SECTION III.

PHYSIOGRAPHY.

§ 1. General Description of Australia.

1. **Geographical Position.**—The Australian Commonwealth, which includes the island continent of Australia proper and the island of Tasmania, is situated in the Southern Hemisphere, and comprises in all an area of about 2,974,581 square miles, the mainland alone containing about 2,948,366 square miles. Bounded on the west and east by the Indian and Pacific Oceans respectively, it lies between longitudes 113° 9′ E. and 153° 39′ E., while its northern and southern limits are the parallels of latitude 10° 41′ S. and 39° 8′ S., or including Tasmania, 43° 39′ S. On its north are the Timor and Arafura Seas and Torres Strait, on its south the Southern Ocean and Bass Strait.[1]

(i.) *Tropical and Temperate Regions.* Of the total area of Australia the lesser portion lies within the tropics. Assuming, as is usual, that the latitude of the Tropic of Capricorn is 23° 30′ S.[2], the areas within the tropical and temperate zones are approximately as follows :—

AREAS OF TROPICAL AND TEMPERATE REGIONS

OF STATES WITHIN TROPICS.

Areas.	Queensland.	Western Australia.	Northern Territory.	Total.
	Sq. miles.	Sq. miles.	Sq. miles.	Sq. miles.
Within Tropical Zone	359,000	364,000	426,320	1,149,320
Within Temperate Zone	311,500	611,920	97,300	1,020,720
Ratio of Tropical part to whole State ...	0.535	0.373	0.814	0.530
Ratio of Temperate part to whole State ...	0.465	0.627	0.186	0.470

Thus the tropical part is roughly about one-half (0.530) of the three territories mentioned above, or about five-thirteenths of the whole Commonwealth (0.386). See hereafter Meteorology 3.

2. **Area of Australia compared with that of other Countries.**—That the area of Australia is greater than that of the United States of America, that it is four-fifths of that of Canada, that it is more than one-fourth of the area of the whole of the British Empire, that it is nearly three-fourths of the whole area of Europe, that it is more than 25 times as large as any one of the following, viz., the United Kingdom, Hungary, Italy, the Transvaal, and Ecuador, are facts which are not always adequately realised. It is this great size, taken together with the fact of the limited population, that gives to the problems of Australian development their unique character, and its clear comprehension is essential in any attempt to understand those problems.

1. The extreme points are "Steep Point" on the west, "Cape Byron" on the east, "Cape York" on the north, "Wilson's Promontory" on the south, or, if Tasmania be included, "South East Cape." The limits, according to the 1903-4 edition of "A Statistical Account of Australia and New Zealand," p. 2, and, according to Volume XXV. of the "Encyclopædia Britannica," tenth edition, p. 787, are respectively 113° 5′ E., 153° 16′ E.,10° 39′ S., and 39° 11½′ S., but these figures are obviously defective. A similar inaccuracy appears in the XI. edition of the Encyclopædia.

2. Its correct value for 1912.0 is 23° 27′ 2″.64, and it decreases about 0″.47 per annum.

The relative magnitudes may be appreciated by a reference to the following table, which shews how large Australia is compared with the countries referred to, or *vice versa*. Thus, to take line 1, we see that Europe is about $1\frac{3}{10}$ times (1.29778) as large as Australia, or that Australia is about three-quarters (more accurately 0.77) of the area of Europe.

SIZE OF AUSTRALIA IN COMPARISON WITH THAT OF OTHER COUNTRIES.

Commonwealth of Australia ... 2,974,581 square miles.

Country.	Area.	Australian Commonw'lth in comparison with—	In comparison with Australian C'wealth.
	Sq. miles.		
Continents—			
Europe	3,860,368	0.77	1.29778
Asia	16,978,885	0.17	5.70799
Africa	11,201,439	0.25	3.76571
North and Central America and West Indies ...	8,543,253	0.34	2.87208
South America	7,423,882	0.40	2.49577
Australasia and Polynesia	3,462,418	0.85	1.16400
Total, exclusive of Arctic and Antarctic Conts.	51,470,245	0.05	17.30335
Europe—			
Russia (inclusive of Poland, Ciscaucasia & Finland)	2,122,557	1.40	0.71356
Austria-Hungary (incl. of Bosnia & Herzegovina)	261,101	11.39	0.08777
Germany	208,780	14.25	0.07011
France	207,054	14.37	0.06969
Spain	194,783	15.27	0.06548
Sweden	172,876	17.21	0.05812
Norway	124,130	23.96	0.04173
United Kingdom	121,391	24.50	0.04081
Italy	110,659	26.88	0.03720
Turkey (inclusive of Crete)	68,715	43.29	0.02310
Denmark (inclusive of Iceland)	55,338	53.73	0.01861
Rumania	50,720	58.65	0.01705
Bulgaria	38,080	78.11	0.01280
Portugal	35,490	83.82	0.01193
Greece	25,014	118.91	0.00841
Servia	18,650	159.49	0.00627
Switzerland	15,976	186.22	0.00537
Netherlands	12,648	235.29	0.00425
Belgium	11,373	261.78	0.00382
Montenegro	3,630	819.67	0.00122
Luxemburg	998	2941.18	0.00034
Andorra	175	16997.61	0.00006
Malta	117	25423.76	0.00004
Liechtenstein	65	45793.55	0.00002
San Marino	38	78278.45	0.00001
Monaco	8	371822.63	...
Gibraltar	2	1487290.50	...
Total, Europe	3,860,368	0.77	1.29778
Asia—			
Russia (inclus. of Transcaucasia, Siberia, Steppes, Transcaspia, Turkestan and inland waters) ...	6,525,130	0.45	2.19364
China and Dependencies...	4,277,170	0.70	1.43791
British India...	1,097,901	2.70	0.36912
Independent Arabia	966,700	3.08	0.32499
Turkey (including Samos)	693,790	4.29	0.23324
Feudatory Indian States...	691,253	4.30	0.23238
Persia	628,000	4.74	0.21112

Country.	Area.	Australian Commonwe'lth in comparison with—	In comparison with Australian C'wealth.
ASIA (continued)—	Sq. Miles.		
Dutch East Indies	584,611	5.09	0.19654
Japan (and Dependencies)	260,919	11.04	0.08771
Afghanistan	250,000	11.90	0.08405
Siam	195,000	15.25	0.06555
Philippine Islands (inclusive of Sulu Archipelago)	127,853	23.27	0.04298
Laos	98,000	30.35	0.03295
Bokhara	83,000	35.83	0.02790
Omán	82,000	36.27	0.02757
British Borneo and Sarawak	73,106	40.68	0.02457
Nepál	54,000	55.10	0.01815
Annam	52,100	57.08	0.01752
Tonking	46,400	64.10	0.01560
Cambodia	45,000	66.10	0.01513
Federated Malay States	27,700	107.38	0.00931
Ceylon	25,332	117.37	0.00852
Khiva	24,000	123.94	0.00807
Cochin China...	20,000	148.73	0.00672
Bhután	20,000	148.73	0.00672
Aden and Dependencies	9,005	330.32	0.00303
Timor, etc. (Portuguese Indian Archipelago) ...	7,330	406.50	0.00246
Brunei	4,000	743.64	0.00134
Cyprus	3,584	833.33	0.00120
Goa, Damaõ, and Diu	1,638	1818.18	0.00055
Straits Settlements	1,600	1851.85	0.00054
Sokotra and Kuria Muria Islands	1,382	2152.22	0.00046
Hong Kong and Dependencies	405	7344.64	0.00013
Wei-hai-wei	285	10623.50	0.00009
Bahrein Islands	250	11898.32	0.00008
French India (Pondicherry, etc.)	196	15176.43	0.00007
Kiauchau	193	15412.33	0.00006
Labuan	30	99152.70	0.00001
Italian Concession, Tientsin	18	165254.50	0.00001
Macao, etc.	4	743643.25	...
Total, Asia	16,978,885	0.17	5.70799
Africa—			
French Sahara	1,544,000	1.93	0.51907
Turkey (inclusive of Egypt and Soudan) ...	1,384,520	2.14	0.46545
Belgian Congo	909,654	3.27	0.30582
French Congo	669,000	4.46	0.22491
Angola	484,800	6.14	0.16298
Union of South Africa	473,184	6.28	0.15907
Rhodesia	439,575	6.77	0.14778
Abyssinia	432,432	6.88	0.14538
Tripoli and Benghezi	398,900	7.45	0.13410
German East Africa	384,000	7.74	0.12909
Mauretania	344,967	8.62	0.11597
Algeria (including Algerian Sahara)	343,500	8.66	0.11548
German South-west Africa	322,450	9.23	0.10840
Portuguese East Africa	293,400	10.14	0.09864
Bechuanaland Protectorate	275,000	10.82	0.09245
Northern Nigeria Protectorate	256,400	11.60	0.08620
Madagascar	228,000	13.05	0.07665
Uganda Protectorate	223,500	13.31	0.07514
Morocco	219,000	13.58	0.07362
British East Africa Protectorate	202,000	14.72	0.06790
Kamerun	191,130	15.56	0.06425
Italian Somaliland	139,430	21.34	0.04687
Ivory Coast	130,000	22.87	0.04370

Country.	Area.	Australian Commonw'lth in comparison with—	In comparison with Australian C'wealth.
	Sq. miles.		
AFRICA (continued)—			
French Guinea	95,000	31.31	0.03194
Gold Coast Protectorate (with North. Territories)	80,000	37.18	0.02689
Southern Nigeria and Protectorate	79,880	37.23	0.02685
Senegal	74,000	40.20	0.02488
Rio de Oro, etc.	73,000	40.75	0.02454
Senegambia and Niger	72,000	41.31	0.02420
British Somaliland	68,000	43.74	0.02286
Dahomey	65,000	45.77	0.02185
Tunis	50,000	59.49	0.01681
Eritrea	45,800	64.95	0.01540
Nyasaland Protectorate	43,608	68.21	0.01466
Liberia	40,000	74.36	0.01345
Togoland	33,700	88.26	0.01133
Sierra Leone and Protectorate	31,624	94.06	0.01063
Portuguese Guinea	13,940	213.22	0.00469
Spanish Guinea (Rio Muni, etc.)	12,000	247.88	0.00403
Basutoland	11,716	253.89	0.00393
Swaziland	6,536	455.10	0.00219
French Somali Coast	5,790	513.74	0.00194
Gambia and Protectorate	4,500	661.02	0.00151
Cape Verde Islands	1,480	2000.00	0.00050
Zanzibar	1,020	2941.18	0.00034
Réunion	965	3082.46	0.00032
Mauritius and Dependencies	850	3499.50	0.00028
Fernando Po, etc.	814	3654.28	0.00027
Comoro Islands	620	4761.91	0.00021
St. Thomas and Prince Islands	360	8262.73	0.00012
Seychelles	160	19830.54	0.00005
Mayotte, etc....	140	21247.01	0.00005
St. Helena	47	63288.95	0.00002
Ascension	34	87487.65	0.00001
Spanish North and West Africa	13	228813.92	...
Total, Africa	11,201,439	0.25	3.76571
North and Central America and West Indies—			
Canada	3,729,665	0.80	1.25385
United States (exclusive of Alaska, &c.) ...	2,973,890	1.00	0.99976
Mexico	767,005	3.88	0.25785
Alaska	590,884	5.03	0.19864
Newfoundland and Labrador	162,734	18.28	0.05471
Nicaragua	49,200	60.46	0.01654
Guatemala	48,290	61.61	0.01623
Greenland	46,740	63.65	0.01571
Honduras	46,250	64.31	0.01555
Cuba	44,164	67.35	0.01484
Costa Rica	23,000	129.32	0.00773
San Domingo	18,045	164.74	0.00607
Haiti	10,204	291.55	0.00343
British Honduras	8,598	345.96	0.00289
Salvador	7,225	411.52	0.00243
Bahamas	4,403	675.58	0.00148
Jamaica	4,200	708.23	0.00141
Porto Rico	3,606	824.90	0.00121
Trinidad and Tobago	1,868	1592.39	0.00063
Leeward Islands	701	4243.33	0.00024
Guadeloupe and Dependencies	688	4323.52	0.00023
Windward Islands	527	5644.36	0.00017

Country.	Area.	Australian Commonwe'lth in comparison with—	In comparison Australian C'wealth.
N. & C. AMERICA & W. INDIES (continued)—	Sq. miles.		
Curaçao and Dependencies	403	7381.09	0.00014
Martinique	381	7807.30	0.00013
Turks and Caicos Islands	166	17925.18	0.00005
Barbados	166	17925.18	0.00005
Danish West Indies	138	21554.94	0.00005
St. Pierre and Miquelon	93	31984.74	0.00003
Bermudas	19	156556.89	...
Total, N. and C. America and W. Indies ...	8,543,253	0.34	2.87208
South America—			
Brazil (inclusive of Acré)...	3,292,991	0.90	1.10704
Argentine Republic	1,135,840	2.62	0.38185
Peru	695,733	4.28	0.23389
Bolivia	608,195	4.89	0.20446
Colombia	438,436	6.78	0.14739
Venezuela	393,976	7.55	0.13244
Chile	292,580	10.17	0.09836
Paraguay	171,204	17.37	0.05755
Ecuador	116,000	25.64	0.03900
British Guiana	90,277	32.95	0.03035
Uruguay	72,210	41.19	0.02428
Dutch Guiana	46,060	64.60	0.01548
Panamá	32,380	91.86	0.01088
French Guiana	30,500	97.56	0.01025
Falkland Islands	6,500	456.62	0.00219
South Georgia	1,000	2974.58	0.00034
Total, South America	7,423,882	0.40	2.49577
Australasia and Polynesia—			
Commonwealth of Australia	2,974,581	1.00	1.00000
Dutch New Guinea	151,789	19.60	0.05103
New Zealand and Dependencies	104,751	28.39	0.03522
Papua	90,540	32.85	0.03044
Kaiser Wilhelm Land	70,000	42.50	0.02353
Bismarck Archipelago	20,000	148.73	0.00672
British Solomon Islands	14,800	204.36	0.00497
New Caledonia and Dependencies	8,548	347.99	0.00287
Fiji	7,435	400.08	0.00250
Hawaii	6,449	460.83	0.00217
German Solomon Islands, etc.	5,160	576.46	0.00173
New Hebrides	5,000	594.92	0.00168
French Establishments in Oceania	1,520	1960.78	0.00051
German Samoa	1,000	2974.58	0.00034
Tonga	390	7627.13	0.00013
Guam	200	14872.91	0.00007
Gilbert Islands	166	17919.16	0.00006
Samoa (U.S.A. part)	79	37652.92	0.00003
Norfolk Island	10	297458.10	...
Total, Australasia and Polynesia ...	3,462,418	0.85	1.16400
British Empire...	11,447,954	0.26	3.84859

3. **Relative Size of Political Subdivisions.**—As already stated, Australia consists of six States and the Northern and Federal Capital Territories. The areas of these, in relation to one another and to the total of Australia, are shewn in the following table :—

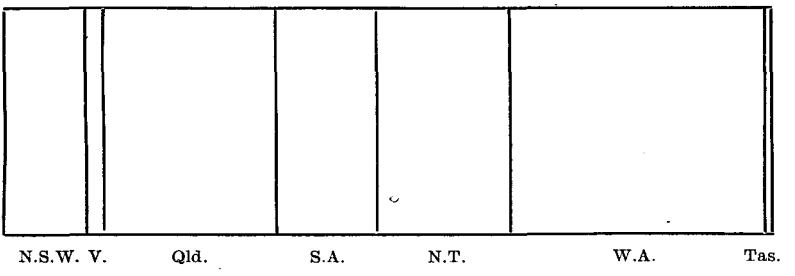
RELATIVE SIZES OF STATES AND COMMONWEALTH.

