stones	50	2		15		8	1	7	41	26	586	30	13,618	49,839	29,429
Ceramics (not otherwise classed)	9	1		1	...	...	...	42	4	...	605	5	22,525	11,497	19,608
Production of heat, light, and energy	65	18		5	(3)	3	...	8,752	58	98	1,020	47	735,230	117,567	724,116
Explosives, ammunition, &c. ...	5	3	...	...		1	...	85	...	5	133	151	47,172	5,257	27,292
Art, science, and letters ... ..	281	12	(2)	180	(14)	43	1	410	671	182	4,829	1,235	551,249	335,325	357,626
Miscellaneous ... ..	47	(1) 20	(3)	12	(1)	3	...	659	72	214	993	406	112,918	61,133	124,599
<b>Total ... ..</b>	<b>4,003</b>	<b>(4) 1,328</b>	<b>(28)</b>	<b>755</b>	<b>(42)</b>	<b>230</b>	<b>100</b>	<b>38,794</b>	<b>3,632</b>	<b>1,395</b>	<b>49,658</b>	<b>23,405</b>	<b>5,082,023</b>	<b>3,045,291</b>	<b>5,125,969</b>

NOTE.—The figures in parentheses indicate engines worked in conjunction with those of a different description. The factories are divided into two large classes—those connected with the treatment of raw material (567) and those dealing with finished articles (3,436). The various sub-orders of these classes will be found in Part VII. of the Statistical Register for the year 1902.

Their classification according to the number of hands employed was:—

Classification	Number of factories	Number of hands
Under 4 hands	525	1,636
4 hands	398	1,603
5 to 10 hands	1,629	11,303
11 to 20 "	726	10,562
21 to 50 "	467	14,361
51 to 100 "	148	10,238
101 and upwards	110	23,360
<b>Total</b>	<b>4,003</b>	<b>73,063</b>

Classification according to hands employed.

Of those employed in factories with under 4 hands, 389 were employed in connexion with creameries.

Of the 73,063 hands employed, 49,658 were males, and 23,405 were females, and are described as follows:—

Working proprietors, managers, and overseers	5,427 men and 813 women
Accountants and clerks	1,987 " 283 "
Workers in factories	36,245 " 20,947 "
" at home	92 " 1,228 "
Engine drivers and firemen	1,555 " —
Carters and messengers	2,767 " —
All others	1,585 " 134 "

The following is a summary of the manufactories and works, as returned for each of the years, 1898 to 1902:—

Return of factories and works for five years.

Year.	Number of Factories.	Power Employed.				Actual Horse-Power of Engines Used.
		Steam.	Gas.	Electric, Oil, Water, Wind, or Horse.	Manual.	
1898	2,869	1,247	531	119	972	30,853
1899	3,027	1,267	603	135	1,022	33,046
1900	3,097	1,260	637	137	1,063	33,410
1901	3,249	1,282	689	160	1,118	34,548
1902	4,003	1,328	755	330	1,590	43,821

Year.	Hands employed.			Approximate Value of—		
	Males.	Females.	Total.	Machinery and Plant.	Land.	Buildings and Improvements.
1898	40,631	14,147	54,778	£ 4,500,727	£ 2,968,331	£ 4,408,227
1899	44,041	16,029	60,070	£ 4,632,629	£ 2,867,413	£ 4,471,698
1900	45,794	18,413	64,207	£ 4,710,834	£ 2,591,653	£ 4,592,462
1901	47,059	19,470	66,529	£ 4,847,130	£ 2,711,990	£ 4,739,380
1902	49,658	23,405	73,063	£ 5,082,023	£ 3,045,291	£ 5,125,969

The statistics for the year 1902 were collected for the first time by the police, under the direct supervision of the Statist. The list of the manufacturers as returned was compared with and supplemented from the list of the Chief Inspector of Factories, which was available for the first time this year.



Heretofore this information was procured through the municipal authorities, and the large increase in the number of factories returned for 1902 is mainly due to the new and more thorough system of collection made by the police, to the inclusion of cyanide works, and of establishments where the principal work done was repairing. These works (cyanide and repairing) were included amongst the factories in Victoria for the first time this year, in accordance with resolutions passed at the conference of statisticians previously referred to. The addition, 754 new works, naturally caused a large increase in the total engine power employed, and increases the approximate value of the machinery, plant, land, buildings, and improvements from £12,298,500 in 1901 to £13,253,283 in 1902.