State.	Area.	Ratio which the Area of each State and Territory bears to that of other States, Territories and Commonwealth.							
		N.S.W.	Vic.	Q'land.	S.A.	W.A.	Tas.	N. Ter.	C'wlth.
	Sq. miles.								
New South Wales	309,460	1.000	3.522	0.462	0.814	0.317	11.806	0.591	0.104
Victoria ...	87,884	0.284	1.000	0.131	0.231	0.090	3.352	0.168	0.030
Queensland ...	670,500	2.166	7.629	1.000	1.764	0.687	25.577	1.280	0.225
South Australia	380,070	1.228	4.325	0.567	1.000	0.389	14.498	0.726	0.128
West. Australia	975,920	3.153	11.105	1.455	2.568	1.000	37.228	1.864	0.328
Tasmania ...	26,215	0.085	0.298	0.039	0.069	0.027	1.000	0.050	0.009
North. Territory	523,620	1.691	5.958	0.781	1.378	0.537	19.974	1.000	0.176
Fed. Capital Ter.	912	0.003	0.010	0.001	0.003	0.001	0.034	0.002	0.000[1]
Commonwealth	2,974,581	9.610	33.847	4.436	7.827	3.048	113.469	5.681	1.000

1. The correct decimal is 0.0003.

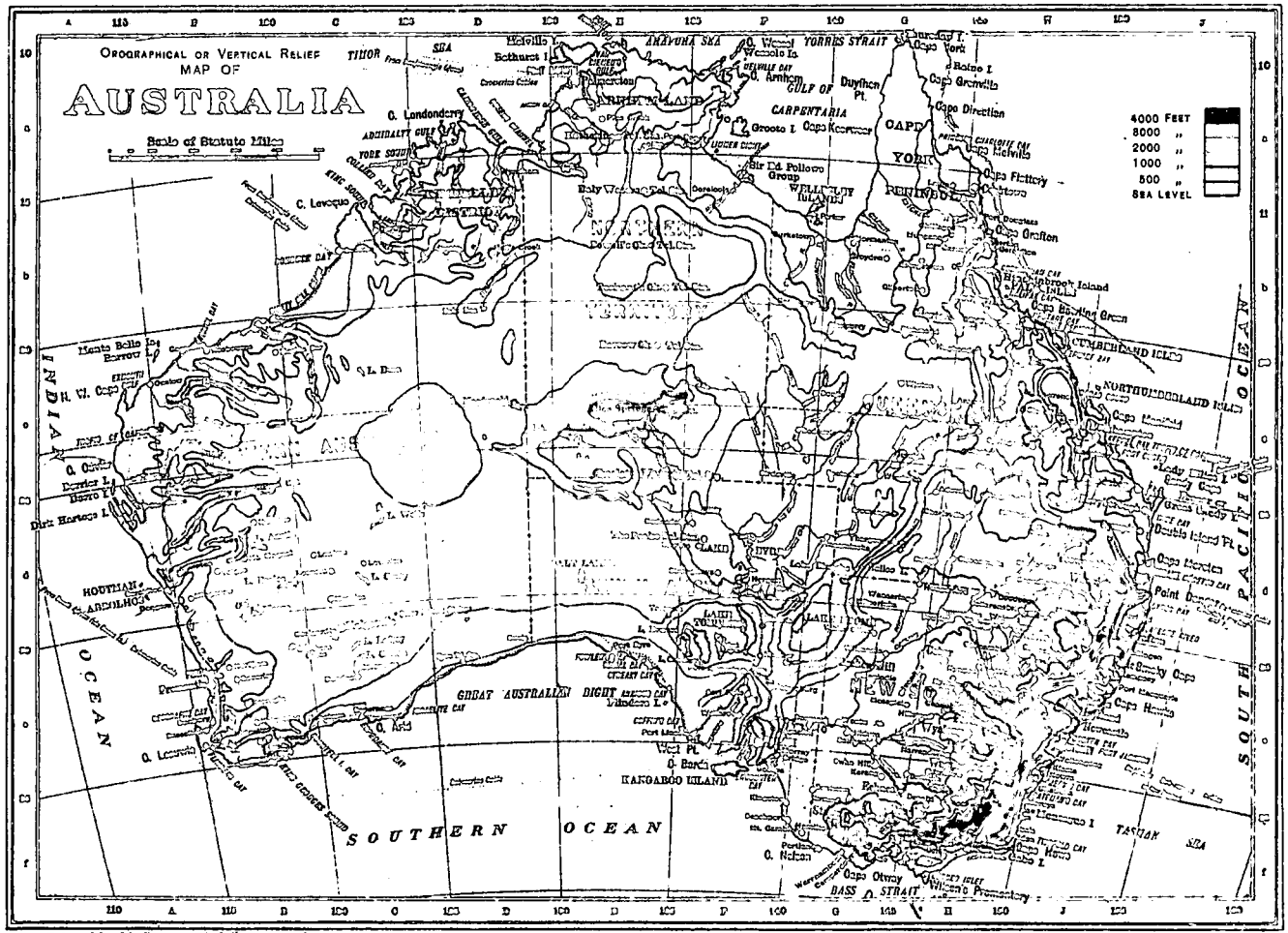
Thus, looking at the top line, New South Wales is seen to be over three-and-a-half times as large as Victoria (3.522) and less than one-half the size of Queensland (0.462); or again, looking at the bottom line, the Commonwealth is shewn to be more than nine-and-a-half times as large as New South Wales (9.610), and nearly thirty-four times as large as Victoria (33.847).

These relative magnitudes are shewn in the small diagram below. It may be added that Papua (or British New Guinea), with its area of 90,540 square miles, is 0.030 of the area of the Commonwealth. The comparatively small size of the Federal Capital Territory prevents its being shewn in this diagram.

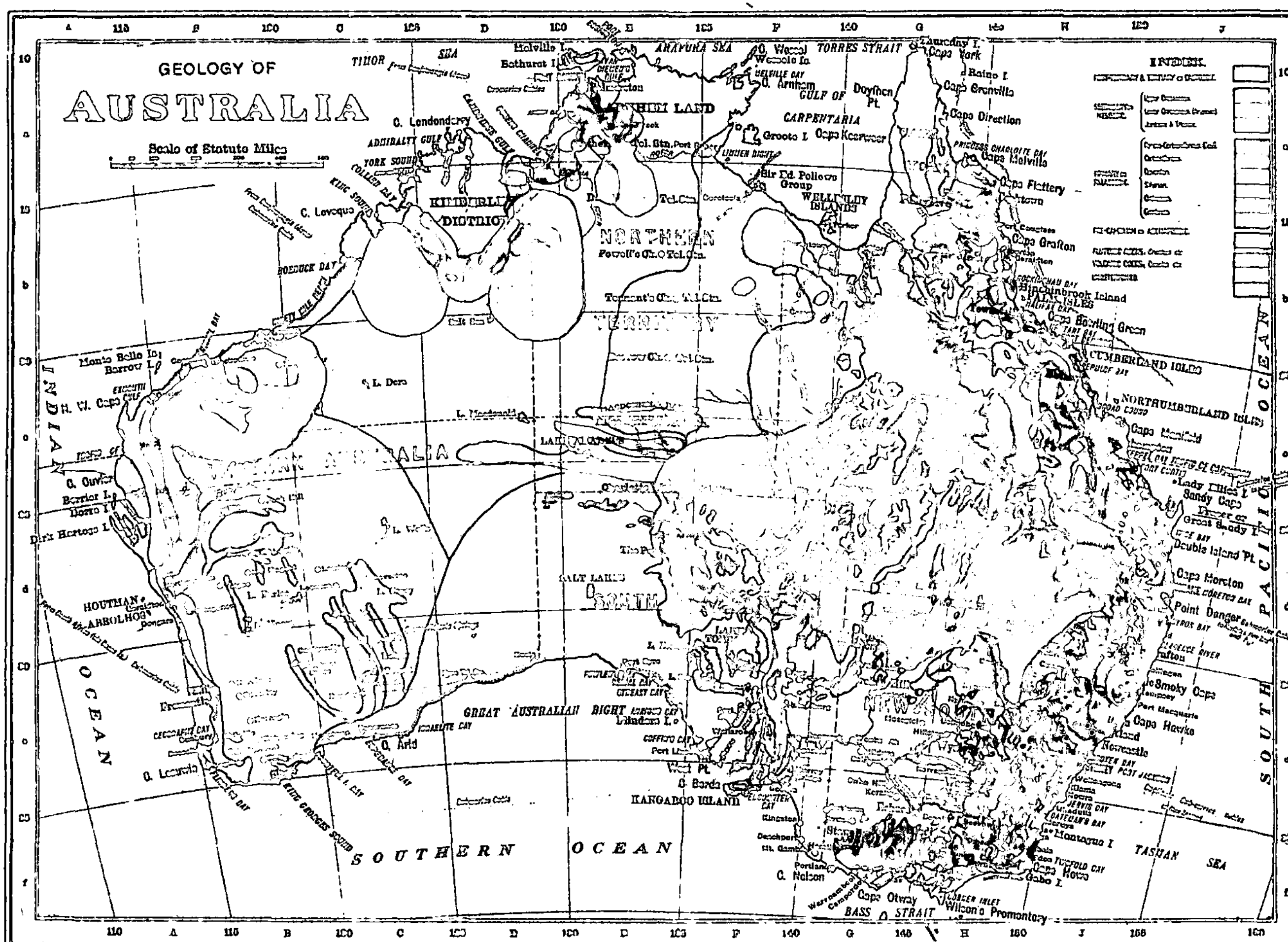


4. **Coastal Configuration.**—There are no striking features in the configuration of the coast: the most remarkable indentations are the Gulf of Carpentaria on the north and the Great Australian Bight on the south. The York Peninsula on the extreme north is the only other remarkable feature in the outline. In Year Book No. 1 an enumeration of the features of the coast-line of Australia was given (see pp. 60 to 68).

(i.) *Coast-line.* The lengths of coast-line, exclusive of minor indentations, both of each State and of the whole continent, are shewn in the following table:—



Printed by McCarron, Bird & Co., Melbourne.



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SQUARE MILES OF TERRITORY PER MILE OF COAST LINE.

STATES AND CONTINENT.

State.	Coast-line.	Area ÷ Coast-line.	State.	Coast-line.	Area ÷ Coast-line.
	Miles.	Sq. miles.		Miles.	Sq. miles.
New South Wales[1]	700	443	South Australia ...	1,540	247
Victoria	680	129	Western Australia	4,350	224
Queensland ...	3,000	223	Continent[2] ...	11,310	261
Northern Territory	1,040	503	Tasmania ...	900	29

1. Including Federal Capital Territory 2. Area 2,948,366 square miles.

For the entire Commonwealth this gives a coast-line of 12,210 miles, and an average of 244 square miles for one mile of coast line. According to Strelbitski, Europe has only 75 square miles of area to each mile of coast line, and, according to recent figures, England and Wales have only one-third of this, viz., 25 square miles.

(ii.) *Historical Significance of Coastal Names.* It is interesting to trace the voyages of some of the early navigators by the names bestowed by them on various coastal features—thus Dutch names are found on various points of the Western Australian coast, in Nuyt's Archipelago, in the Northern Territory, and in the Gulf of Carpentaria; Captain Cook can be followed along the coasts of New South Wales and Queensland; Flinders' track is easily recognised from Sydney southwards, as far as Cape Catastrophe, by the numerous Lincolnshire names bestowed by him; and the French navigators of the end of the eighteenth and the beginning of the nineteenth century have left their names all along the Western Australian, South Australian, and Tasmanian coasts.

5. **Geographical Features of Australia.**—In each preceding issue of this Year Book, fairly complete information has been given concerning some special geographical element. Thus No. 1 Year Book, pp. 60-68, contains an enumeration of Coastal features, No. 2, pp. 66-77, deals with Hydrology, No. 3, pp. 59-72, with Orography, No. 4, pp. 59-82, with the Lakes of Australia, and No. 5, pp. 51-80, with the Islands of Australia. In the present issue the Mineral Springs of Australia constitute the special feature treated. An orographical or vertical relief map of Australia will be found on p. 53.

§ 2. Mineral Springs in the Commonwealth.

1. **General.**—The following Section contains the latest available information regarding the mineral springs in each State of the Commonwealth. Owing to incomplete examination the details given in some cases are extremely meagre.

2. **New South Wales.**—(i.) The accompanying information regarding the mineral springs of New South Wales has been compiled from particulars furnished by the State Department of Mines. Further information on the subject will be found in "Mineral Resources of New South Wales," by E. F. Pittman (see p. 448 therein), "Iron Ore Deposits of New South Wales," by J. B. Jaquet (see p. 52 therein), and "Geology of the Western Coal Field," by J. E. Carne.

(ii.) (*a*) *The Mittagong Spring.* The list given below must not be taken as exhaustive, for, as stated by Pittman in his "Mineral Resources," mineral springs are fairly numerous in New South Wales, and their waters vary considerably in composition. Chalybeate springs are common in the Permo-Carboniferous Coal Measures and the overlying Hawkesbury Sandstones, but only the Mittagong Spring—alluded to in the table—has been utilised. Out of a total solids amounting to 15.765 grains per gallon, the Mittagong water contains nearly 6 grains of bicarbonate of iron, over 2 grains each of bicarbonate of magnesium and calcium, over 2 grains each of chloride of sodium and

potassium, and over 1 grain of chloride of magnesium. The water has the usual inky taste, its odour is earthy, and the colour in a two-ft. tube, light brown. This spring is the source of a considerable deposit of brown hematite, and some years ago the Fitzroy Ironworks were opened for the purpose of utilising the ore. Facilities have been provided to enable local residents and visitors to drink the waters.

(*b*) *The Ballimore Spring.* This spring is situated on the Talbragar River, about 20 miles north-east of Dubbo. It was located by a diamond drill bore put down in 1886 in search of coal. The water, which has a pleasant taste and is highly charged with carbonic acid, rose from a depth of over 540 feet, and the pressure was found sufficient to cause it to flow through perpendicular piping 30 feet above the surface. Out of a total fixed matter amounting to 225 grains per gallon, bicarbonate of soda accounts for 183 grains, of potassium nearly 13 grains, of calcium over 11 grains, of magnesium over 9 grains, while chloride of sodium yields nearly 7 grains. Bicarbonates of lithium, strontium, and iron are present together with traces of silica and alumina.

(*c*) *The Rock Flat Spring.* This is a natural spring which comes to the surface on the bank of Rock Flat Creek, about 10 miles south-east of Cooma. The water, which is strongly charged with carbonic acid gas, is pleasant to the taste, and discharges at the rate of about 54 gallons per hour. Out of 143 grains of fixed matter per gallon, bicarbonates of calcium and sodium are responsible for 52 grains and 45 grains respectively, while bicarbonate of magnesium yields over 22 grains. Bicarbonates of potassium and strontium are also present, together with 5 grains of chloride of sodium, and traces of silica, alumina, and nitrate of soda.

(*d*) *The Bungonia Spring.* The mineral water from this spring, which is heavily charged with carbonic acid gas, possesses a very agreeable flavour. The spring is situated in Bungonia Creek, about a mile and a-half to the west of the town of Bungonia. Fixed matter per gallon amounted to nearly 207 grains, of which nearly 143 grains were bicarbonate of calcium. Bicarbonate of magnesium was present to the amount of 32 grains. The other principal constituents afforded by analysis were chloride of sodium and bicarbonate of sodium, which gave nearly 13 grains each.

(*e*) *The Jarvisville Mineral Spring.* This natural spring issues from the face of a cliff of Hawkesbury Sandstone on the Jarvisville estate, about a mile from Picton Railway Station. Out of 212 grains of fixed matter per gallon, chloride of sodium accounts for nearly 101 grains, hence the strong saline taste. Amongst the other principal constituents the most noteworthy are bicarbonate of magnesium 50 grains, bicarbonate of calcium 19 grains, chloride of magnesium 26 grains, and sulphate of potash 12 grains.

MINERAL SPRINGS IN NEW SOUTH WALES.

Name of Spring.	Geographical Position.	Geological Characteristics of surrounding Country.	Type of Spring.	Chemical Constituents of water (see also par. ii. above).	Facilities for public use and Medicinal or Remedial Properties.
Mittagong	Mittagong ...	Hawkesbury Sandstone	Chalybeate	For complete analysis see Pittman, Mineral Resources, N.S.W., p. 448, and J. B. Jaquet, Iron Ore Deposits. N S.W.,p.52	—
Ballimore	Ballimore, Talbragar R.	Mesozoic Sandstones overlying Permo-Carboniferous Marine beds	Soda "Zetz Spa"	See Pittman *supra*; also Carne, Geol. Western Coal Field	Bore and piping. Table water.
Rock Flat	Cooma ...	Silurian Slates and Limestone	Soda "Koomah Spa"	See Pittman *supra* ...	Table water.
Bungonia	Bungonia ...	Devonian Limestone	Soda	,, ,, ...	,,
Jarvisville	Picton ...	Hawkesbury Stone	...	,, ,, ...	,,

3. **Victoria.**—The tabular statement below which gives particulars of the chief mineral springs in Victoria, has been compiled from particulars furnished by the State Mines Department. At the time of compilation of this section it was understood that the Victorian Mines Department intended to publish a complete list of the springs, accompanied by plans.

MINERAL SPRINGS IN VICTORIA.

No. and Name of Spring.*	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public Use.
	2 miles N.W. of Newstead on the north bank of the Loddon River and south of Allot. 19, Section VI., Parish of Tarrengower	Alluvial flat, no Ordovician bedrock showing			Crown Lands Shaft and pump over spring
	Near Turpin's Falls on the Campaspe River west of the western boundary of Allot. 6, Sec. 1, Parish of Emberton	Issuing from basalt	20 gals. per hour 64° F.	Grains per Gal. Na_2CO_3 ... 34.7 $CaCO_3$ ... 15.8 $MgCO_3$ ... 25.0 Na Cl ... 9.0 K Cl ... 2.6 Na_2SO_4 ... trace Na_2HPO_4 ... — Li_2CO_3 ... trace SiO_2 ... 5.3 Al_2O_3, Fe_2O_3 ... 0.9 93.3 CO_2 81.8 ccs of gas per 100 ccs of water.	Crown Lands
	Near Glenluce, on the western side of the Loddon River and west of the western boundary of Allot. 9, Sec. x.A, Parish of Fryers.	In river bed. Ordovician bedrock	16½ gals. per hour. 60° F.	Grains per Gal. Na_2CO_3 ... 17.4 $MgCO_3$ ... 19.9 $CaCO_3$ ... 19.6 Na Cl ... 8.9 K Cl ... 1.0 Na_2SO_4 ... 3.9 Li_2CO_3 ... trace SiO_2 ... 3.5 Fe_2O_3, Al_2O_3 ... 0.7 74.9 CO_2 69.9 ccs of gas per 100 ccs of water.	Crown land. Flow small & water difficult to get at, being 3 in. above summer level of river
7B	On Loddon River, about 7 chains up stream from Spring No. 7	On Loddon River In Ordovician bedrock	16½ gals. per hour 59° F.	Grains per Gal. Na_2CO_3 ... 26.4 $CaCO_3$ ... 30.8 $MgCO_3$ ... 29.5 Na Cl ... 42.5 K Cl ... 1.0 Na_2SO_4 ... 20.6 Li_2CO_3 ... trace SiO_2 ... 2.6 Al_2O_3, Fe_2O_3 ... 0.9 154.3 CO_2 83.7 ccs of gas per 100 ccs of water.	Crown land
	On Limestone Creek in Allot. 3, Sec. 6, Parish of Yandoit	On alluvial flat Ordovician bedrock	Soda spring Large flow		Outlets: (1) Under water in dam about 1 chain wide. On private land (2) A few feet south of the dam a free outlet

* The number given to each spring corresponds with the number on the list as furnished by the State Mines Department.

MINERAL SPRINGS IN VICTORIA—Continued.

No. and Name of Spring.*	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public use.
10	Near Kyneton on the Campaspe River and south of Allot. 1, Sec. XLVIII, Parish of Lauriston	Ordovician bedrock	654 gals. per hour 61° F.	Grains per Gal. Na_2CO_3 ... 28.8 $CaCO_3$ ... 20.3 $MgCO_3$ ... 30.7 NaCl ... 7.2 KCl ... 2.8 Na_2SO_4 ... trace Na_2HPO_4 1.9 Li_2CO_3 ... 0.3 SiO_2 ... 6.8 Al_2O_3, Fe_2O_3 } 0.9 99.7 CO_2 91.5 ccs of gas per 100 ccs of water.	Clear sparkling water Crown land Pump attached, but natural flow is sufficient.
21 Kangaroo Creek Mineral Spring	On Kangaroo Creek, and about three chains south of the Glenlyon-Franklinford rd. Section VIII, Parish of Glenlyon	Issuing in small vents from Ordovician bedrock	Large flow		Private land
25 Boot's Gully Spring	In Boot's Gully, about 14 chains slightly N.W. of Allot. 16, Section XXX, Parish of Wombat	Issuing from Ordovician bedrock	Small flow		Permanent reserve in State forest
27 Hepburn Spring	On Spring Creek, about seven chains east of Sec. IV, Township of Hepburn, Section XXIV, Parish of Wombat	Ordovician bedrock	Soda-Magnesia Not flowing	Grains per gal. No. 1 Tap. No. 2 Tap. $NaHCO_3$ ... 67.16 73.00 $Ca(HCO_3)_2$ 46.43 45.70 $Mg(HCO_3)_2$ 25.67 25.70 $Fe(HCO_3)_2$ .63 3.05 $MgSO_4$ ... 11.06 2.76 K_2SO_4 ... 1 37 1.46 $CaSO_4$ ... trace Silica ... 1.73 2.65 Organic Matter } trace 3.52 NaCl ... 3.13 trace 157.18 157.84 Much gas from both taps	Crown lands Fitted with pavilion for public use
31 Argyle Spring	In Argyle Gully, about 21 chains west from western boundary of Allot. 3, Sec. VIII, Parish of Wombat	Issuing from Ordovician bedrock	Small flow		Crown land Fitted for public use
36 Tipperary Spring	On Sailor's Creek, about 54½ chains west of the western boundary of the Township of Daylesford, Sec. XXVI, Parish of Wombat	On alluvial flat Ordovician bedrock	Good flow		Permanent reserve in State forest Fitted for public use
37 Brandy Hot Spring	On Deep Creek, about 2½ chains west of N. W. corner of Egan's Corinella Pre-emptive Right, Section B, Parish of Bullarrook	On small alluvial flat Ordovician bedrock	Good flow		Crown lands. One of the best springs in the district

* The number given to each spring corresponds with the number on the list a furnished by he State Mines Department.

MINERAL SPRINGS IN VICTORIA—Continued.

No. and Name of Spring.*	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public Use.
38 Crystal Spring	On Deep Creek, and on Egan's Corinella Pre-emptive Right, about 38 chains N.W. from the S.E. corner of the Bullarook Public Gardens, Parish of Wombat	Issuing from Ordovician bedrock	Soda-Magnesia Spring Good flow	Grains per gal. $Ca CO_3$ ... 25.73 $Mg CO_3$ ... 35.72 $Na_2 CO_3$ ... 18.00 $Fe_2 CO_3$ ... 1.70 $Ca SO_4$ ... 0.47 $Na Cl$ ... 3.69 $Li Cl$ ... 1.50 $Si O_2$ ... 8.40 90.21	Private land Fitted for public use Water bottled by the Company
39	About four chains west of the southern corner of Section XXVII., Township of Daylesford, Parish of Wombat.	On alluvial flat Ordovician bedrock	Medium flow	—	Crown land Shelter shed fitted for public use
41 Sutton's Spring	About 23 chains west of Leggatt's Block, Section XXXVII., Township of Daylesford, Parish of Wombat.	On alluvial flat Ordovician bedrock	Medium flow	—	Crown lands, and fitted up for public use
42 Hard Hill Spring	About 11¾ chains west from the western boundary of Block west of Leggatt St., Sec. XXXVIII., Township of Daylesford, Parish of Wombat.	On alluvial flat Ordovician bedrock	Medium flow	—	Crown land Fitted for public use
48	On Sailor's Creek, 11 chains west from the western boundary of Allot. 10, Sec. A, Parish of Wombat.	Issuing from Ordovician bedrock	Small flow	—	Permanent reserve in State forest
49 Leitch's Creek Spring	On Leitch's Creek about 2½ chains S. of the S.W. angle of Allot. 27, Sec. VI, Parish of Glenlyon	On alluvial flat Ordovician bedrock	Large flow	—	Crown land Fitted for public use Water bottl'd by company
51 Jubilee Lake Spring	On Wombat Creek about ¾ chain E. of Allot. 4, Sec. 14A. Par. of Wombat	On alluvial flat Ordovician bedrock	Medium flow	—	Crown land Fitted for public use
56 Lyonville No. 2 Mineral	On the Loddon River about 16½ chains W. from the N.W. angle of Allot. 28, Sec. I, Parish of Bullarto	On alluvial flat Ordovician bedrock	Small flow 57° F.	Grains per Gal. $Na_2 CO_3$ ... 41.9 $Ca CO_3$ ... 22.2 $Mg CO_3$ ... 16.4 $Na Cl$ ... 0.9 $K Cl$ ... 1.5 $Li_2 CO_3$ ... trace $Si O_2$ ... 2.2 $Fe_2 O_3$, $Al_2 O_3$ ... 1.0 86.1 CO_2. Little gas	Permanent reserve in State forest

* The number given to each spring corresponds with the number on the list as furnished by the State Mines Department.

MINERAL SPRINGS IN VICTORIA—Continued.

No. and Name of Spring.*	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public Use.
57 Lyonville No. 1 Spring	On the Loddon River about 20 chains N.W. of the N.W. angle of the boundary of the Township of Lyonville, Sec. 1, Parish of Bullarto	On alluvial flat Ordovician bedrock	5½ gals. per hour 54° F.	Grains per Gal. Na_2CO_3 ... 94.3 $CaCO_3$ ... 32.8 $MgCO_3$ ... 25.6 NaCl ... nil KCl ... 1.6 Li_2CO_3 ... trace SiO_2 ... 2.2 Fe_2O_3, Al_2O_3 } 1.0 157.5 CO_2 50 ccs of gas per 100 ccs of water.	Crown lands Shelter shed erected
59 Bullarto Spring	In the N.W. of Allot. 16, Sec. III, Parish of Bullarto, and N.W. of the Township of North Bullarto	Issuing from Ordovician bedrock	Small spring	—	Permanent reserve in State forest
60 Sailor's Falls Spring	On Sailor's Creek about 6½ chains W. of the western boundary of Allot. 21A Sec. IVA, Parish of Wombat	Issuing from Ordovician bedrock	Small flow	—	Crown land
62	About 10 chains W. of the N.E. angle of Allot. 6 Sec. IVA, Parish of Wombat	From shaft issuing through basalt	Good flow	—	One of the best springs in the district
64 Blackwood Spring	Township of Blackwood on the north bank of the Lerderberg River at Tipperary Flat	Issuing from Ordovician bedrock	Soda water Good flow	Grains per Gal. $NaHCO_3$ 76.84 $Ca(HCO_3)_2$ 29.49 $Mg(HCO_3)_2$ 1.46 $Fe(HCO_3)_2$ trace NaCl 9.05 $CaCl_2$ trace $MgCl_2$ 1.08 K_2SO_4 trace Na_2SO_4 1.55 $CaSO_4$ trace Organic matter } trace 119.47 Large amount of gas.	Crown land Fitted for public use
65	On the Moorabool River about 20⅔ chains S.E. from the S.E. angle of Allot. 2 Sec. A, Parish of Korweinguboora	From Ordovician bedrock	Small flow	—	Permanent reserve in State forest
70	On the Moorabool River and in the western portion of Allot. 5 Sec. 14 Parish of Moorabool	From Ordovician bedrock	Soda water Good flow	Grains per Gal. $NaHCO_3$ 99.28 $Ca(HCO_3)_2$ 32.25 $Mg(HCO_3)_2$ 18.49 $Fe(HCO_3)_2$ trace $MgSO_4$ 13.82 K_2SO_4 2.74 $CaSO_4$ trace NaCl 5.21 SiO_2 2.56 Organic matter } trace 174.35	Private land Fitted for public use Cordial factory

* The number given to each spring corresponds with the number on the list as furnished by the State Mines Department.

MINERAL SPRINGS IN VICTORIA—Continued.

No. and Name of Spring.*	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public Use.
73 Donnybrook Spring	On Merri Merri Creek in the N.E. portion of Allot. 23 Parish of Kalkallo and about ¾ mile N.E. from Donnybrook Ry. Station	Issuing from basalt	38 gals. per hour 58.5° F.	Grains per Gal. Na_2CO_3 44.3 $CaCO_3$ 30.2 $MgCO_3$ 79.2 Na_2SO_4 5.8 Na Cl 58.1 K Cl 2.7 Li_2CO_3 nil SiO_2 6.3 Fe_2O_3, Al_2O_3 0.7 227.3 CO_2 38 ccs of gas per 100 ccs of water	Private land Fitted with concrete chamber
74 Coimadai Spring	On the western boundary of allot. and on the eastern bank of Coimadai Creek Allot. 17 Sec. XXII. Parish of Merrimu	Issuing from Ordovician bedrock	—	Grains per Gal. Na Cl 101.40 $CaCl_2$ trace $MgCl_2$ „ $Mg(HCO_3)_2$ 66.30 $Ca(HCO_3)_2$ 46.05 $NaHCO_3$ 8.76 $Fe(HCO_3)_2$ 1.27 $MgSO_4$ 20.78 $CaSO_4$ trace K_2SO_4 3.65 SiO_2 1.92 Organic matter trace 250.13 Small amount of gas.	Private land
75 Clarendon Spring	About 3 chains N. of Williamson's Creek in the southern portion of Allot. A 2A Sec. 3, Par. Clarendon	On alluvial flat Ordovician bedrock	Good flow	—	Private land
76 Geelong Springs No. 1 Spring	Geelong. On beach a little N.W. of the N.W. corner of the Botanical Gardens, Parish of Corio	In Tertiary limestone about tide level	Saline 15½ gals. per hour	Grains per Gal. Na Cl 375.6 $MgCl_2$ 1.0 $MgSO_4$ 15.2 $Mg(HCO_3)_2$ 49.6 $Ca(HCO_3)_2$ 81.4 $Fe(HCO_3)_2$ 1.4 SiO_2 2.4 526.6 Ammonia (free) 2.4 „ (albuminoid) 0 11 Nitrogen as nitrates nil Nitrogen as nitrites nil Co_2 in ccs per 100 ccs of water 31.1 Note.—Ammonia and nitrogen figures calculated in parts per million	On Crown lands Fitted for public use
77 Geelong Springs No. 2 Spring	Geelong. On beach about 2 chains S.W. from No. 76 Spring, Parish of Corio	In Tertiary limestone about tide level	Saline 13½ gals. per hour	Grains per Gal. Na Cl 377.9 $MgCl_2$ 0.8 $MgSO_4$ 30.4 $Mg(HCO_3)_2$ 42.6 $Ca(HCO_3)_2$ 64.9 $Fe(HCO_3)_2$ 0.3 SiO_2 2.1 519.0	On Crown lands Fitted for public use

* The number given to each spring corresponds with the number on the list as furnished by the State Mines Department.

MINERAL SPRINGS IN VICTORIA—Continued.

No. and Name of Spring.	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public Use.
77 (contd.)				Ammonia (free) 0.06 „ (albuminoid) trace Nitrogen as nitrates 0.075 „ „ nitrites nil CO_2 in ccs per 100 ccs of water 13.3 Note.—The nitrogen and ammonia figures calculated in parts per milli'n	
78 Geelong Springs No. 3 Spring	Geelong. On beach about 1¼ chains S.W. of No. 77 Spring, Parish of Corio	In Tertiary limestone about tide level	Saline 36 gals. per hour	Grains per Gal. Na Cl 341.2 Mg Cl_2 0.6 Mg SO_4 13.6 Mg $(HCO_3)_2$ 50.4 Ca $(HCO_3)_2$ 59.1 Fe $(HCO_3)_2$ 1.3 Li O_2 2.4 468.6 Ammonia (free) 2.4 „ (albuminoid) 0.11 Nitrogen as nitrates trace „ „ nitrites nil CO_2 in ccs per 100 ccs of water 22.1 Note.—The nitrogen and ammonia figures are calculated in parts per million	
79 Clifton Springs No. 1 Spring	Bellarine. In N.E. corner of Allot. 6 Sec. 11 Parish of Bellarine, near Clifton Springs Hotel. On coast	Issuing from Tertiary beds	Sulphur spring Small flow	Grains per Gal. Na Cl 338.22 Ca Cl_2 trace Mg Cl_2 50.35 Mg $(HCO_3)_2$ 44.77 Ca $(HCO_3)_2$ 41.47 Na $(HCO_3)_2$ 5.07 Fe $(HCO_3)_2$ trace Mg SO_4 19.78 Ca SO_4 trace K_2 SO_4 trace Silica 6.40 Organic matter trace 506.06 CO_2. Gas present. This analysis is not from No. 1 Spring, but is given as a typical analysis of the Clifton Springs water	Spring protected and fitted with pump On private property Hot mineral water baths provided at Clifton Spgs. Hotel
80 Clifton Springs No. 2 Spring	Bellarine. On coast about 1½ chains S.W. of No. 79 Spring, Allot. 6 Sec. 2, Par. of Bellarine	Issuing from Tertiary beds	Magnesia spring Small flow	See No. 79.	Do.
81 Clifton Springs No. 3 Spring	Bellarine, 1¾ chs. S.W. of No. 80 Spring, Allot. 6 Sec. 2 Parish of Bellarine. On coast	Issuing from Tertiary beds	Seltzer spring Small flow	See No. 79.	Do.
82 Clifton Spring No. 4	Bellarine, 6¾ chs. S.W. of No. 81 Spring, Allot. 6 Sec. 2 Parish of Bellarine. On coast	Issuing from Tertiary beds	Iron spring Small flow	See No. 79.	Do.

* The number given to each spring corresponds with the number on the list as furnished by the State Mines Department,

MINERAL SPRINGS IN VICTORIA—Continued.

No. and Name of Spring.	Geographical Position.	Geological Characteristics of Surrounding Country.	Type of Spring, Rate of Outflow, Temperature of Outflow.	Chemical Composition.	Character of Water and Facilities for Public Use.
83 Frankston Spring No. 1	Township of Frankston, S. of Public Gardens, Sec. 10, Parish of Frankston	—	Sulphur spring	Parts per 100,000 $Fe SO_4$ 2.2419 $Ca SO_4$ 4.0000 $Mg SO_4$ 1.2247 Na Cl 9.3200 $Ca Cl_2$ 0.4320 $Fe CO_3$ 0.5400 $Ca CO_3$ 1.4200 Phosphates trace Arsenic trace $Si O_2$ 1.2600 Na Br trace $H_2 S$ 2.55 grs. Total solids inorganic 19.852	
84 Frankston Spring No. 2	Township of Frankston, near No. 83	—	Chalybeate spring	Parts per 100,000 $Fe SO_4$ 6.0151 $Mg SO_4$ 2.1620 $Ca SO_4$ 4.6420 Na Cl 18.3200 $Ca Cl_2$ 1.0200 $Fe CO_3$ 0.6890 $Ca CO_3$ 1.7320 Phosphates trace Arsenic trace $Si O_2$ 0.1988 $H_2 S$ 0.1500 Total solids inorganic 30.2143	

4. **Queensland.**—Particulars regarding the mineral springs of Queensland will be found in the tabular statement given below, which has been compiled from particulars supplied by the State Mines Department. In addition to those mentioned in the list, there are some springs on the Walsh River to the north of the Chillagoe railway line, but beyond the fact that the water is cold and potable, little is known of these springs, as they are seldom visited.