Although the number of these establishments decreased from 102 in 1898 to 95 in 1902, yet the horse-power of the engines used increased from 921 to 1,049 during the same period, whilst the number of hands employed decreased from 1,766 to 1,635. The approximate values of the machinery, plant, land, buildings, and improvements during the same period were:—

Year.	Approximate Value of—		
	Machinery and Plant in Use.	Land.	Buildings and Improvements.
	£	£	£
1898 ... ..	90,037	46,738	111,804
1899 ... ..	87,120	43,040	111,160
1900 ... ..	91,530	51,250	117,960
1901 ... ..	99,710	47,750	98,950
1902 ... ..	103,329	54,179	104,114

It is satisfactory to note that the machinery, &c., connected with this industry continues to increase in value, notwithstanding the decrease in the number of establishments in operation for the past year. The output was:—

Year.	Number Tanned of—			Sheepskins Stripped.	Wool Washed.
	Hides.	Calf Skins.	Sheep and Other Skins.		
	No.	No.	No.	No.	lbs.
1898 ... ..	400,262	177,739	1,271,960	1,455,674	7,545,066
1899 ... ..	430,809	197,514	1,280,722	1,395,626	6,918,572
1900 ... ..	500,549	165,802	1,395,600	1,431,811	6,866,383
1901 ... ..	406,260	181,522	676,930	615,614	8,511,171
1902 ... ..	424,786	189,886	313,166	453,660	5,279,916

Tanneries,  
fell-  
mongeries,  
and wool-  
washing  
establish-  
ments.

The columns "Hides" and "Calf Skins" include the number of skins dealt with in small tanneries; but these are not included in the regular lists.

Of the 5,279,916 lbs. of wool washed in 1902, there were 2,620,897 lbs., valued at £125,512, exported, principally to the United Kingdom, the balance being treated in the State woollen mills, or on hand in these mills, or in private wool stores at the end of the year.

The leather of all kinds exported amounted to 43,941 cwt., and was valued at £237,391. Of this, more than half was exported to the United Kingdom.

Forest saw-mills were established for the purpose of cutting native timber at or near the place where it is grown. The number of these mills increased during the last five years from 107 in 1898 to 124 in 1902, the horse-power of the engines used from 1,492 to 1,773, and the hands employed from 1,302 to 1,467. The maximum number of hands (1,593) was employed in 1901. The approximate value of machinery, plant, land, buildings, improvements, together with the quantity and value of timber sawn during the last five years appears in the following statement:—

Year.	Approximate Value of—			Timber Sawn.	
	Machinery and Plant in use.	Land.	Buildings and Improvements.	Quantity.	Value.
	£	£	£	Super ft.	£
1898 ...	89,420	7,545	30,271	37,698,486	104,734
1899 ...	101,880	7,510	27,670	40,716,500	107,938
1900 ...	104,500	7,520	27,350	44,782,330	125,121
1901 ...	91,810	6,170	13,500	46,495,885	134,310
1902 ...	81,898	6,380	11,854	40,494,660	128,430

The result of the milling work of 1902 does not compare favourably with that of previous years, and this is to some extent accounted for by a large increase in the quantity of imported timber in the rough from £306,000 worth in 1900 to £317,900 worth in 1901, and to £357,000 worth in 1902, also to the falling off in the building trade since 1900, which would naturally leave large stocks of rough timber on the hands of the timber merchants throughout the State. The opening of the Victorian markets to the timbers of other States since federation would no doubt also slightly contribute to this result.

In all probability this industry will further decline in the future, as the facilities heretofore granted to saw-millers to

enter upon Crown lands, cut down timber, and establish mills, must of necessity be extensively curtailed in the interests of forest conservation, and the preservation of a large selection of indigenous trees, shrubs, and plants which otherwise may possibly be eradicated.

Forest con-  
servation.

The area of the forest reserves is becoming so curtailed year after year by alienation, that it will not be possible to continue to grant licences for timber cutting, except under the most stringent conditions, and then only to a limited extent.

A greater danger than even the saw-mill industry is that which has been brought about in the past by the entrance of splitters upon the reserves. These men cut down the trees in ruthless fashion, and were altogether regardless of any precautions that might have been taken, and heedless of any safeguards that might have been effective in saving the forests. The danger from fire is also very great. Large areas of valuable timber are destroyed or damaged by the spread of extensive fires in the hot season. Many of these are unquestionably due to the carelessness of settlers in clearing their land, and of timber-getters in leaving their camp fires unextinguished. The danger will only be completely met when the punishment meted out to those who use fire carelessly is adequate to administer an effective check. In regard to the splitters, an important advance has been made during the past year in the working of the more valuable forests by the abolition of timber-cutters' licences and the substitution of personal permits for a fixed quantity of timber, and a specific class of tree. Stringent conditions are embodied in these permits, which are in the form of an agreement between the Crown and the holder, and can be revoked or suspended at the pleasure of the Conservator for any serious breach of the forest regulations.

It must be remembered that the climatic conditions which aid the increase and development of population are also most favourable to the growth of trees. Yet, with the advent of man into a new country, it must perforce lose its forests. The wood is necessary for fuel, for commercial purposes, for building and fencing, and for mining and railway development; whilst the land is required for cities, and markets, and manufactories, and the roads thereto, and for the cultivation of agricultural produce.