MINERAL SPRINGS IN QUEENSLAND.

Name of Spring.	Geographical Position.	Geological Characteristics of surrounding Country, and Type of Spring, &c.	Temperature of Outflow.	Chemical Constituents of Water. Grains per gallon.	Facilities for Public use, and Medical or Remedial Properties
Innot Hot Springs.	8 miles E. by N. of Mount Garnet railway station (Chillagoe line), North Queensland.	The outlets of the springs are in the bed of Innots or Nettles Creek about 1900 ft. above sea level. The prevailing rock in the vicinity is granite, with dykes of felsite traversing slates, schists, &c. On the banks of the creek extensive siliceous sinter deposits are to be found.*	158° to 168° Fahr.	Total Solids 41.6 Iron with Alumina .8 Calcium Carbonate 2.6 Sodium Carbonate 8.6 Sodium Sulphate 3.3 Sodium Chloride 19.1 Silica 7.2 Sulphates as SO_4 3.3	Rheumatic complaints. Table use. Bath houses erected, and hotel accommodation.

MINERAL SPRINGS IN QUEENSLAND—Continued.

Name of Spring.	Geographical Position.	Geological Characteristics of surrounding Country, and Type of Spring, &c.	Temperature of Outflow.	Chemical Constituents of Water. Grains per gallon	Facilities for Public use, and Medicinal or Remedial Properties.
Einasleigh Hot Springs.	102 miles (by rail), S.S.W. of Almaden railway station (Etheridge line), North Queensland.	The springs have formed several sinter-terraced pools. Basalt forms the bed of the Einasleigh R. and surrounding country, and it has been suggested that the volcanic forces which produced the outbursts of basalt still possess sufficient vitality to give rise to thermal springs.*	...	Total Solids 57.60 Carbonate of Cal. and Magnesium 6.25 Carbonates of Sod. and Potassium 15.94 Chlorides of Sod. and Potassium 32.61 Volatile matter 2.80 Sulphuric Acid Trace Sulphuretted Hydrogen 2.19	Chlorinated sulphuretted water, possessing certain medicinal properties. Rheumatic complaints.
Petford (Oakvale) Mineral Springs.	2 miles S. of Petford railway station (Chillagoe line), North Queensland.	The prevailing rock in the vicinity is granite, with slates belonging to the Gympie formation. The outlet of the spring is a few inches in diameter with sinter surrounding it.*	Normal	Total Solids 104.80 Silica 6.57 Iron (Fe_2O_3), with Alumina 0.53 Cal. Carb. 25.95 Mag. Carb. 3.97 Sod. Carb. 54.10 Sodium Chloride 11.37 Potassium Sulphate 1.01 Potassium Chloride 1.12 Lithia Trace	Table use.
Maria Creek Bore.	4 miles W. of Tolmies railway station (central line), 133 miles (by rail and road) W. of Rockhampton.	Bore passed through shales and sandstones belonging to the Upper Bowen formation (Permo-Carboniferous), to a depth of 1002 ft. Water met with at 400 ft. Artesian.†		Total Solids 864.50 Silica 2.55 Iron (Fe_2O_3) with Alumina 1.45 Cal. Carb. 15.20 Mag. Carb. 45.45 Sod. Carb. 576.00 Sod. Chloride 223.85	Table use
Sandersons (Stanwell Bore).	Stony Creek, 2 miles S.S.W. of Stanwell railway station (central line), 18 miles (by rail and road) S.W. of Rockhampton.	Bore sunk in Coal Measures (Permo-Carboniferous). Flow of 10,000 gallons per diem at 200 ft., increasing to 15,000 gallons on sinking deeper. Artesian.		Total Solids 33.50 Silica 1.00 Cal. Carb. 7.00 Mag. Carb. 8.50 Sod. Chloride 15.00 Sod. Sulphate 2.00 Free Carbonic Acid 4.40	
The Springs, "Helidon Spa" Water.	Near Helidon, 72 miles (by rail) S.W. of Brisbane.	Water is charged with carbonic acid gas, and is obtained from a natural spring in alluvium, which rests on sandstone belonging to the Ipswich Coal Measures (Trias Jura). Basalt occurs about 1 mile to the south. Artesian.		Total Solids 233.01 Silica 0.29 Iron (Fe_2O_3) with Alumina Trace Cal. Carb. 7.35 Mag. Carb. 3.39 Sod. Carb. 2 12.14 Sod. Chloride 2.99 Lithium Carb. 2.68	Table use.
Muckadilla Bore.	334 miles (by rail) W. of Brisbane.	The rocks in the vicinity of the bore belong to the Rolling Downs formation (lower cretaceous). Basalt occurs about 8 miles to the north. Artesian. The flow uncontrolled is 23,000 gallons daily.		Total Solids 32.85 Silica 3.00 Iron (Fe_2O_3) with Alumina 0.50 Cal. Carb. 3.30 Mag. Carb. 1.51 Sod. Carb. 15.99 Sod. Chloride 6.90 Sod. Sulphate 1.55	Rheumatic complaints. Bath houses erected and hotel accommodation.

* Suggested origin, Geyser. † Flow of 10,000 gallons and more at brief intervals produced by pneumo-dynamic or gas pressure. Water saturated with carbonic anhydride, which under ordinary pressure shows the presence of 32.8 grains per gallon.

5. **South Australia.**—According to the Government Geologist of South Australia there is a large number of springs in that State from which issue mineralised waters of such a character that they may be applied to medicinal uses. Although individual cases have been reported of the application of these mineral waters to such ends, no general recourse to the springs by that section of the community likely to derive benefit from them can be stated to exist.

The areas in which these springs are found occur in parts of the State in which the annual rainfall is low and vegetation is correspondingly sparse. The surroundings are not, as a rule, picturesque in the conventional way, but have a certain weird fascination of their own. The summer climate is trying, but during the winter months the general climatic conditions are pleasant and bracing.

The great majority of the springs are distributed along a zone which fringes the Great Australian Artesian Water Basin. The artesian water appears at the natural springs, where the hydraulic pressure existing in this great depression is sufficient to force it to the surface of the ground through any naturally occurring channel, or where the impermeable rock masses of the margin of the basin arrest the subterranean circulation of the water. Many of these mineral springs build up a mound at the surface by the deposition of mineral material brought up in solution and precipitated as evaporation proceeds. They are consequently often referred to as "mound springs."

The composition of the mineral waters varies from point to point, as may be seen from the analyses. The salts most abundantly present in solution are sodium carbonate, calcium carbonate, sodium chloride, and sulphates of magnesium and sodium. The total amount of solids in solution varies between one-quarter and three-quarters of an ounce to the gallon.

The temperature of the issuing water rises in the case of Paralana Springs to 130° F., but is usually much lower.

The railway line between Oodnadatta and Hergott Springs follows the zone of the mound springs and gives ready access to many of them, but others are more difficult to approach. Dalhousie Springs, a large important group, lie 75 miles to the north of Oodnadatta, and other springs are found at similar distance to the east of Hergott Springs.

The water which issues from these springs is also tapped by a large number of artesian bores. Advantage can be therefore taken of any natural facilities within the limits of the area in which flowing bores are situated to arrange for a supply of uncontaminated water and to control its distribution. Should a sufficiently great demand arise for the mineral waters for medicinal purposes, this method of exploitation will probably be followed.

In addition to the mound springs which are connected with the Great Australian Artesian Basin there are others which are less well known and the origin of which is undetermined. Such are the Indulkana and Arcoeillinna springs, distant 120 miles from Oodnadatta in a west-north-westerly direction, and enclosed within the limits of primary rocks.

6. **Western Australia.**—So far as is yet known there are no mineral springs in this State.

7. **Tasmania.**—The accompanying information regarding the mineral springs of Tasmania has been compiled from particulars supplied by the State Government Geologist.

MINERAL SPRINGS IN TASMANIA.

Name of Spring.	Geographical Position.	Geological Characteristics of surrounding Country and Type of Spring.	Suggested Origin.	Temperature of Outflow.	Chemical Constituents of Water.	Facilities for Public use.
Kimberley	Warm spring at Kimberley, Northern Tasmania	In Quaternary beds Carbonate	Meteoric water probably issuing from a fissure dividing Permo - Carboniferous beds from Pre-cambrian quartzite	74° F.	Solid matter, chiefly Carbonate of Lime. 20 grns. per gal. Chlorine 1.4 grns. per gal.	On private land near railway station.
Southport	Warm spring near Southport, Southern Tasmania	Permo - Carboniferous	...	85° F.	Not known.	...
Duck River	Springs in country on both sides of Deep Creek, near Duck Bay, North West Coast	No outcrops of rock near Chloride	...	Temperature not ascertained.	Chlorine in Chlorides 10.9 grns. per gal. Total solid matter 81.0 grns. per gal. The solids consist chiefly of Sodium Chloride with Carbonates of Lime and Magnesia, the latter Carbonate in larger proportion.	Exclusive control could probably be acquired

1. *(a) Kimberley Spring.* This spring is situated at about 200 yards N.W. of the Kimberley Hotel, on the Mersey and Deloraine Tramway Co.'s land, east of the Mersey, and 20 feet above the present banks of that river. It forms a pool about 130 feet long by 60 feet wide. This pond has a basin-shaped outline a few feet above the present rim, suggestive of a shrinkage in supply of water. The depth of water is from 3 to 6 feet. In one corner of the pool gas bubbles are continually rising to the surface, and this is the part in which the spring is situate. The water escapes at the lowest point and forms a permanent creek. The temperature is constant at 74° F. The composition of the water is shown in the preceding table. The ground surrounding the spring is a pebbly drift of Quarternary age, compacted with a ferruginous cement. The bed rock is conjectural, but Pre-Cambrian quartzite borders the flat in which the spring is situate, and probably junctions with concealed Permo-Carboniferous beds.

(b) Southport. Near Southport, up the Lune River, a warm spring (85° F.) bubbles up in the bed of a small tributary stream. The country is level and timbered, though open button grass marshes also exist. The ground is strewn in places with boulders of Mesozoic diabase, and the strata in which the springs occurs are supposed to be of Permo-Carboniferous age.

(c) Duck River. On the Mowbray swamp, half mile west of Smithton, are springs issuing from small crateriform mounds of peat 10 to 30 feet high, from which decomposition gas bubbles constantly rise. The water is cold and apparently iron, salt, and lime bearing. The age of the strata is Quarternary. It was in this swamp that the skeleton of the giant Marsupial Nototherium Tasmanicum was found in 1910.

§ 3. The Fauna of Australia.

An authoritative article describing in some detail the principal features of the Fauna of Australia was given in Year Books No. 1 (see pp. 103 to 109) and No. 2 (see pp. 111 to 117), while a synoptical statement appeared in No. 3 (see pp. 73 to 76). Considerations of space will, however, preclude the inclusion in this issue of more than a passing reference to the subject.

§ 4. The Flora of Australia.

In Year Books No. 1 (see pp. 109 to 114) and No. 2 (see pp. 117 to 122) a fairly complete though brief account was given of the Flora of Australia, and in Year Book No. 3 similar information in a greatly condensed form will be found on pp. 76 to 78. Space in this issue will not permit of more than a mere reference to preceding volumes.

A special article dealing with Australian fodder plants will be found towards the end of this volume. This article has been contributed by J. H. Maiden, Esq., F.L.S., Government Botanist of New South Wales, and Director of the Botanic Gardens, Sydney.

5. Seismology in Australia.

A brief statement regarding the position of seismology and seismological record in Australia appears in Year Book No. 4, pp. 82 and 83.

Barisal Guns. Reference may be made here to an interesting pamphlet published by Dr. J. Burton Cleland, in which the author sums up the available information regarding the peculiar explosive or booming noises heard at times in Australia as well as in other parts of the world. As far as inland Australia, at all events, is concerned, it seems clear that the explosions are of earth origin, and are probably due to the sudden sundering of immense rock masses, either as a result of climatic influences, or through folding movements in the earth's crust.

§ 6. The Geology of Australia.

1. **General.**—Independent and authoritative sketches of the geology of each State were given in Year Books No. 1 (see pp. 73 to 103) and No. 2 (see pp. 78 to 111). Want of space has precluded the insertion of these sketches in the present issue of the Year Book, and it has not been considered possible to give anything like a sufficient account of the geology of Australia by presenting here a mere condensation of these sketches. Reference must, therefore, be made to either Year Book No. 1 or No. 2, *ut supra.*

2. **Geological Map of Australia.**—The map of the Geology of Australia on page 54 shews the geographical distribution of the more important geological systems and formations.

§ 7. Climate and Meteorology of Australia.[1]

1. **Introductory.**—In preceding Year Books some account was given of the history of Australian meteorology, including reference to the development of magnetic observations and the equipment for the determination of various climatological records. (See Year Book 3, pp. 79, 80). In Year Book No. 4, pp. 84 and 87, will be found a short sketch of the creation and organisation of the Commonwealth Bureau of Meteorology and a resumé of the subjects dealt with at the Meteorological Conference of 1907. Space will not permit of the inclusion of this matter in the present issue.

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1. Prepared from data supplied by the Commonwealth Meteorologist, H. A. Hunt, Esquire, F.R.M.S.

2. **Meteorological Publications.**—The following publications are issued daily from the Meteorological Bureau, viz.:—(i.) Weather charts. (ii.) Rainfall maps. (iii.) Bulletins, Victorian and Interstate, shewing pressure, temperature, wind, rain, cloud extent, and weather.

The Bulletins of Climatology are as follows:—No. 1.—A general discussion of the climate and meteorology of Australia, illustrated by one map and diagrams. No. 2.—A discussion of the rainfall over Australia during the ten years (1897-1906) compared with the normal, illustrated by one map. No. 3.—Notes and statistics of the remarkable flood rains over south-eastern Australia during the winter of 1909, illustrated by five maps and diagrams. No. 4.—A discussion of the monthly and seasonal rainfall over Australia, illustrated by one map and diagram. No. 5.—An investigation into the possibility of forecasting the approximate winter rainfall for Northern Victoria, illustrated by two diagrams. No. 6.—The physiography of the proposed Federal Territory at Canberra, illustrated by a relief map and 21 plates. No. 7.—On the climate of the Yass-Canberra district, illustrated by one map. No. 8.—Physiography of Eastern Australia, with 28 text illustrations.

Commencing with January 1910, the "Australian Monthly Weather Report," containing statistical records from representative selected stations, with rain maps and diagrams, etc., is being published. Complete rainfall and other climatological data are published in annual volumes of meteorological statistics for each State separately.

3. **General Description of Australia.**—In the general description of Australia, page 47, it is pointed out that a considerable portion (0.530) of three divisions of the Australian Commonwealth is north of the tropic of Capricorn, that is to say, within the States of Queensland and Western Australia, and the Northern Territory, no less than 1,149,320[1] square miles belong to the tropical zone, and 1,020,720 to the temperate zone. The whole area of the Commonwealth within the temperate zone, however, is 1,825,261[2] square miles, thus the tropical part is about 0.386, or about five-thirteenths of the whole, or the "temperate" region is half as large again as the "tropical" (more accurately 1.591). By reason of its insular geographical position, and the absence of striking physical features, Australia is, on the whole, less subject to extremes of weather than are regions of similar area in other parts of the globe; and latitude for latitude Australia is, on the whole, more temperate.

The altitudes of the surface of Australia range up to a little over 7300 feet, hence its climate embraces a great many features, from the characteristically tropical to what is essentially alpine, a fact indicated in some measure by the name Australian Alps given to the southern portion of the great Dividing Range.

While on the coast the rainfall is often abundant and the atmosphere moist, in some portions of the interior the rainfall is very limited, and the atmosphere dry. The distribution of forest, as might be expected, and its climatic influence, is consequently very variable. In the interior there are on the one hand fine belts of trees, on the other there are large areas which are treeless, and where the air is hot and parched in summer. Again, on the coast, even as far south as latitude 35°, the vegetation is tropical in its luxuriance, and also somewhatso in character. Climatologically, therefore, Australia may be said to present a great variety of features. The various climatological characteristics will be referred to in detail.

4. **Meteorological Divisions.**—The Commonwealth Meteorologist has divided Australia, for climatological and meteorological purposes, into five divisions. The boundaries between these may be thus defined:—(*a*) Between divisions I. and II., the boundary between South and Western Australia, viz., the 129th meridian of east

1. In the article "Australia" in the Encyclopædia Britannica, Vol. XXX., p. 796, this area is given as 1,145,000 square miles.

2. Given as 1,801,700 square miles in the work above quoted, where, however, the statistics are said "to refer only to the continental States of the Federation, not to Tasmania."

longitude; (*b*) between divisions II. and III., starting at the Gulf of Carpentaria, along the Norman River to Normanton, thence a straight line to Wilcannia on the Darling River, New South Wales; (*c*) between divisions II. and IV., from Wilcannia along the Darling River to its junction with the Murray; (*d*) between divisions II. and V., from the junction of the Darling and Murray Rivers, along the latter to Encounter Bay; (*e*) between divisions III. and IV., starting at Wilcannia, along the Darling, Barwon, and Dumaresq Rivers to the Great Dividing Range, and along that range and along the watershed between the Clarence and Richmond Rivers to Evans Head on the east coast of Australia; (*f*) between divisions IV. and V., from the junction of the Darling and Murray Rivers along the latter to its junction with the Murrumbidgee, along the Murrumbidgee to the Tumut River, and along the Tumut River to Tumut, thence a straight line to Cape Howe; (*g*) division V. includes Tasmania.