The use of forest timber in new countries is, therefore, a necessity of the situation; but the removal of the trees should be so carried out as to ensure not only the economical harvesting of the forest produce, but also the other advantages that follow therefrom.

There is little doubt as to the advantages in regard to climate of the presence of forests. Their influence on rainfall has been disputed, because it is asserted that the conditions upon which the amount of rain depends are not changed by the existence of forests. These conditions are the presence of oceans and seas, the degree of heat, and the rapidity with which the air moves over the surface of the waters. Air currents blowing landwards are year by year charged with the same amount of moisture, which precipitates as soon as the air is cooled below the point of saturation. It is argued that if the forests cause the precipitation, the regions behind are deprived of rain, because the air-currents which reach them are dry and unable to yield a further supply of water.

Forests—  
influence  
on rainfall

But this argument does not take into account the re-evaporation of moisture which the rain precipitates on the land, and which is very great from lakes and streams, as well as from the soil, and from the crowns of trees. Many instances can be given, not only of the baneful effects of the destruction of forests, but also of the benefits of re-afforestation. There is abundant historical evidence that in past centuries the destruction of the forests in many of the countries bordering the Mediterranean, such as Palestine, Asia Minor, Greece, Dalmatia, Italy, Sicily, Spain, and Northern Africa, was followed by marked changes in the climate, by periods of drought and flood, and by the desiccation and erosion of the soil, accompanied by loss or diminution of fertility. In Victoria the difference of rainfall in open, treeless districts, and that in thickly-clad forest regions, has been considerable, the average in the latter districts being much higher than in the former. In 1898 the Royal Commission on State Forests and Timber Reserves, from whose reports the principal facts here given are abridged, made enquiries from the various municipalities as to the effect upon the water supply in their districts, of forest clearing by settlers. In general, the answers showed that there had been a considerable diminution in the volume of water in the rivers and creeks, only a small number of districts being unaffected.

For, that one direct result of the destruction of forests is the drying up of water courses, there is no difference of opinion. The deep absorbent mould of a forest area, protected by the branches and leaves of the trees from the direct action of the sun, is a splendid receptacle for the rain-water, which it gives out again in small streams and springs. The supply for the lowlands is thus regulated by the tree-clad area, and the waste of water by its outpouring in torrents and freshets is prevented, and alternations of drought and flood checked.

The presence of forests also regulates the temperature, preventing sudden changes, and the occurrence of severe frosts and hail storms consequent upon them.

State forests  
—area and  
timbers.

The past history and present position of forestry in Victoria are as follow:—The area of Victoria is 56,245,760 acres, of which the forest area is about 11,797,000 acres, consisting of inaccessible mountain country and of proposed or existing reserves. The area of existing State forest reserves is only 4,341,248 acres, that of timber reserves only 338,292 acres, the two together making a total of 4,679,540 acres available for State forestry purposes. The difference between this total and the 11,797,000 acres of forest being the area of practically inaccessible mountain ranges, where economic forestry is rendered difficult. The most important timber trees in the reserves are—(1) river red gum, of which the supply on Crown reserves is very limited, being principally confined to Barmah and Gunbower forests, on the Murray; (2) red ironbark, whose product is chiefly supplied from trees of small size, the mature forests having been largely cut out; (3) grey box, which is the principal firewood for the metropolis, and flourishes in the north-eastern district, in South Gippsland, and in the easternmost portion of the State; (4) yellow stringybark, luxuriant in South Gippsland; (5) blue gum, growing chiefly in the Mount Cole reserves, Otway forest, and Western and Southern Gippsland; (6) spotted gum; (7) yellow box; and (8) messmate, which cover wide areas in various parts of the State; (9) stringybark, flourishing in the northern and north-eastern districts, and in the Yarra watershed; (10) blackbutt, found in the forests along the seaboard; (11) silvertop, an alpine and mountain-range production; (12) cypress pine, growing on the sandy and loamy ridges and hills in the Murray district, and the Mallee; (13) blackwood, a valuable fine-grained timber, attaining its best development in Southern and Western Gippsland, and in the Otway forest; and (14) evergreen beech, covering large areas in the Otway forest, and also found in the mountainous parts of Gippsland and the Yarra watershed. These two latter timbers, together with sassafras, satin box, sycamore, olive and pencil wood, found usually under high forest, are those principally used for household furniture and cabinet work generally, and for carving, veneering, and picture-frame making.

Forest  
legislation.

From 1876 efforts at forest legislation have been made, but the necessities of the situation have not yet been met. In the year named, a short Forest Act provided for the creation of local forest boards. In 1879, 1881, 1887, and 1892, Bills were introduced to deal with the subject, but not one of them became law. The only forest legislation is that contained in the "Land Act 1901," which, after empowering the



Governor-in-Council to set aside and withdraw from settlement temporarily or permanently reserves of timber for sawing or splitting purposes, and reserves for the growth and preservation of timber, and to except lands or any portion thereof from occupation for business or residential or mining purposes, forbids the alienation of State forests or timber reserves, but permits the latter reserves when denuded of timber to be added to other classes of land which may be alienated or occupied for settlement. But another section gives the Governor-in-Council power to increase or diminish the area of land under these headings, and thereby nullifies the protective effect of the sections which forbid the alienation. The maintenance of all such areas, except those proclaimed as permanent reserves, is thus endangered.

Considering the unsatisfactory position occupied by forestry in Victoria, where the only protection is that afforded by a department whose policy in general is to open all lands to settlers as quickly and as freely as possible, it must be observed that the issue of every licence to cut timber in the State reserves is, more or less, a menace to forest preservation. In many districts the supply for fuel is totally insufficient to meet the home consumption. Extensive areas of the best natural forest country, such as the slopes of the Dividing Range, have long since passed from the Crown. In 1888 a Conservator of Forests was appointed, but little attention was paid to his oft-repeated warnings. Supervision has, however, been exercised by his officers, who have striven to preserve intact those limited areas which the utter neglect of forestry has now left to the State.

After a thorough investigation of the whole subject, the Royal Commission came to the conclusion that a high standard of forestry could not be successfully established until the reserves were declared inalienable by Act of Parliament, and the control and administration of the forests removed from political interference and vested in an independent Conservancy Board. In order that there might be no undue delay in carrying out this great reform they drafted, in 1901, a comprehensive Forests Bill providing for the delimitation and permanent tenure of all reserves, the protection under tree cover of all mountain watersheds and lake and river frontages, the proper regulation of timber cutting on unreserved Crown lands, the encouragement of tree planting on denuded areas, the granting of larger protective powers to the Conservator and his staff, and the institution of reasonable penalties for grave breaches of the law. Provision was also made for the establishment of an effective system of fire protection. The Bill has been highly commended as essential to the foundation of an intelligent forestry policy by competent authorities in Victoria and the

Forest con-  
servation—  
Royal Com-  
mission.

neighbouring States to whom it has been submitted, but owing to a press of other new legislation it has not yet been dealt with by Parliament.

While the Governments of all the great nations of the world have seen the necessity of forest conservation, and of re-forestation large areas for the general purposes of forestry, the Government of Victoria has in the past done very little. Something less than a thousand acres were enclosed along the lower slopes of the You Yangs, and planted with eucalypts and conifers for timber, and with wattles for bark. Minor plantations exist at Sawpit Gully (Dividing Range), Havelock, Majorca, and Macedon. There are also two forest nurseries situated at Macedon and Creswick, which have lately been extended.

The timber plantations at You Yangs, Creswick, and Majorca have also been extended, and new plantations of the best varieties of wattle for the production of bark for tanning purposes have been formed. No forest produce yields such a good return to the State as wattle, the royalties for the stripping rights ranging from £2 10s. to £5 10s. per ton, according to the distance from the chief tanning centres. As a rule, the bark is fit for a first stripping in the sixth year after the trees are planted, but the main yield is obtained in the seventh and eighth years.

The evils of destruction, to which reference has been made, might have been to some extent mitigated by planting trees in areas where cereals do not thrive, because of poor or thin soil or excessive rainfall. There are many such areas in the neighbourhood of towns and cities, and even in agricultural districts, where trees might have been advantageously planted, and forests reserved. Unfortunately, even these areas have passed from the Crown, but doubtless suitable arrangements are possible whereby the present owners can be induced to establish plantations. There are still, however, in many parts of Victoria, unappropriated areas, on the tops and slopes of hills and mountains, and on the steep sides of river banks,

which may be reserved for forests, and planted with tree-stocks.

A lively sense of the irreparable injuries that result from the despoliation of forest areas should induce extreme caution in the further alienation of these lands.

The establishments connected with this industry increased from 24 in 1897 to 28 in 1902, and the number of hands employed from 204 in 1897 to 285 in 1902. The approximate value of machinery and plant increased from £15,750 to £29,611, and the weight of bacon and hams from 7,248,049 lbs. to 11,702,322 lbs. during the same period. Bacon and ham curing.

The following gives details of the industry between 1898 and 1902: —

Year.	Approximate Value of—			Pigs Slaughtered for Curing.	Weight of Bacon and Hams Cured.
	Machinery and Plant.	Land.	Buildings and Improvements		
	£.	£	£	No.	lbs.
1898 ...	18,250	5,730	18,950	69,140	7,135,740
1899 ...	24,265	6,870	22,205	83,661	8,895,122
1900 ...	23,210	7,680	25,200	109,619	10,267,778
1901 ...	27,900	8,690	27,670	112,428	11,696,710
1902 ...	29,611	9,231	30,625	114,539	11,702,322

NOTE.—The columns, "Pigs Slaughtered" and "Weight of Bacon and Ham Cured," include the number and quantity dealt with in small factories. These are not included in the regular list.