The population included within these boundaries at the Census of the 3rd April, 1911, was approximately as follows:—

Division	I.	II.	III.	IV.	V.
Population	282,000	429,000	607,000	1,540,000	1,597,000

In these divisions the order in which the capitals occur is as follows:—(i.) Perth, (ii.) Adelaide, (iii.) Brisbane, (iv.) Sydney, (v.) Melbourne, (vi.) Hobart, and for that reason the climatological and meteorological statistics will be set forth in the indicated order in this publication.

(i.) *Special Climatological Stations.* The latitudes, longitudes, and altitudes of special stations, the climatological features of which are graphically represented hereinafter, are as follows:—

SPECIAL CLIMATOLOGICAL STATIONS.

Locality.	Height above Sea Level.	Latitude. S.		Longitude. E.		Locality.	Height above Sea Level.	Latitude. S.		Longitude. E.	
	Feet.	deg.	min.	deg.	min.		Feet.	deg.	min.	deg.	min.
Perth	197	31	57	115	51	Darwin ...	97	12	28	130	51
Adelaide ...	140	34	56	138	35	Daly Waters ...	700	16	16	133	23
Brisbane ...	137	27	28	153	2	Alice Springs ...	1926	23	38	133	37
Sydney	146	33	52	151	12	Dubbo ...	870	32	18	148	35
Melbourne ...	115	37	50	144	59	Laverton ...	1530	28	40	122	23
Hobart	160	42	53	147	20	Coolgardie ...	1402	30	57	121	10

5. **Temperatures.**—In respect of Australian temperatures generally it may be pointed out that the isotherm for 70° Fahrenheit extends in South America and South Africa as far south as latitude 33°, while in Australia it reaches only as far south as latitude 30°, thus shewing that, on the whole, Australia has a more temperate climate when compared latitude for latitude with places in the Southern Hemisphere.

The comparison is even more favourable when the Northern Hemisphere is included in the comparison, for in the United States the 70° isotherm extends in several of the western States as far north as latitude 41°. In Europe the same isotherm reaches almost to the southern shores of Spain, passing, however, afterwards along the northern shores of Africa till it reaches the Red Sea, when it bends northward along the eastern shore of the Mediterranean till it reaches Syria. In Asia nearly the whole of the land area south of latitude 40° N. has a higher isothermal value than 70°.

The extreme range of shade temperatures in summer and winter in a very large part of Australia amounts to probably only 81°. In Siberia, in Asia, the similar range is no less than 171°, and in North America 153°, or approximately double the Australian range.

Along the northern shores of the Australian continent the temperatures are very equable. At Darwin, for example, the difference in the means for the hottest and

coldest months is only 8.6°, and the extreme readings for the year, that is, the highest maximum in the hottest month and the lowest reading in the coldest month, shew a difference of under 50°.

Coming southward the extreme range of temperature increases gradually on the coast, and in a more pronounced way inland.

The detailed temperature results for the several capitals of the States of Australia are shewn in the Climatological Tables hereinafter. It will suffice here to briefly refer to special features.

(i.) *Perth.* Meteorological observations were taken in the Perth Botanical Gardens as far back as 1876, but since the conditions surrounding the instruments and the situation of the station relative to Perth cannot be regarded as quite satisfactory, the more exact climate history of Perth did not properly commence until 1897, when the present observatory was established. During the period 1897 to 1911, the mean annual shade temperature of Perth was 64°, about a degree higher than that of Sydney and Adelaide, nearly 6° higher than that of Melbourne, and 10° above that of Hobart, but, on the other hand, 5° below that of Brisbane. The average temperature for the month of January is 73.5°, and for July 55.0°.

The extreme maximum shade record of 107.9° was registered in December, 1904, and the lowest minimum shade temperature was 35.3°, in August, 1908.

(ii.) *Adelaide.* In Adelaide the climate is drier and more sunny than in the other capitals, and, consequently, radiation is less hindered. The extremes of heat are consequently somewhat more marked, especially in the summer months. The mean shade temperature for January is 74.2°, and February 73.9°, and that for July 51.5°. Records of the temperature having reached 100° exist for each of the six summer months from October to March, and of having exceeded 110° exist for each of those months with the exception of March and October. The highest record of shade temperature in Adelaide is 116.3°, registered in January, 1858, and the lowest 32.0°, a range of 84.3°. The freezing point has only once been reached by the shade temperature thermometers, notwithstanding the fact that records have been kept for fifty-five years. Frosts have, however, occurred on the grass (four feet below the shade thermometers) at various times between the beginning of April and the end of November.

(iii.) *Brisbane.* In Brisbane the monthly mean shade temperature ranges from 77.1° in January to 58.0° in July, a difference of 19.1°. The extremes have varied from 108.9° in January, 1902, to 36.1° in July, 1894 and 1896, viz., through a range of 72.8°.

(iv.) *Sydney.* In Sydney the highest monthly mean is 71.6°, recorded in January, while the lowest, again in July, is 52.3°, giving a range of 19.3°.

The extremes of shade temperature recorded at Sydney over a period of half a century are 108.5° in January, 1896, and 35.9° in July, 1890, *i.e.*, a range of 72.6°.

(v.) *Melbourne.* In Melbourne the January mean shade temperature averages 67.5°, and that of July 48.5°, the highest reading ever recorded being 111.2° in January, 1862, and the lowest 27.0° in July, 1869.

(vi.) *Hobart.* The mean temperature for the hottest month at Hobart is 62.2° in February, and that of the coldest 45.7°, in July, the highest reading ever recorded being 105.2° in December, 1897, and the lowest 27.7° in July, 1895, nearly a degree higher than the lowest experienced in Melbourne.

(vii.) *Hottest and Coldest Parts.* A comparison of the temperatures recorded at coast and inland stations shews that, in Australia as in other continents, the range increases with increasing distance from the coast.

In the interior of Australia, and during exceptionally dry summers, the temperature occasionally reaches or exceeds 120° in the shade, and during the dry winters the major

portion of the country to the south of the tropics is subject to ground frosts. An exact knowledge of temperature disposition cannot be determined until the interior becomes more settled, but from data procurable, it would appear that the hottest area of the continent is situated in the northern part of Western Australia about the Marble Bar and Nullagine goldfields, where the maximum shade temperature during the summer sometimes exceeds 100° for days, and even weeks continuously. The coldest part of the Commonwealth is the extreme south-east of New South Wales and extreme east of Victoria, namely, the region of the Australian Alps. Here the temperature seldom, if ever, reaches 100° even in the hottest of seasons.

In Tasmania also, although occasionally hot winds may cross the Straits and cause the temperature to rise to 100° in the low-lying parts, yet the island as a whole enjoys a most moderate and equable range of temperature throughout the year.

(viii.) *Monthly Maximum and Minimum Temperatures.* The mean monthly maximum and minimum temperatures can be best shewn by means of graphs, which exhibit the nature of the fluctuation of each for the entire year. In the diagram (on page 87) for nine representative places in Australia, the upper heavy curves shew the mean maximum, the lower heavy curves the mean minimum temperatures based upon daily observations. On the same diagram the thin curves shew the relative humidities (see next paragraph).

6. **Relative Humidity.**— Next after temperature the degree of humidity may be regarded as of great importance as an element of climate; and the characteristic differences of relative humidity between the various capitals of Australia call for special remark. For six representative places the variations of humidity are shewn on the graph on page 87, which gives results based upon daily observations of the dry and wet bulb thermometers. Hitherto difficulties have been experienced in many parts of Australia in obtaining satisfactory observations for a continuous period of any length. For this reason it has been thought expedient to refer to the record of humidity at first order stations only, where the results are thoroughly reliable. Throughout, the degree of humidity given will be what is known as *relative humidity*, that is, the percentage of aqueous vapour actually existing to the total possible if the atmosphere were saturated.

(i.) *Perth.* At Perth the mean annual humidity at 9 a.m. is 63; the greatest monthly mean is 84, and is in June, and the lowest 45, in January.

(ii.) *Adelaide.* At Adelaide the mean annual humidity at 9 a.m. is only 54; the mean monthly humidity has been as low as 33 in January and December, and as high as 87 in July.

(iii.) *Brisbane.* In Brisbane the mean annual humidity at 9 a.m. is 68; the lowest monthly mean recorded is 47, and is in September, 1905, and the highest 85 in the months of March, 1890, and May, 1891.

(iv.) *Sydney.* In Sydney the mean annual humidity at 9 a.m. is 73; the greatest monthly average, which occurred in May, 1891, was 90, while the lowest monthly mean, 52, occurred in the month of December, 1911.

(v.) *Melbourne.* The mean annual humidity derived from the 9 a.m. 3 p.m. and 9 p.m. observations in Melbourne is 71; the greatest monthly average 88, in June and July, 1858, and the lowest 49, in December, 1908.

(vi.) *Hobart.* Hobart's mean annual humidity at 9 a.m. is 70, the highest monthly mean 92, in June, and the lowest 50, in November.

From the above results, it is seen that, in respect of relative humidity, Sydney has the first place, while Melbourne, Hobart, Brisbane, Perth, and Adelaide follow in the order stated, Adelaide being the driest. The graphs on page 87 shew the annual variations in humidity. It will be observed that the *relative* humidity is ordinarily but not invariably great when the temperature is low.

7. **Evaporation.**—The rate and quantity of evaporation in any territory is influenced by the prevailing temperature, and by atmospheric humidity, pressure and movement. In Australia the question is of perhaps more than ordinary importance; since in its drier regions water has often to be conserved in "tanks"[1] and dams. The magnitude of the economic loss by evaporation will be appreciated from the following records, which have been obtained from either jacketed tanks sunk into the ground, or in the case of Laverton (W.A.) from a jacketed vessel (8 inches in diameter) exposed on the surface.

The average total evaporation at Sydney is 36.82 inches; at Melbourne, 38.31 inches; at Adelaide, 54.29 inches; and at Perth, 66.03 inches, these results being based respectively upon 32, 39, 42, and 13 years' observations. For Brisbane the evaporation for the year 1910 was 48.61 inches, and for 1911 49.34 inches. At Hobart the mean for the two years was 28.86 inches.

In the interior of New South Wales the annual evaporation is as high as 84 inches; in Central Australia at Alice Springs the average for 20 years is 97.10 inches; at Coolgardie, Western Australia, the mean for thirteen years is 87.37 inches, and at Laverton, in the same State, the yearly amount derived from the last 6 years is 146.57 inches, or over 12 feet.

(i.) *Monthly Evaporation Curves.* The curves showing the mean monthly evaporation in various parts of the Commonwealth will disclose how characteristically different are the amounts for the several months in different localities. The evaporation for characteristic places is shewn on diagram shewing also rainfalls (see page 88).

(ii.) *Loss by Evaporation.* In the interior of Australia the possible evaporation is often greater than the actual rainfall. Since, therefore, the loss by evaporation depends largely on the exposed area, tanks and dams so designed that the surface shall be a minimum are advantageous. Similarly, the more protected from the direct rays of the sun and from winds, by means of suitable tree planting, the less will be the loss by evaporation: these matters are of more than ordinary concern in the drier districts of Australia.

8. **Rainfall.**—As even a casual reference to climatological maps, indicating the distribution of rainfall and prevailing direction of wind, would clearly shew, the rainfall of any region is determined mainly by the direction and route of the prevailing winds, by the varying temperatures of the earth's surface over which they blow, and by the physiographical features generally.

Australia lies within the zone of the south-east and westerly trade winds. The southern limit of the south-east trade strikes the eastern shores at about 30° south latitude. Hence, we find that, with very few exceptions, the heaviest rains of the Australian continent are precipitated along the Pacific slopes to the north of that latitude, the varying quantities being more or less regulated by the differences in elevation of the shores and of the chain of mountains, upon which the rain-laden winds blow, from the New South Wales northern border to Thursday Island. The converse effect is exemplified on the north-west coast of Western Australia from the summer south-east trade winds. Here the prevailing winds, blowing from the interior of the continent instead of from the ocean, result in the lightest coastal rain in Australia.

The westerly trade winds, which skirt the southern shores, are responsible for the very reliable, although generally light, rains enjoyed by the south-western portion of Western Australia, by the south-eastern agricultural areas of South Australia, by a great part of Victoria, and by the whole of Tasmania.

(i.) *Factors determining Distribution and Intensity of Rainfall.* The distribution and intensity of rainfall in the interior of the continent, and also to some extent in the areas already mentioned, are governed by the seasonal peculiarities of three distinct atmospheric control systems, the most important of which is, undoubtedly, the anticyclonic stream. This stream, which girdles the earth and embraces approximately the region between 15° and 40° south latitude, breaks up into vast elliptically-shaped bodies

1. In Australia artificial storage ponds or reservoirs are called "tanks."

of circulating atmosphere, measuring frequently 3000 miles in their major and 2000 miles in their minor axes. In passing over Australia from west to east, these great bodies of circulating air cause moist-laden winds to sweep across the continent from the surrounding oceans. The front-circulation brings in winds from the Southern Ocean, and the rear-circulation those from the equatorial seas.

The rain-invoking agent second in order of importance because of its reliability is the well-known "V-shaped depression." The sphere of operation of this latter disturbance is ordinarily the southern half of the continent, although occasionally it may extend its influence to tropical latitudes. The western half of this type of disturbance, with a southerly wind circulation, is the portion from which rain is most frequently to be expected, but occasionally good falls of rain, attended with electrical manifestations, are liberated from the warm eastern portion.

The third agent associated with the production of rain is the tropical depression more popularly known as the "monsoonal depression." This disturbance may be in active evidence for a succession of seasons, and then be conspicuously absent for a number of years, thus raising the question whether, after all, it can be regarded as in any way a distinctive feature of Australian meteorology.

When these disturbances are actively operative in the production of rain, the effect on the country generally, and the economic results for the succeeding season, are very pronounced. The interior of the continent becomes transformed. The plains, which ordinarily have so profound an effect on the heat winds of the summer, are deluged with rain, and respond immediately with an astonishingly luxurious growth of grass and herbage. The air is both tempered in heat, and loses its dryness for considerable periods after their visitations.

The distribution of rain by monsoonal disturbances is, however, very capricious in comparison with that precipitated by the southern "depressions." During some seasons the whole of the northern half of the continent will benefit to a fairly uniform degree; at another time some special region will be favoured. A remarkable example of this peculiarity occurred in 1902, for when monsoonal rains were copiously falling over the major portion of Western Australia, the eastern half of the continent was suffering from severe drought conditions.

During other seasons, tongue-shaped regions extending southwards from the northern shores of the continent will be particularly favoured in regard to rain. These regions may extend to the interior of Western Australia, and simultaneously others may occur in the Central Territory, in Western Queensland, and in the interior of New South Wales.

It is thus obvious that different parts of the continent are mainly dependent upon forms of atmospheric disturbances for what may be called their fundamental rains, and since there is a seasonal tendency for a particular class of storms to predominate, it rarely happens that any year passes in which the rains are universally good. Again, the condition of drought can hardly affect the whole of the continent at the same time. Nevertheless a more than ordinarily fortunate condition in one part of the continent usually implies drought conditions in another, or *vice-versâ*. Thus in New South Wales, monsoonal rains, so beneficial to its north-western districts, rarely extend during the same season to coastal areas, or to Southern Riverina. For this reason it may happen occasionally that sheep may with advantage be sent 500 or 600 miles from the coast for feed and water. Should the southern or antarctic low-pressures be the predominating influence, the country to the south of the Murrumbidgee River is benefiting at the expense of the remainder of the State. A good coastal season ordinarily depends upon an anticyclonic control; when such exists, the country west of the tablelands usually wants water.

A good season for Australia as a whole is dependent upon many circumstances. Not only must the main rain-giving storms be well represented, but other favourable conditions must also coexist. The general rate of translation of the atmosphere across the continent is a factor of the utmost importance. Another is the latitude the cyclones and

anti-cyclones are moving in, and, further, the daily or periodic surgings of high and low pressures to and from the equator are also factors of considerable moment.

(ii.) *Time of Rainfall.* Monsoonal rains affect the northern parts of the continent in the summer months, and may continue with diminishing energy for nearly six months of the year. As they penetrate into higher latitudes in a south-easterly direction the period of action is delayed, but is not shortened, though the quantities of the fall materially lessen. Antarctic rains are experienced during the winter months of the year, the resultant quantities being reliable and consistently regular. The heaviest totals from this source are precipitated on the west coast of Tasmania. Thus at Mount Lyell the total for one year exceeded 140 inches, and even the average is 115.82 inches.

Anticyclonic rains occur at all times of the year, but more markedly from March to September. They benefit particularly the southern area of the continent, and are responsible for many of the heaviest rainfalls and floods on the coastal districts of New South Wales.