In addition, the following quantities of bacon and hams were returned as having been cured on farms, viz.:—1,795,372 lbs. in 1898, 2,081,192 lbs. in 1899, 2,936,769 lbs. in 1900, 3,314,906 lbs. in 1901, and 2,736,048 lbs. in 1902.

Of the 11,702,322 lbs. of bacon and hams cured in 1902, 3,387,411 lbs., valued at £129,817, were exported, principally to Western Australia. Export of bacon and hams.

The number of butter and cheese factories, exclusive of creameries, was 211 in 1902. The great majority of these employed steam power. There was a decrease of 7 from the previous year, but an increase of 102, or nearly 100 per cent., during the last ten years. Of the factories in operation in Butter and cheese factories.

1902, 177 made butter, 8 made butter and cheese, and 26 made cheese only. The number of creameries was first recorded in 1895, when there were 284. In 1902 there were 334, the maximum number being 399 in 1900. From 1898 to 1902 the horse-power of the engines used increased from 2,666 to 3,759, the number of hands employed from 1,220 to 1,403, the approximate value of machinery, plant, land, buildings, and improvements from £446,135 to £547,775. The quantity of milk received at the factories and creameries increased from 77,520,000 gallons in 1895—the first year in which a record was kept—to 80,621,245 gallons in 1902. In 1900, the return was 116,220,239 gallons—the maximum quantity received.

The output from butter and cheese factories during the last five years was:—

Year.	Butter.	Cream Sold.	Cheese.	Concentrated Milk Made.
	lbs.	gallons.	lbs.	gallons.
1898 ...	26,886,860	39,277	2,289,170	164,817
1899 ...	45,878,459	62,493	2,373,178	205,888
1900 ...	48,839,996	38,274	2,508,843	263,138
1901 ...	40,824,928	50,092	2,073,940	266,083
1902 ...	32,927,546	23,739	2,128,835	243,904

Butter and cheese made on farms.

In addition to the quantity of butter and cheese made in the factories, the following quantities were returned as having been made on farms, viz.:—Butter, 7,193,450 lbs. in 1898, 7,449,126 lbs. in 1899, 6,764,122 lbs. in 1900, 6,032,644 lbs. in 1901, and 6,300,208 lbs. in 1902; cheese, 2,108,199 lbs. in 1898, 2,139,528 lbs. in 1899, 1,775,327 lbs. in 1900, 1,900,728 lbs. in 1901, and 1,720,726 lbs. in 1902.

Butter and cheese made in factories and on farms.

Taking the returns of butter from all sources, the largest quantity, 55,604,118 lbs., was made in 1900. The largest quantity of cheese, 5,052,782 lbs., was made in 1895. The figures under this head have undergone only a slight variation during the last ten years, the lowest during that period being in 1893, when the return was 3,748,555 lbs.

Export of butter.

Of the total quantity of butter made in factories and on farms, 39,227,754 lbs., 15,040,029 lbs., valued at £769,811, were

exported, principally to the other Australian States and South Africa.

The total quantity of cheese made in factories and on farms was 3,849,561 lbs., of which 797,438 lbs., valued at £26,978, were exported, principally to Queensland and New South Wales. Export of cheese.

The number of works for freezing and preserving meat increased from 6 in 1895 to 15 in 1902, the horse-power from 529 to 825, and the number of hands from 238 to 598. The approximate value of machinery, plant, land, buildings, and improvements shows an increase of £25,040 in the same period. Meat freezing and preserving works.  
The output was:—

Year.	Frozen.			
	Sheep.	Cattle.	Rabbits.	Poultry.
	No.	Qrs.	No.	No.
1898 ... ..	215,639	398	3,014,240	22,962
1899 ... ..	475,579	9,608	4,477,866	5,405
1900 ... ..	437,242	16,096	4,840,128	44,050
1901 ... ..	417,721	6,395	3,990,460	71,490
1902 ... ..	375,178	1,388	6,218,422	34,228

  

Year.	Preserved.			
	Beef.	Mutton.	Rabbits.	Fish.
	Cwt.	Cwt.	Cwt.	Cwt.
1898 ... ..	349	2,790	22,687	2,381
1899 ... ..	608	4,277	34,144	6
1900 ... ..	5,593	2,198	24,874	831
1901 ... ..	3,304	2,417	26,303	1,140
1902 ... ..	7,705	14,913	16,537	2,134

The quantity of Victorian frozen mutton exported in 1902 was 13,320,200 lbs., valued at £185,539, of which nearly 55 per cent. was sent to the United Kingdom, and the greater portion of the balance to South Africa. The quantity of frozen beef exported was 583,500 lbs., valued at £10,135. The value of frozen poultry and game exported was £18,821. The number of pairs of frozen rabbits and hares exported was 3,274,210, valued at £160,445, 98 per cent. of which was sent to the United Kingdom. The export of preserved rabbits was 977,835 lbs., and its value was £13,528. Export of frozen meat.



## MEAT FREEZING AND PRESERVING.

BY A. A. BROWN, ESQ., M.B., B.S., INSPECTOR OF FOOD FOR EXPORT,  
DEPARTMENT OF AGRICULTURE.

Meat products, frozen and canned in Victoria, find their way to different parts of the world. Government supervision is exercised over slaughtering establishments and canneries where meats are prepared for export, and no unsound carcase is passed for export, and no meat from such a carcase or that has undergone any putrefactive change is permitted to be canned. Before any meat product can be placed on board a vessel for exportation beyond Australia, the consignor must make a declaration that it has been derived from healthy sources, and an expert Government official makes a careful examination before it is placed on board ship.

The fecundity of the rabbit in Victoria is marvellous, and its extermination has now become a matter of impossibility. The export trade in frozen and canned rabbits has converted what otherwise would be a serious pest into a commodity of considerable commercial value.

The rabbits of Victoria are singularly free from bacterial diseases, and the only parasitic diseases are Coccidiosis (*Coccidium Oviforme*) and Hydatids (*Cysticercus Pisiformis*).

Flour mills.

These mills decreased in number by 10 and the number of hands by 101 since 1898, whilst an increase of 314 took place in the horse-power of the engines. The approximate values of machinery, plant, land, buildings, and improvements, the wheat operated on for flour, and the quantity of flour made during the last five years, were as follow:—

Year.	Approximate Value of—			Wheat Operated on for Flour.	Flour Made.
	Machinery and Plant.	Land.	Buildings and Improvements.		
	£	£	£	bushels.	tons.
1898	295,135	60,515	185,520	7,947,381	154,722
1899	304,365	62,885	186,070	9,139,289	184,835
1900	297,880	74,442	184,470	8,387,323	169,739
1901	280,130	70,530	175,520	9,482,175	190,845
1902	256,980	76,121	171,125	8,491,224	170,696

The exports of produce from flour mills were:—

Flour, 44,783,700 lbs., valued at, £179,293.  
Bran, 17,648,500 lbs. „ £51,226  
Pollard, 4,439,800 lbs. „ £13,408

The two sugar refineries working in 1902 employed steam engines of 424 horse-power and 346 hands, treated 952,801 cwt. of raw (cane) sugar, and produced 879,521 cwt. of refined sugar, and 51,052 cwt. of refined treacle. The value of the machinery, plant, land, buildings, and improvements was returned at £168,500. Although there is one factory less in 1902 than in 1898, the horse-power of the engines is about the same, while the hands employed increased by 22. The output of sugar was less by 11,359 cwt., but that of treacle increased by 12,748 cwt. The value of the machinery, &c., increased by £35,670.

Sugar refineries.

The number of breweries in 1902, 44, was seven less than in 1898, but the number of hands employed increased from 1,088 to 1,112. The approximate value of the machinery, plant, land, buildings, and improvements, the quantities of materials used, and the beer made during the last five years, were:—

Breweries.

Year.	Approximate Value of—			Materials Used—			Beer Made.
	Machinery and Plant.	Land.	Buildings and Improvements.	Sugar.	Malt.	Hops.	
	£	£	£	cwt.	bushels.	lbs.	gallons.
1898 ...	177,265	447,185	282,085	109,853	606,503	713,230	15,400,017
1899 ...	189,590	447,885	281,265	109,881	595,149	676,959	15,326,289
1900 ...	204,840	230,530	269,410	111,863	598,094	648,648	16,162,550
1901 ...	212,280	236,310	271,600	113,686	608,445	650,214	16,563,068
1902 ...	211,036	228,990	273,325	115,258	625,441	677,262	17,162,680

NOTE.—The columns under "Materials Used" and "Beer Made" include those of small breweries, not included in the regular list.

The distilleries decreased from 10 in 1898 to 9 in 1902, the hands from 138 to 73, the estimated value of machinery, plant, land, buildings, and improvements from £154,990 to £147,644, whilst the horse-power of the engines increased from 170 to 198. The materials used in the manufacture of spirits were:—

Distilleries.

Year.	Wine.	Malt.	Wheat.	Maize.	Other Grain.	Sugar and Molasses.	Beer.
	Gallons.	Bushels.	Bushels.	Bushels.	Bushels.	lbs.	Gallons.
1898 ...	350,956	46,177	...	...	1,963	5,178,880	1,000
1899 ...	160,798	84,558	3,129	...	112	5,344,640	...
1900 ...	160,301	91,223	2,353	3,692	26	4,652,480	...
1901 ...	148,584	123,394	1,541	16,000	2,464	2,853,760	2,265
1902 ...	128,272	16,744	87	11,880	2,507	1,780,016	...