(iii.) *Wettest and Driest Regions.* The wettest known part of Australia is on the north-east coast of Queensland, where three stations situated on, or adjacent to, the Johnstone and Russell Rivers have an average annual rainfall of between 150 and 166 inches. The maximum and minimum falls there are:—Goondi, 241.53 in 1894 and 76.24 inches in 1902, or a range of 165.29 inches; Innisfail, 211.24 in 1894 and 69.87 inches in 1902, or a range of 141.37 inches; Harvey Creek, 238.45 in 1901 and 80.47 inches in 1902, or a range of 157.98 inches.

On three occasions more than 200 inches have been recorded at Goondi, the last of these being in 1910 when 204.82 inches were registered. The record at this station covers a period of 19 years.

Harvey Creek in the shorter period of 15 years has twice exceeded 200 inches, the total for 1910 being 201.28 inches.

The driest known part of the continent is about the Lake Eyre district in South Australia (the only part of the continent below sea level), where the annual average is but 5 inches, and where it rarely exceeds 10 inches for the twelve months.

The inland districts of Western Australia have until recent years been regarded as the driest part of Australia, but authentic observations taken during the past decade at settled districts in the east of that State shew that the annual average is from 10 to 12 inches.

(iv.) *Quantities and Distribution of Rainfall generally.* The departure from the normal rainfall increases greatly and progressively from the southern to the northern shores of the continent, and similarly also at all parts of the continent, subject to capricious monsoonal rains, as the comparisons hereunder will shew. The general distribution is best seen from the map on page 93, shewing the areas subject to average annual rainfalls lying between certain limits. The areas enjoying varying quantities of rainfall determined from the latest available information are shewn in the following table:—

DISTRIBUTION OF AVERAGE RAINFALL.

Average Annual Rainfall.	N.S.W.	Victoria.	Queensland.	South Aust.	Northe'n Territ'y.	Western Aust.	Tasmania.	Commonwealth.
	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.	sqr. mls.
Under 10 inches	44,997	nil	126,390	317,600	138,190	513,653	nil	1,140,830
10—15 ,,	77,268	19,912	132,500	33,405	141,570	232,815	nil	637,470
15—20 ,,	57,639	12,626	118,650	14,190	62,920	89,922	nil	355,947
20—30 ,,	77,202	29,317	175,390	13,827	93,470	95,404	4,242	488,852
30—40 ,,	30,700	14,029	67,310	984	40,690	40,750	7,397	201,860
Over 40 ,,	22,566	12,000	50,260	64	46,780	3,376	14,576	149,622
Total area ...	310,372	87,884	670,500	380,070	523,620	975,920	26,215	2,974,581

NOTE.—Tasmania and Queensland are subject to alteration.

Referring first to the southern capitals, it may be noted that the average at Melbourne from 68 years' records is 26.28 inches; the maximum 44.25, and minimum 15.61; the range therefore is 28.64 inches. At Adelaide the average determined from 73 years' totals is 21.06, the maximum 30.87, the minimum 13.43 and the range therefore 17.44 inches. At Hobart 23.57 inches is the average annual rainfall for 69 years, 40.67 being the highest total for one year, and 13.43 the lowest; thus 27.24 inches is the extreme range. The average from 36 years' records for Perth is 33.26 inches, 46.73 being the maximum and 20.48 inches the minimum; the range is therefore 26.25 inches. These figures appear to constitute an exception to the general rule, but it should be mentioned as a possible explanation that records have there been taken only since 1876, whereas the records at the other cities date from 1840 or thereabouts.

Continuing the comparison of rainfall figures, Sydney's average annual total derived from 72 years' records is 48.29 inches, its maximum 82.81 in 1860, and minimum 21.48 in 1849, thus the range is 61.33 inches. At Brisbane the disparities are greater still. There the average from 62 years' totals is 46.79 inches—a trifle lower than that of Sydney—the annual maximum was 88.26 inches in 1893, the minimum 16.17 inches in 1902, and the range therefore 72.09 inches.

In order to shew how the rainfall is distributed throughout the year in various parts of the continent, the figures of representative towns have been selected. Darwin, typical of the Northern Territory, shews that in that region nearly the whole of the rainfall occurs in the summer months, while little or nothing falls in the middle of the year. The figures of Perth, as representing the south-western part of the continent, are the reverse, for while the summer months are dry, the winter ones are very wet. In Melbourne and Hobart the rain is fairly well distributed throughout the twelve months, with a maximum in October in the former, and in November in the latter. The records at Alice Springs and Daly Waters indicate that in the central parts of Australia the wettest months are in the summer and autumn. In Queensland, as in the Northern Territory, the heaviest rains fall in the summer months, but good averages are also maintained during the other seasons.

On the coast of New South Wales, the first six months of the year are the wettest, with slight excesses in April and July; the averages during the last six months are fair and moderately uniform. In general it may be said that one-fourth of the area of the continent, principally in the eastern and northern parts, enjoys an annual average rainfall of from 20 to 50 inches, the remaining three-fourths receiving generally from 10 to 15 inches.

(v.) *Curves of Rainfall and Evaporation.* The relative amounts of rainfall and evaporation at different times through the year are best seen by referring to the graphs for a number of characteristic places. It will be recognised at once how large is the evaporation when water is fully exposed to the direct rays of the sun, and to wind, etc.

(vi.) *Tables of Rainfall.* The table of rainfall for a long period of years for each of the various Australian capitals affords information as to the variability of the fall in successive years, and the list of the more remarkable falls furnishes information as to what may be expected on particular occasions.

RAINFALL AT THE AUSTRALIAN CAPITALS, 1840 to 1911.

Year.	Perth.			Adelaide.			Brisbane.			Sydney.			Melbourne.			Hobart.		
	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.	Amount.	No. of Days.	10 Years' Means.
	in.		in.	in.		in.	in.		in.	in.		in.	in.		in.	in.		in.
1840	...	...	...	24.23	99	...	29.32	...	...	58.52	150	...	22.57	...	...	...	...	...
1	...	...	...	17.96	93	...	49.31	...	...	76.31	142	...	30.18	...	...	13.95	...	...
2	...	...	...	20.32	122	...	28.81	...	...	48.82	137	...	31.16	...	...	23.60	...	...
3	...	...	...	17.19	104	...	51.67	...	...	62.78	168	...	21.54	...	...	13.43	...	...
4	...	...	...	16.88	136	...	63.20	...	...	70.67	157	...	30.74	...	...	26.25	...	...
5	...	...	...	18.83	125	...	39.09	...	...	62.03	132	...	23.93	...	...	16.68	...	...
6	...	...	...	26.89	114	...	31.41	...	41.83	43.83	139	...	30.53	...	...	21.96	...	...
7	...	...	...	27.61	109	...	...	...	(7 yr.)	42.80	142	...	30.18	...	...	14.46	...	...
8	...	...	...	19.74	114	21.07	42.59	...	...	59.17	137	58.33	33.15	...	28.22	23.62	...	19.24
9	...	...	...	25.44	110	(9 yr.)	...	...	...	21.48	140	(9 yr.)	44.25	...	(9 yr.)	33.51	...	(8 yr.)
1850	...	...	...	19.56	84	...	...	...	...	44.88	157	...	26.98	...	...	14.51	...	...
1	...	...	...	30.86	128	...	...	...	...	35.14	142	...	...	...	...	17.98	...	...
2	...	...	...	27.44	118	...	...	...	...	43.78	145	...	...	...	...	23.62	...	...
3	...	...	...	27.08	128	...	...	...	...	46.11	130	...	...	...	...	14.52	...	...
4	...	...	...	15.35	105	...	...	...	...	29.28	136	...	...	...	...	30.54	...	...
5	...	...	...	23.15	124	...	...	...	...	52.85	138	...	28.21	...	...	18.25	...	...
6	...	...	...	24.93	118	...	...	...	...	43.31	116	...	29.76	134	...	22.73	151	...
7	...	...	...	22.15	105	...	...	...	...	50.95	135	...	28.90	138	...	17.14	113	...
8	...	...	...	21.55	107	23.75	43.00	...	...	39.60	139	40.74	26.01	158	...	33.07	129	22.59
9	...	...	...	14.85	95	...	35.00	...	...	42.06	128	...	21.82	156	...	23.31	...	...
1860	...	...	...	19.67	119	...	54.63	144	...	82.81	182	...	25.38	133	...	21.05	...	...
1	...	...	...	24.04	147	...	69.45	155	...	59.36	157	...	29.16	159	...	28.19	...	...
2	...	...	...	21.85	119	...	28.27	98	...	23.98	111	...	22.08	139	...	21.72	...	...
3	...	...	...	23.68	145	...	68.83	146	...	47.08	152	...	36.42	165	...	40.67	...	...
4	...	...	...	19.75	121	...	47.00	114	...	69.12	187	...	27.40	144	...	28.11	...	...
5	...	...	...	15.51	108	...	24.11	52	...	36.29	128	...	15.94	119	...	23.07	...	...
6	...	...	...	20.11	116	...	51.18	142	...	36.81	149	...	22.41	107	...	23.55	...	...
7	...	...	...	19.05	112	...	61.04	112	...	59.68	126	...	25.79	133	...	22.27	...	...
8	...	...	...	19.99	113	19.85	35.98	110	47.55	43.05	127	50.02	18.27	120	24.47	18.08	...	25.00
9	...	...	...	14.74	117	...	54.39	114	...	48.19	134	...	24.58	129	...	23.87	...	...
1870	...	...	...	23.84	119	...	79.06	154	...	64.22	178	...	33.77	129	...	27.53	...	...
1	...	...	...	23.25	137	...	45.45	119	...	52.27	141	...	30.17	125	...	18.25	131	...
2	...	...	...	22.66	146	...	49.22	131	...	37.12	161	...	32.52	136	...	31.76	160	...
3	...	...	...	21.00	139	...	62.02	138	...	73.40	176	...	25.61	134	...	23.43	157	...
4	...	...	...	17.23	127	...	38.71	135	...	63.60	173	...	28.10	134	...	24.09	138	...
5	...	...	...	29.21	157	...	67.03	162	...	46.25	153	...	32.87	158	...	29.25	181	...
6	28.73	100	...	13.43	110	...	53.42	130	...	45.69	156	...	24.04	134	...	23.63	...	...
7	20.48	103	...	24.95	135	...	30.28	119	...	59.66	147	...	24.10	124	...	20.82	...	...
8	39.72	143	29.64	22.08	112	21.24	56.33	134	53.59	49.77	129	54.02	25.36	116	28.11	29.76	...	25.24
9	41.34	106	(3 yr.)	20.69	130	...	67.30	157	...	63.19	167	...	19.28	127	...	21.07	...	...
1880	31.79	116	...	22.48	142	...	49.12	134	...	29.51	142	...	28.48	147	...	...	...	...
1	24.78	101	...	18.02	135	...	29.39	117	...	41.09	163	...	24.08	134	...	...	...	...
2	35.68	109	...	15.70	134	...	42.62	121	...	42.28	112	...	22.40	131	...	30.69	...	...
3	39.65	122	...	26.76	161	...	32.22	114	...	46.92	157	...	23.71	130	...	24.05	160	...
4	31.96	92	...	18.74	138	...	43.49	136	...	44.04	159	...	25.85	128	...	21.55	171	...
5	33.44	110	...	15.89	133	...	26.85	112	...	39.91	145	...	26.94	123	...	28.29	176	...
6	28.90	89	...	14.42	141	...	53.66	152	...	39.43	152	...	24.00	128	...	21.39	189	...
7	37.52	105	...	25.70	164	...	81.54	242	...	60.16	189	...	32.39	153	...	24.21	174	...
8	27.83	117	33.29	14.55	131	19.30	33.08	143	45.93	23.01	132	42.95	19.42	123	24.66	18.45	151	23.71
9	39.96	123	...	30.87	143	...	49.36	155	...	57.16	186	...	27.14	125	...	30.80	180	(8 yr.)
1890	46.73	126	...	25.78	139	...	73.02	162	...	81.42	184	...	24.24	140	...	27.51	173	...
1	30.33	93	...	14.01	113	...	41.68	143	...	55.30	200	...	26.73	126	...	23.25	160	...
2	31.23	122	...	21.53	137	...	64.98	146	...	69.26	189	...	24.96	124	...	18.62	...	...
3	40.12	145	...	21.49	129	...	88.26	147	...	49.90	208	...	26.80	140	...	27.46	146	...
4	23.72	103	...	20.78	134	...	44.02	143	...	38.22	188	...	22.60	138	...	27.39	151	...
5	33.01	123	...	21.28	130	...	59.11	105	...	31.86	170	...	17.04	131	...	25.40	119	...
6	31.50	103	...	15.17	121	...	44.97	121	...	42.40	157	...	25.16	124	...	21.61	136	...
7	27.17	106	...	15.42	119	...	42.53	115	...	42.52	136	...	25.85	117	...	20.45	153	...
8	31.76	118	33.55	20.75	116	20.71	60.06	131	56.80	43.17	149	51.12	15.61	102	23.61	20.40	164	24.29
9	32.40	107	...	18.84	119	...	38.85	141	...	55.90	172	...	28.87	116	...	20.68	170	...
1900	36.61	124	...	21.68	133	...	34.41	110	...	66.54	170	...	28.09	139	...	19.14	135	...
1	36.75	122	...	18.01	124	...	38.48	110	...	40.10	151	...	27.45	113	...	25.11	147	...
2	27.06	93	...	16.02	123	...	16.17	87	...	43.07	176	...	23.08	102	...	21.85	151	...
3	35.69	140	...	25.47	134	...	49.27	136	...	38.62	169	...	28.43	130	...	25.86	139	...
4	34.35	125	...	20.31	117	...	33.23	124	...	45.93	155	...	29.72	128	...	22.41	139	...
5	34.61	116	...	22.28	131	...	36.76	108	...	35.03	144	...	25.64	129	...	32.09	168	...
6	32.37	121	...	26.51	127	...	42.84	125	...	31.89	159	...	22.29	114	...	23.31	155	...
7	40.12	132	...	17.78	125	...	31.46	119	...	31.32	132	...	22.26	102	...	25.92	167	...
8	30.52	106	34.05	24.56	125	21.15	44.01	125	36.55	45.65	168	43.41	17.72	130	25.36	16.50	149	23.29
9	39.11	107	...	27.69	138	...	34.07	121	...	32.27	177	...	25.86	171	...	27.29	170	...
1910	37.02	135	...	24.62	116	...	49.00	133	...	46.91	160	...	24.61	167	...	25.22	205	...
1	23.38	108	...	15.99	127	...	35.15	128	...	50.24	155	...	36.61	168	...	26.78	193	...
Aver.	...	...	33.26	...	...	21.06	...	...	46.79	...	...	48.29	...	...	6.28	...	...	23.57
No. of Yrs.			(36)			(73)			(62)			(72)			(68)			(69)

NOTE.—The above average Rainfall figures for Brisbane, Sydney, and Melbourne differ slightly from the mean annual falls given in the Climatological Tables on pp. 99-101, which are for a less number of years.

9. **Remarkable Falls of Rain.**—The following are the more remarkable falls of rain in the States of New South Wales, Queensland, Western Australia, and South Australia, which have occurred within a period of twenty-four hours :—

HEAVY RAINFALLS, NEW SOUTH WALES, UP TO 1911 INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Albion Park ...	8 Feb., 1895	10.00	Kempsey	10 Mar., 1893	10.84
,, ,, ...	13 Jan., 1911	10.95	Leconfield... ...	9 ,, ,,	14.53
Albury	14 Feb., 1898	10.70	Liverpool	23 Feb., 1874	10.39
Alme Dorrigo ...	22 Jan., 1893	10.27	Macksville* ...	23 Feb., 1908	10.00
Anthony	28 Mar., 1887	17.14	Madden's Creek ...	2 ,, ,,	10.36
,, ...	15 Jan., 1890	13.13	,, ,, ...	13 Jan., 1911	18.68
Arnold Grove ...	28 May, 1889	11.13	Maitland W. ...	9 Mar., 1893	14.79
,, ,, ...	20 Mar., 1892	10.08	Major's Creek ...	14 Feb., 1898	12.32
Araluen	14 Feb., 1898	10.51	Milton	13 Jan., 1911	10.41
,, ...	15 ,, ,,	13.36	Mittagong... ...	6 Mar., 1893	11.71
Bellawongarah ...	13 Jan., 1911	10.92	Morpeth	9 ,, ,,	21.52
Berry	13 ,, ,,	12.05	Mount Kembla ...	14 Feb., 1898	10.25
Billambil	14 Mar., 1894	12.94	,, ,, ...	2 ,, 1908	10.27
Bomaderry... ...	13 Jan., 1911	13.03	,, ,, ...	13 Jan., 1911	18.25
Bowral	6 Mar., 1893	11.94	Mount Pleasant ...	14 ,, ,,	10.40
Bowraville... ...	22 June, 1898	11.50	Myra Vale ...	14 Feb., 1898	10.00
Broger's Creek ...	14 Feb., ,,	20.05	Nambucca Heads ...	3 Apr., 1905	10.62
,, ,, ...	19 July, 1910	12.22	Nepean Tunnel ...	14 Feb., 1898	12.30
,, ,, ...	13 Jan., 1911	20.83	Nethercote ...	14 Jan., 1911	11.32
Bulli Mountain ...	19 Mar., 1894	10.45	Newcastle... ...	19 Mar., 1871	11.17
,, ,, ...	13 Feb., 1898	17.14	,, ...	9 ,, 1893	11.14
Burwood	28 May, 1889	11.75	,, ...	24 Feb., 1908	10.02
Camden	11 July, 1904	10.90	Nowra	11 July, 1904	11.50
Camden Haven ...	22 Jan., 1895	12.23	,, ...	13 Jan., 1911	13.00
Canley Vale ...	28 May, 1889	10.06	Parramatta ...	28 May, 1889	11.94
,, ,, ...	20 Mar., 1892	10.85	,, ...	20 Mar., 1892	11.01
Castle Hill... ...	28 May, 1889	13.49	Port Macquarie ...	9 Nov., 1887	10.76
Cockle Creek ...	23 Feb., 1908	10.45	Port Stephens ...	9 Feb., 1889	10.15
Colombo Lyttleton ...	5 Mar., 1893	12.17	Prospect	28 May, ,,	12.37
Condong	27 ,, 1887	18.66	Raymond Terrace ...	28 Sep., 1903	10.32
,, ...	15 Jan., 1890	11.50	Richmond ...	28 May, 1889	12.18
Cookville	1 Apr., 1892	11.31	Robertson... ...	14 Feb., 1898	10.00
Coramba	11 June, 1893	10.83	,, ...	10 July, 1904	10.50
Cordeaux River ...	26 Feb., 1873	10.98	Rooty Hill ...	27 May, 1889	11.85
,, ,, ...	3 ,, 1890	11.51	Rylstone	28 ,, ,,	10.26
,, ,, ...	14 Feb., 1898	22.58	Seven Oaks ...	22 June, 1898	11.06
,, ,, ...	31 Aug., 1906	10.31	Springwood ...	7 Mar., 1894	10.55
,, ,, ...	13 Jan., 1911	14.52	Stockyard Mount ...	13 Jan., 1911	11.54
Cudgen	15 Mar., 1894	10.23	Taree	28 Feb., 1892	12.24
Dapto West ...	14 Feb., 1898	12.05	Terara	26 ,, 1873	12.57
,, ,, ...	13 Jan., 1911	10.37	Tomago	9 Mar., 1893	13.76
Darkes' Forest ...	8 Feb., 1895	11.10	Tongarra	9 July, 1904	11.10
Dunheved	28 May, 1889	12.40	Tongarra Farm ...	14 Feb., 1898	15.12
Eden	4 ,, 1875	10.52	Towamba	5 Mar., 1893	20.00
Fernmount ...	2 Feb., 1890	10.36	Tweed Heads ...	14 Jan., 1890	10.53
,, ...	2 June, 1903	11.29	,, ,, ...	14 Mar., 1894	11.40
Goorangoola ...	9 Mar., 1893	10.34	Trial Bay	9 ,, 1893	11.13
Guy Fawkes ...	2 June, 1903	11.30	White Swamp ...	12 Jan., 1911	10.24
Hercynia	28 May, 1889	11.85	Wollongong ...	26 Feb., 1873	11.00
Holy Flat	12 Mar., 1887	12.00	,, ...	5 Apr., 1882	10.00
,, ,, ...	28 Feb., 1892	12.24	Woolgoolga ...	11 June, 1893	10.83
Jamberoo	14 ,, 1898	10.92	Yellow Rock ...	14 Feb., 1898	11.69
,, ...	13 Jan., 1911	10.89	South Head		
Kareela	20 Oct., 1902	11.73	(near Sydney)...	29 Apr., 1841	20.12
Kembla Heights ...	13 Jan., 1911	17.46	,, ,, ...	16 Oct., 1844	20.41

6.50 inches fell in 2 hours.

HEAVY RAINFALLS, QUEENSLAND, UP TO 1911 INCLUSIVE.

Name of Town or Locality.	Date.	Amnt. ins	Name of Town or Locality.	Date.	Amnt. ins.
Anglesey	26 Dec., 1909	18.20	Coen	1 Apr., 1910	10.71
Ascot	14 Mar., 1908	11.34	Collaroy	30 Jan., 1896	14.25
Ayr	20 Sep., 1890	14.58	,, ...	30 ,, 1910	10.25
,, ...	25 Mar., 1891	10.19	Cooktown	22 ,, 1903	12.49
,, ...	26 Jan., 1896	10.50	,, ...	19 ,, 1907	11.70
Beenleigh	21 ,, 1887	11.30	,, ...	1 Apr., 1911	11.11
,, ...	14 Mar., 1908	10.40	Cooran	1 Feb., 1893	13.62
Bloomsbury ...	14 Feb., 1893	17.40	,, ...	9 June, ,,	10.12
,, ...	27 Jan., 1896	10.52	,, ...	26 Dec., 1908	14.08
,, ...	10 ,, 1901	16.62	Cooroy	9 June, 1893	13.60
,, ...	4 Mar., 1906	11.36	,, ...	10 Jan., 1898	13.50
,, ...	9 Jan., 1908	11.30	,, ...	6 Mar., ,,	10.04
Boggo Road Junction	14 Mar., 1908	10.42	Cressbrook ...	16 Feb., 1893	10.65
Botanic Gardens, Bris.	,, ,,	10.80	Crohamhurst (Blackall Range)	31 Jan., ,,	10.78
Bowen	13 Feb., 1893	14.65	,, ,, ...	2 Feb., ,,	35.71
,, ...	20 Jan., 1894	11.11	,, ,, ...	9 June, ,,	13.31
Bowen Park ...	16 Feb., 1893	10.38	,, ,, ...	9 Jan., 1898	19.55
,, ...	14 Mar., 1908	11.50	,, ,, ...	6 Mar. ,,	16.01
Brisbane	21 Jan., 1887	18.31	,, ,, ...	26 Dec., 1909	13.85
,, ...	14 Mar., 1908	11.18	Crow's Nest ...	2 Aug., 1908	11.17
Bromby Park (Bowen)	14 Feb., 1893	13.28	Croydon	29 Jan., 1908	15.00
,, ,, ,,	20 Jan., 1894	11.20	Cryna (Beaudesert)...	21 ,, 1887	14.00
Brookfield ...	14 Mar., 1908	14.95	Donaldson (now Granada)	27 Jan., 1891	11.29
Buderim Mountain ...	11 Jan., 1898	26.20	,, ,,	8 ,, 1911	13.50
,, ,, ...	9 Mar., 1898	11.10	,, ,,	9 ,, ,,	14.30
Bulimba (Brisbane)...	16 Feb., 1893	10.40	Dungeness ...	16 Mar., 1893	22.17
Bundaberg ...	31 Jan., 1893	10.15	,, ...	19 Jan., 1894	11.84
Burketown ...	15 ,, 1891	13.58	,, ...	17 Apr., ,,	14.00
,, ...	12 Mar., 1903	14.52	Dunira	9 Jan., 1898	18.45
Bustard Head ...	18 Feb., 1888	10.14	,, ...	6 Mar., ,,	15.95
,, ,, ...	30 Jan., 1893	11.85	Eddington (Clonc'ry)	23 Jan., 1891	10.33
Caboolture... ...	21 ,, 1887	10.00	Emu Park ...	31 ,, 1893	10.00
,, ...	10 ,, 1898	10.28	Enoggera Railway ...	14 Mar., 1908	12.14
Cairns	11 Feb., 1889	14.74	,, Reservoir	,, ,,	10.98
,, ...	21 Apr., ,,	12.40	Ernest Junction ...	,, ,,	13.00
,, ...	5 ,, 1891	14.08	Esk	21 Jan., 1887	10.70
,, ...	9 Jan., 1892	10.56	,, ...	14 Mar., 1908	11.12
,, ...	4 ,, 1909	11.56	Fassifern	21 Jan., 1887	10.20
,, ...	3 ,, 1911	11.97	Flat Top Island ...	22 Dec., 1909	12.96
,, ...	11 Feb., ,,	15.17	Floraville	6 Jan., 1897	10.79
,, ...	17 Mar., ,,	10.35	,, ...	11 Mar., 1903	12.86
,, ...	1 Apr., ,,	11.71	Geraldton (now Innisfail)	11 Feb., 1889	17.13
,, ...	2 ,, ,,	20.16	,, ,,	31 Dec., ,,	12.45
Caloundra	21 Jan., 1887	10.50	,, ,,	25 Jan., 1892	11.10
Cape Capricorn ...	17 ,, 1905	10.16	,, ,,	6 Apr., 1894	16.02
Cape Grafton ...	5 Mar., 1896	13.37	,, ,,	3 Mar., 1896	11.42
Cardwell	18 ,, 1887	10.15	,, ,,	7 ,, 1899	10.25
,, ...	30 Dec., 1889	12.00	,, ,,	18 Apr., ,,	13.20
,, ...	2 Jan., 1890	10.06	,, ,,	24 Jan., 1900	15.22
,, ...	23 Mar., ,,	12.00	,, ,,	6 ,, 1901	11.35
,, ...	18 ,, 1904	18.24	,, ,,	29 Dec., 1903	21.22
,, ...	3 Apr., 1911	12.84	,, ,,	17 Mar., 1904	10.35
Cedar Pocket ...	26 Dec., 1909	11.36	,, ,,	30 Jan., 1908	11.76
Central Kin Kin ...	,, ,,	10.17	,, ,,	14 ,, 1909	11.65
Chiefswood ...	14 Mar., 1908	11.01	,, ,,	11 Feb., 1911	14.48
Childers	6 ,, 1898	11.28	,, ,,	1 Apr., ,,	12.35
Clare	26 Jan., 1896	15.30	,, ,,	2 ,, ,,	15.00
Cleveland	13 ,, 1910	10.13			
,, ...	2 June, ,,	11.20			
Coen	20 Apr., 1903	11.11			

HEAVY RAINFALLS, QUEENSLAND—Continued.

Name of Town or Locality.	Date.	Amnt.
		ins.
Geraldton (now Innisfail)	3 Apr., 1911	11.25
Gin Gin	16 Jan., 1905	13.61
Gladstone	18 Feb., 1888	12.37
,, ...	31 Jan., 1893	14.62
,, ...	4 Feb., 1911	18.83
Glass Mountains ...	26 Dec., 1909	10.48
Glen Broughton ...	5 Apr., 1894	18.50
Glen Prairie ...	18 ,, 1904	12.18
Gold Creek Reservoir	16 Feb., 1893	11.16
,, ,, ,,	14 Mar., 1908	12.50
Goodna	21 Jan., 1887	11.00
,, ...	14 Mar., 1908	11.03
Goondi Mill (Gerald'n)	20 Jan., 1892	11.10
,, ,,	6 Apr., 1894	15.69
,, ,,	7 Mar., 1899	10.08
,, ,,	18 Apr., ,,	14.78
,, ,,	24 Jan., 1900	13.30
,, ,,	6 ,, 1901	10.70
,, ,,	2 Mar., ,,	10.67
,, ,,	29 Dec., 1903	17.83
,, ,,	17 Mar., 1904	10.00
,, ,,	21 ,, 1910	10.38
,, ,,	10 Feb., 1911	17.68
,, ,,	31 Mar., ,,	12.38
,, ,,	1 Apr., ,,	13.60
Gympie ,,	9 Mar., 1901	11.64
Halifax	5 Feb., 1899	15.37
,, ...	8 Mar., 1899	11.00
,, ...	6 Jan., 1901	15.68
,, ...	8 Feb., ,,	10.50
,, ...	26 Mar., 1903	10.07
,, ...	30 Jan., 1906	10.41
Hambledon Mill ...	7 ,, 1908	11.00
,, ,, ...	13 ,, 1909	13.80
,, ,, ...	16 Feb., 1910	11.45
,, ,, ...	2 Jan., 1911	18.61
,, ,, ...	10 Feb., ,,	13.97
,, ,, ...	30 Mar. ,,	13.04
,, ,, ...	31 ,, ,,	14.95
,, ,, ...	1 Apr., ,,	19.62
Harvey Creek ...	8 Mar., 1899	17.72
,, ,, ...	25 Jan., 1900	12.53
,, ,, ...	25 May, 1901	14.00
,, ,, ...	14 Mar., 1903	12.10
,, ,, ...	21 Apr., 1903	10.10
,, ,, ...	11 Jan., 1905	16.96
,, ,, ...	28 ,, 1906	12.29
,, ,, ...	20 ,, 1907	10.13
,, ,, ...	8 ,, 1908	10.31
,, ,, ...	30 ,, ,,	11.31
,, ,, ...	25 Mar., ,,	11.84
,, ,, ...	14 Jan., 1909	14.40
,, ,, ...	16 Feb., 1910	10.90
,, ,, ...	3 Jan., 1911	27.75
,, ,, ...	11 Feb., ,,	12.88
,, ,, ...	31 Mar., ,,	10.93
,, ,, ...	1 Apr., ,,	13.61
,, ,, ...	2 ,, ,,	16.46
Haughton Valley ...	26 Jan., 1896	18.10
Hillcrest (Mooloolah)	26 Dec., 1909	13.35
Holmwood (Woodf'd)	2 Feb., 1893	16.19
,, ,,	10 Jan., 1898	12.40
Homebush ...	3 Feb., ,,	12.04
,, ...	21 Mar., ,,	10.26
,, ...	11 Jan., 1901	11.40
Howard	15 ,, 1905	19.55
Indooroopilly ...	14 Mar., 1908	10.28
Ingham	18 Jan., 1894	12.60
,, ...	7 Apr., ,,	10.10
,, ...	6 Jan., 1901	13.59
,, ...	25 Dec., 1903	12.30
Inkerman	21 Sep., 1890	12.93
Inneshowen (Johnstone River)	30 Dec., 1889	14.01
Inskip Point ...	13 Mar., 1892	10.65
Isis Junction ...	6 ,, 1898	13.60
Kamerunga (Cairns)	20 Jan., 1892	13.61
,, ,, ...	23 Feb., 1894	10.10
,, ,, ...	6 Apr., ,,	14.04
,, ,, ...	5 ,, 1895	12.31
,, ,, ...	5 Mar., 1896	11.81
,, ,, ...	8 ,, 1899	10.50
,, ,, ...	21 Apr., 1903	11.75
,, ,, ...	2 Jan., 1911	10.95
,, ,, ...	3 ,, ,,	10.25
,, ,, ...	11 Feb., ,,	13.07
,, ,, ...	17 Mar., ,,	10.30
,, ,, ...	1 Apr., ,,	14.20
,, ,, ...	2 ,, ,,	21.00
Kilkivan Junction ...	10 Jan., 1898	11.08
Kululu, Mackay ...	11 ,, 1901	11.70
,, ,, ...	12 ,, 1905	10.94
Kuranda	6 Mar., 1899	14.12
,, ...	20 Apr., 1903	14.16
,, ...	14 Jan., 1909	12.37
,, ...	27 ,, 1910	9.40
,, ...	28 ,, ,,	9.28
,, ...	3 ,, 1911	10.72
,, ...	11 Feb., ,,	16.30
,, ...	17 Mar., ,,	15.10
,, ...	31 ,, ,,	18.60
,, ...	1 Apr., ,,	24.30
,, ...	2 ,, ,,	28.80
Lake Nash ...	10 Jan., 1895	10.25
,, ,, ...	20 Mar., 1901	10.02
Landsborough. ...	2 Feb., 1893	15.15
,, ...	9 June, ,,	12.80
,, ...	9 Jan., 1898	9.54
,, ...	7 Mar., ,,	10.35
,, ...	26 Dec., 1909	14.00
Low Island ...	10 Mar., 1904	15.07
,, ...	16 Mar., 1911	10.15
,, ...	31 ,, ,,	14.70
,, ...	1 Apr., ,,	23.43
Lucinda	4 Feb., 1899	11.10
,, ...	17 ,, 1906	13.35
,, ...	10 Mar., 1906	14.60
Lytton	21 Jan., 1887	12.85
,, ...	13 Mar., 1892	10.60