Spirits made by vine-growers for fortifying wine are not included in the previous table. The following quantities were

distilled during the last five years in vineyards for that purpose:—38,885 gallons in 1898, 42,625 gallons in 1899, 30,554 gallons in 1900, 38,058 gallons in 1901, and 49,867 gallons in 1902. The following are the quantities of Victorian spirits consumed (i.e., duty paid) in the years named:—192,770 gallons in 1898, 204,637 gallons in 1899, 194,345 gallons in 1900, 297,486 gallons in 1901, and 234,986 gallons in 1902.

Tobacco, &c.  
manufac-  
tories.

These decreased from 14 in 1898 to 13 in 1902, but there was an increase in the horse-power of the engines from 99 to 154, in the number of hands employed from 764 to 1,293, and in the value of machinery, plant, land, buildings, and improvements from £154,950 to £176,531. The quantity of material used and the output from 1898 to 1902 were:—

Year.	Manufactured Leaf.			Quantity Manufactured of—			
	Imported Duty Paid.	Operated on.		Tobacco.	Snuff.	Cigars.	Cigarettes.
		Imported.	Colonial.				
	lbs.	lbs.	lbs.	lbs.	lbs.	No.	No.
1898	970,382	1,080,580	386,148	1,066,003	1,300	8,963,737	84,149,770
1899	1,246,582	1,309,067	306,728	1,191,327	782	9,639,992	85,055,431
1900	1,743,280	1,661,632	276,407	1,722,236	794	11,584,442	111,010,705
1901	2,742,653	2,542,580	230,113	2,365,831	1,133	13,025,840	125,693,600
1902	969,602	1,379,905	205,434	1,630,510	550	11,936,455	100,817,104

The total production and consumption of tobacco, duty paid, for the same period were:—

Year.	Total (Tobacco, Cigars, Cigarettes and Snuff) Made in State, Excise Duty Paid.	Imported Manu- factured Tobacco, Duty Paid.	Total Consumption.	
			Quantity.	Average per Head.
	lbs.	lbs.	lbs.	lbs.
1898	1,287,946	1,115,076	2,403,022	2·03
1899	1,456,102	1,036,777	2,492,879	2·10
1900	1,803,550	878,473	2,682,023	2·25
1901	2,658,899	931,296	3,590,195	2·98
1902	1,653,170	552,611	2,205,781	1·83

In anticipation of the increased duty which operated in the latter part of 1901, a large quantity of tobacco was withdrawn from bond, and the amount of excise paid was consequently much larger than in previous years. Hence the consumption

per head that year appears to be higher, and in the following year lower than the real average.

These mills increased from 8 in 1898 to 10 in 1902. They were situated, one in each of the following municipalities:— Ballarat East, Castlemaine, Collingwood, Footscray, Williamstown, and Bungaree Shire, and two in each of the municipalities of Geelong, and Newton and Chilwell. The horse-power of the engines increased from 770 to 1,716, the number of hands from 813 to 1,122, and the approximate value of the machinery, plant, land, buildings, and improvements from £219,515 to £289,645, during the same period. The quantities of wool and cotton used, and of goods manufactured, were:—

Woollen mills.

Year.	Quantity of Scoured Wool Used.	Quantity of Cotton Used.	Goods Manufactured—			
			Tweed and Cloth.	Flannel.	Blankets.	Shawls and Rugs.
	lbs	lbs.	yards.	yards.	No. of pairs.	No.
1898 ...	1,317,953	188,000	988,067	1,031,914	23,872	2,375
1899 ...	1,634,680	154,388	1,051,832	1,108,183	33,427	3,200
1900 ...	1,831,000	178,332	971,267	1,596,120	56,340	3,500
1901 ...	2,023,509	250,184	818,975	2,229,617	49,302	4,600
1902 ...	2,149,897	273,335	708,749	2,612,343	67,609	5,718

These factories increased from 89 in 1898 to 132 in 1902, the horse-power of the engines from 282 to 461, the number of hands from 4,019 to 5,101, and the approximate value of machinery, plant, land, buildings, and improvements from £179,945 to £223,290. The following are the quantities of goods manufactured each year from 1898 to 1902:—

Boot factories.

Year.	Goods Manufactured—		
	Boots and Shoes.	Boot and Shoe Uppers for other than Factory use.	Slippers.
	No. of pairs.	No. of pairs.	No. of pairs.
1898 ...	2,611,532	53,812	95,600
1899 ...	2,929,011	50,673	96,976
1900 ...	3,446,809	18,639	66,740
1901 ...	3,125,799	66,057	92,174
1902 ...	3,613,487	72,391	216,483

NOTE.—The number of slippers returned for 1902 includes canvas shoes and house-boots, which were not returned previous to this year.

The export of boots and shoes is mainly to the neighbouring States. The quantity exported in 1902 was 757,492 pairs, and their value £186,224.

Brickyards  
and  
potteries.

The brickyards increased since 1898 from 94 to 107, the horse-power of the engines from 856 to 1,066, the number of hands from 1,105 to 1,451, and the approximate value of machinery, plant, land, buildings, and improvements from £212,580 to £248,186.

The number of bricks made, and the value of pottery and of pipes and tiles manufactured during the same period, were returned as follow:—

Year.	Number of Bricks Made.	Value of—	
		Pottery.	Pipes and Tiles.
		£	£
1898 ...	64,511,000	36,315	25,746
1899 ...	82,751,200	51,538	27,515
1900 ...	85,387,275	55,751	19,870
1901 ...	86,769,000	73,060	23,695
1902 ...	92,503,080	71,074	27,289

NOTE.—The number of bricks includes those made in small brick-yards.

Soap and  
candle  
works.

The number of soap and candle works was the same in 1902 as in 1898, viz., 22, but there were 26 in operation in 1901. Between the years 1898 and 1902 the horse-power of engines decreased from 540 (including the power of boilers in one large factory) to 290, but the hands employed increased from 425 to 486. The estimated value of machinery, plant, land, buildings, and improvements decreased steadily since 1898, but on the other hand the quantity of soap and candles shows a substantial increase, as will be seen by reference to the figures below:—

Year.	Approximate Value of—			Products Made.	
	Machinery and Plant in Use.	Land.	Buildings and Improvements.	Soap. (Including that made in small Factories.)	Candles.
	£	£	£	Cwt	Cwt.
1898 ...	100,105	48,865	66,700	128,000	41,907
1899 ...	105,145	48,950	67,590	136,424	45,848
1900 ...	95,114	42,675	58,049	133,678	46,624
1901 ...	97,260	42,870	60,940	143,140	47,313
1902 ...	91,325	39,967	56,852	165,188	49,406



The export of common soap in 1902 was 2,110,612 lbs., and its value was £17,794. The export of candles was 793,919 lbs., valued at £17,222.

The number of electric light works decreased from 10 in 1898 to 7 in 1902 (due to amalgamation of works in the city of Melbourne); the horse-power of the engines increased from 4,402 to 7,178; but on the other hand the number of hands employed decreased from 158 to 147, the maximum number employed being 199 in 1901. The approximate value of machinery, plant, land, buildings, and improvements, also the quantity of electricity supplied, are set forth in the following table for the period under review:—

Year.	Approximate Value of—			Electricity Supplied.
	Machinery and Plant.	Land.	Buildings and Improvements.	
	£	£	£	British Units.
1898 ...	156,570	16,300	37,920	4,507,176
1899 ...	152,780	16,200	37,720	4,505,351
1900 ...	145,580	16,060	37,700	6,100,519
1901 ...	220,690	15,240	86,730	6,680,214
1902 ...	204,022	10,000	67,661	6,450,560

Forty-seven gasworks were in operation in 1902, and 46 in 1898. An increase from 350 to 543 took place in the horse-power of engines in use, and from 680 to 758 in the number of hands employed. In the value of machinery, plant, and buildings, and improvements, however, a reduction from £1,230,663 to £1,201,794 is reported for the same period.

The quantities of coal used, of gas made, and of coke produced, during the period under review, are shown hereunder:—

Year.	Coal Used.	Gas Made.	Coke Produced.
	Tons.	Cubic Feet.	Tons.
1898 ...	142,411	1,457,948,000	74,778
1899 ...	149,733	1,477,450,400	75,603
1900 ...	153,455	1,516,531,100	77,255
1901 ...	159,374	1,567,649,380	84,546
1902 ...	169,356	1,642,652,799	92,308

The number of stone quarries (including stone crushing works) increased from 52 in 1898 to 79 in 1902, the horse-power of the engines from 113 to 210, the number of hands

employed from 280 to 567, and the approximate value of machinery, plant, land, buildings, and improvements from £28,135 to £39,314 during the same period. The quantity and value of stone raised for the years 1898 to 1902 are set forth in the following table:—

Year.	Quantity of Stone Operated on—			Approximate Total Value of Stone Raised.
	Bluestone.	Sandstone, Freestone, Slate, &c.	Granite.	
	c. yds.	c. yds.	c. yds.	£
1898 ... ..	141,112	864	306	19,182
1899 ... ..	209,960	930	650	30,401
1900 ... ..	252,870	1,263	400	44,513
1901 ... ..	270,126	2,400	1,500	45,447
1902 ... ..	323,485	5,964	3,099	53,395