HEAVY RAINFALLS, QUEENSLAND—Continued.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Lytton	16 Feb., 1893	11.74	Nerang	15 „ 1892	12.35
„	20 Mar., 1898	10.20	„	14 Mar., 1908	10.95
Mackay	17 Feb., 1888	10.10	Netley(Rockhampton)	29 Jan., 1896	11.77
„	15 „ 1893	10.46	Normanton ...	14 „ 1905	10.72
„	3 „ 1898	11.95	North Pine ...	21 „ 1887	11.60
„	5 Jan., 1904	10.45	„ „ ...	16 Feb., 1893	14.97
„	23 Dec., 1909	13.96	Nundah	14 Mar., 1908	12.00
„	12 Mar., 1910	10.31	One Mile, Gympie ...	10 „ 1901	11.40
Sugar Experimental Farm, Mackay ...	23 Dec., 1909	12.00	Oxenford	14 „ 1908	15.65
Macnade Mill (Townsville) ...	28 Mar., 1891	10.61	Palmerville ...	1 Apr., 1911	11.55
„	15 „ 1893	10.50	Palmwoods ...	4 Feb., 1893	12.30
„	18 Jan., 1894	12.56	„ ...	10 Jan., 1898	15.85
„	17 Apr., „	14.26	„ ...	7 Mar., „	13.02
„	5 Feb., 1899	15.20	„ ...	25 Dec., 1909	17.75
„	6 Jan., 1901	23.33	Peachester ...	26 „ „	14.91
Maleny	14 Mar., 1908	10.95	Pinkenba	14 Mar., 1908	11.63
„	26 Dec., 1909	14.76	Pittsworth ...	11 „ 1890	14.68
Manly	14 Mar., 1908	11.90	Port Douglas ...	5 „ 1887	13.00
Mapleton	„ „	14.29	„ „ ...	12 Feb., 1888	10.00
„	26 Dec., 1909	15.72	„ „ ...	20 Jan., 1892	11.50
„	4 Feb., 1911	10.07	„ „ ...	23 Feb., 1894	10.25
Marlborough ...	17 „ 1888	14.24	„ „ ...	7 Apr., „	10.00
„ ...	29 Jan., 1896	10.84	„ „ ...	10 Mar., 1904	16.34
Mareeba	31 Mar., 1911	10.59	„ „ ...	29 Dec., „	10.67
Mayne Junction ...	14 „ 1908	10.30	„ „ ...	11 Jan., 1905	14.68
Mein	4 Apr., 1895	10.50	„ „ ...	2 „ 1911	11.64
Milton	14 Mar., 1908	12.24	„ „ ...	11 Feb., „	11.89
Mirani	12 Jan., 1901	16.59	„ „ ...	17 Mar., „	16.10
„	28 Mar., 1903	10.16	„ „ ...	1 Apr., „	31.53
Molloy	16 „ 1911	11.50	Ravenswood ...	24 Mar., 1890	17.00
„	30 „ „	10.00	„ ...	27 Jan., 1896	10.52
„	31 „ „	20.02	Redcliffe	21 „ 1887	14.00
„	1 Apr., „	20.00	„	16 Feb., 1893	17.35
„	2 „ „	20.00	„	10 Jan., 1898	10.25
Monkira	1 Feb., 1906	11.61	Riverview	14 Mar., 1908	10.12
Mooloolah	13 Mar., 1892	21.53	Rockhampton ...	17 Feb., 1888	10.82
„	2 Feb., 1893	19.11	„	29 Jan., 1896	10.53
„	9 June, „	11.50	Rosedale	6 Mar., 1898	12.60
„	6 Mar., 1898	14.43	Sandgate	21 Jan., 1887	10.50
Morningside ...	14 Mar., 1908	10.50	„	16 Feb., 1893	14.03
Mount Chalmers ...	3 Feb., 1911	11.90	Sherwood	14 Mar., 1908	11.08
Mount Crosby ...	14 Mar., 1908	14.00	Somerset	28 Jan., 1903	12.02
Mount Cuthbert ...	8 Jan., 1911	18.00	Southport	14 Mar., 1908	11.05
Mount Gravatt ...	14 Mar., 1908	10.80	St. Helena ...	16 Feb., 1893	11.20
Mount Perry ...	24 Feb., 1887	10.00	St. Helens (Mackay)	24 „ 1888	12.00
Mourilyan ...	14 Jan., 1909	13.00	„	22 Mar., 1898	10.00
„ ...	3 „ 1911	12.70	St. Lawrence ...	17 Feb., 1888	12.10
„ ...	11 Feb., „	17.40	„ „ ...	30 Jan., 1896	15.00
„ ...	1 Apr., „	13.20	Sunnybank ...	14 Mar., 1908	11.40
„ ...	2 „ „	10.59	Tabragalba ...	21 Jan., 1887	10.00
Mundoolun ...	21 Jan., 1887	17.95	Tallebudgera ...	14 Mar., 1908	10.80
Mungar Junction ...	10 Mar., 1901	10.20	Tambourine Mount'n	17 July, 1889	10.91
Murrarie	14 „ 1908	11.50	Taringa	14 Mar., 1908	11.40
Musgrave	6 Apr., 1894	13.71	Tewantin	10 Jan., 1898	10.51
Nambour	9 Jan., 1898	21.00	„	30 Mar., 1904	12.30
„	7 Mar., „	13.28	„	14 Apr., „	11.36
„	27 Dec., 1909	16.80	The Hollow (Mackay)	23 Feb., 1888	15.12
Nanango	9 June, 1893	10.00	„ „ ...	? Mar., 1891	10.39
			Thornborough ...	20 Apr., 1903	18.07
			Tierawoomba ...	2 Feb., 1898	10.36

HEAVY RAINFALLS, QUEENSLAND—Continued.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Tooloombah ...	29 Jan., 1896	11.70	Woombye	26 Dec., 1909	13.42
Toowong	14 Mar., 1908	11.60	Wynnum	14 Mar., 1908	11.95
Townsville ...	24 Jan., 1892	19.20	Yandina	1 Feb., 1893	20.08
,, ...	28 Dec., 1903	15.00	,, ...	9 June, ,,	12.70
Victoria Mill ...	6 Jan., 1901	16.67	,, ...	9 Jan., 1898	19.25
Walkerston ...	12 ,, 1905	10.60	,, ...	7 Mar., ,,	13.52
Walsh River ...	12 ,, 1903	10.22	,, ...	28 Dec., 1909	15.80
,, ,, ...	1 Apr., 1911	13.70	Yarrabah	14 Jan., ,,	11.20
Woodford	2 Feb., 1893	14.93	,, ...	3 ,, 1911	11.50
,, ...	10 Jan., 1898	11.40	,, ...	11 Feb., ,,	12.00
Woodlands (Yeppoon)	10 ,, 1889	10.00	,, ...	2 Apr., ,,	30.65
,, ,,	26 Jan., 1890	10.22	Yeppoon	31 Jan., 1893	20.05
,, ,,	25 Mar., ,,	14.25	,, ...	30 ,, 1896	11.02
,, ,,	31 Jan., 1893	23.07	,, ...	8 ,, 1898	18.05
,, ,,	30 ,, 1896	11.91	,, ...	8 Apr., 1904	10.70
,, ,,	9 Feb., ,,	13.97	,, ...	3 Feb., 1906	14.90
,, ,,	7 Jan., 1898	14.50	,, ...	,, 1911	14.92
Woodstock ...	4 Nov., 1903	10.44	Zillmere	14 Mar., 1908	11.00
Woogaroo	14 Mar., 1908	11.20			

HEAVY RAINFALLS, SOUTH AUSTRALIA, UP TO 1911 INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Arltunga	1 Mar., 1910	1.02	Port Darwin ...	7 Jan., 1897	11.67
,, ...	2 ,, ,,	1.42	Powell's Creek ...	25 Feb., 1910	2.31
,, ...	3 ,, ,,	7.77	,, ,, ...	26 ,, ,,	1.21
,, ...	4 ,, ,,	1.85	,, ,, ...	27 ,, ,,	8.19
,, ...	5 ,, ,,	1.24	Tennant's Creek ...	26 ,, ,,	1.18
Borroloola	14 ,, 1899	14.00	,, ,, ...	27 ,, ,,	1.02
Lake Nash... ...	21 ,, 1901	10.25	,, ,, ...	28 ,, ,,	9.22
Pine Creek ...	8 Jan., 1897	10.35			

HEAVY RAINFALLS, WESTERN AUSTRALIA, UP TO 1911 INCLUSIVE.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Balla Balla ...	20 Mar., 1899	6.00	Cossack	3 Apr., 1898	12.82
,, ,, ...	21 ,, ,,	14.40	,, ...	15 ,, 1900	6.89
Boodarie	3 Jan., 1894	10.03	,, ...	16 ,, ,,	13.23
,, ...	4 ,, ,,	5.22	Croydon	3 Mar., 1903	12.00
,, ...	21 Mar., 1899	14.53	Cocos Island ...	29 Nov., ,,	14.38
,, ...	6 Feb., 1901	1.91	,, ,, ...	26 Dec., 1907	8.00
,, ...	7 ,, ,,	9.16	,, ,, ...	27 ,, ,,	2.65
Bamboo Creek ...	22 Mar., 1899	10.10	,, ,, ...	8 July, 1908	10.21
Carlton	11 Jan., 1903	10.64	,, ,, ...	9 ,, ,,	2.75
Cherrabun... ...	28 Apr., 1910	2.90	,, ,, ...	23 ,, ,,	2.40
,, ...	29 ,, ,,	7.78	,, ,, ...	24 ,, ,,	7.00

HEAVY RAINFALLS, WESTERN AUSTRALIA—Continued.

Name of Town or Locality.	Date.	Amnt.	Name of Town or Locality.	Date.	Amnt.
		ins.			ins.
Cocos Island ...	25 July, 1908	3.85	Tambrey	3 Mar., 1903	10.46
Derby	29 Dec., 1898	13.09	Thangoo	17-19 Feb.'96	24.18
,, ...	30 ,, ,,	7.14	,, ...	28 Dec., 1898	11.15
Kerdiadary ...	7 Feb., 1901	12.00	,, ...	20 Nov., 1910	7.40
Millstream ...	5 Mar., 1900	10.00	,, ...	21 ,, ,,	4.56
Obagama	16 Feb., 1896	3.95	Whim Creek ...	2 Apr., 1898	7.08
,, ...	17 ,, ,,	6.30	,, ...	3 ,, ,,	29.41
Obagama	18 Feb., 1896	7.22	,, ...	20 Mar., 1899	8.89
,, ...	28 ,, 1910	12.00	,, ...	21 ,, ,,	18.17
Point Torment ...	17 Dec., 1906	11.86	,, ...	6 ,, 1900	10.03
Point Cloates ...	20 Jan., 1909	10.87	,, ...	3 ,, 1903	10.44
Port Hedland ...	7 Feb., 1901	3.56	Wyndham	27 Jan., 1890	11.60
,, ...	8 ,, ,,	9.55	,, ...	11 ,, 1903	9.98
Quanbun	29 Apr., 1910	6.55	,, ...	12 ,, ,,	6.64
,, ...	30 ,, ,,	3.40	,, ...	13 ,, ,,	4.20
Roebourne... ...	3 Apr., 1898	11.44	Yeeda	28 Dec., 1898	8.42
,, ...	6 Mar., 1900	10.32	,, ...	29 ,, ,,	6.88
Tambrey	6 ,, ,,	11.00	,, ...	30 ,, ,,	6.12

10. **Snowfall.**—Light snow has been known to fall even as far north, occasionally, as latitude 31° S., and from the western to the eastern shores of the continent. During exceptional seasons it has fallen simultaneously over two-thirds of the State of New South Wales, and has extended at times along the whole of the Great Dividing Range, from its southern extremity in Victoria as far north as Toowoomba in Queensland. During the winter snow covers the ground to a great extent on the Australian Alps for several months, where also the temperature falls below zero Fahrenheit during the night, and in the ravines around Kosciusko and similar localities the snow never entirely disappears.

The antarctic "V"-shaped disturbances are always associated with our most pronounced and extensive snowfalls. The depressions on such occasions are very steep in the vertical area, and the apexes are unusually sharp-pointed and protrude into very low latitudes, sometimes even to the tropics.

11. **Hail.**—Hail falls throughout Australia most frequently along the southern shores of the continent in the winter, and over south-eastern Australia during the summer months. The size of the hailstones generally increases with distance from the coast, a fact which lends strong support to the theory that hail is brought about by ascending currents. Rarely does a summer pass without some station experiencing a fall of stones exceeding in size an ordinary hen-egg, and many riddled sheets of light-gauge galvanised iron bear evidence of the weight and penetrating power of the stones.

Hail storms occur most frequently in Australia when the barometric readings indicate a flat and unstable condition of pressure. They are almost invariably associated with tornadoes or tornadic tendencies, and on the east coast the clouds from which the stones fall are generally of a remarkable sepia-coloured tint.

12. **Barometric Pressures.**—The mean annual barometric pressure (corrected to sea-level and standard gravity) in Australia varies from 29.80 inches on the north coast to 29.92 inches over the central and 30.03 inches in the southern parts of the continent.

In January the mean pressure ranges from 29.70 inches in the northern and central areas to 29.91 inches in the southern. The July mean pressure ranges from 29.90 inches at Darwin to 30.13 at Alice Springs. Barometer readings, corrected to mean sea-level, have, under anticyclonic conditions in the interior of the continent, ranged from 30.81 inches to as low as 28.44 inches. This lowest record was registered at Townsville during a hurricane on the 9th March, 1903. The mean annual fluctuations of barometric pressure for the capitals of Australia are shewn on page 89.

13. **Wind.**—(i.) *Trade Winds.* The two distinctive wind currents in Australia are, as previously stated, the south-east and westerly trade winds. As the belt of the earth's atmosphere in which they blow apparently follows the sun's ecliptic path north and south of the equator, so the area of the continent affected by these winds varies at different seasons of the year. During the summer months the anticyclonic belt travels in very high latitudes, thereby bringing the south-east trade winds as far south as 30° south latitude. The westerly trade winds are forced a considerable distance to the south of Australia, and are very rarely in evidence in the hot months. When the sun passes to the north of the equator, the south-east trade winds follow it, and only operate to the north of the tropics for the greater part of the winter. The westerly winds, by the same force, are brought into lower latitudes during the same period of the year. They sweep across the southern areas of the continent from the Leeuwin to Cape Howe, and during some seasons are remarkably persistent and strong. They occasionally penetrate to almost tropical latitudes, and though usually cold and dusty inland, are of the greatest service to the country, for being rain-bearing winds, moisture is by their agency precipitated over vast areas in the south of the continent.

(ii.) *Land and Sea Breezes.* The prevailing winds second in order of importance are the land and sea breezes. These generally blow at right angles to the coast-line in their early stages, but are deflected to the north and south in the middle and later periods of the blows.

On the east coast the sea breezes which come in from the north-east, when in full force, frequently reach the velocity of a gale during the afternoon in the summer months, the maximum hourly velocity, ordinarily attained about 3 p.m., not unfrequently attaining a rate of 35 to 40 miles per hour. This wind, although strong, is usually shallow in depth, and does not ordinarily penetrate more than 9 or 12 miles inland.

The land breezes on the east coast blow out from a south-westerly direction during the night.

On the western shores of the continent the directions are reversed. The sea breezes come in from the south-west, and the land breezes blow out from the north-east.

(iii.) *Inland Winds.* Inland, the direction of the prevailing winds is largely regulated by the seasonal changes of pressure, so disposed as to cause the winds to radiate spirally outwards from the centre of the continent during the winter months, and to circulate spirally from the seaboard to the centre of Australia during the summer months.

(iv.) *Prevailing Direction at the State Capitals.* In *Perth*, southerly (south-west to south-east) is the prevailing direction for August to April inclusive, and east-north-east to north-north-east for the remaining months.

In *Adelaide* the summer winds are from the south-west and south, and in the winter from north-east to north.

In *Brisbane*, south-east winds are in evidence all the year round, but more especially during the months January, February, March and April.

In *Sydney* from May to September the prevailing direction is westerly, and for the remaining seven months north-easterly.

Melbourne winter winds are from north-west to north-east, and those of the summer from south-west to south-east.

At *Hobart* from April to September the prevailing direction is from north to north-west, and for the other six months from north and south-east.

Over the greater part of Australia January is the most windy month, i.e., is the month when the winds are strongest on the average, though the most violent wind storms occur at other times during the year, the time varying with the latitude.

14. **Cyclones and Storms.**—(i.) *General.* The "elements" in Australia are ordinarily peaceful, and although severe cyclones have visited various parts, more especially coastal areas, such visitations are rare, and may be properly described as erratic.

During the winter months the southern shores of the continent are subject to cyclonic storms, evolved from the V-shaped depressions of the southern low-pressure belt. They are felt most severely over the south-western parts of Western Australia, to the south-east of South Australia, in Bass Straits, including the coast line of Victoria, and on the west coast of Tasmania. Apparently the more violent wind pressures from these cyclones are experienced in their northern half, that is, in that part of them which has a north-westerly to a south-westerly circulation.

Occasionally the north-east coast of Queensland is visited by hurricanes from the north-east tropics. During the first three months of the year these hurricanes appear to have their origin in the neighbourhood of the South Pacific Islands, their path being a parabolic curve of south-westerly direction. Only a small percentage, however, reach Australia, the majority recurving in their path to the east of New Caledonia.

Anemometrical records for these storms do not exist, but the fact that towns visited by them have been greatly damaged indicates that the velocity must be very great. Fortunately the area covered by these storms is very small when compared with the southern cyclones, and the region affected during an individual visitation is very limited. The heaviest blows are experienced to the west of the vortex with south-east to south-west winds.

(ii.) *Severe Cyclones.* Very severe cyclones, popularly known as "Willy Willies," are peculiar to the north-west coast of Western Australia from the months of December to March inclusive. They apparently originate in the ocean, in the vicinity of Cambridge Gulf, and travel in a south-westerly direction with continually increasing force, displaying their greatest energy near Cossack and Onslow, between latitudes 20° and 22° South. The winds in these storms, like those from the north-east tropics, are very violent and destructive, causing great havoc amongst the pearl-fishers. The greatest velocities are usually to be found in the south-eastern quadrant of the cyclones, with north-east to east winds. After leaving the north-west coast, these storms either travel southwards, following the coast-line, or cross the continent to the Great Australian Bight. When they take the latter course their track is marked by torrential rains, as much as 29.41 inches, for example, being recorded at Whim Creek from one such occurrence. Falls of 10 inches and over have frequently been recorded in the interior of Western Australia from similar storms.

Cyclones occasionally develop from incipient monsoonal low-pressures in the interior of the continent. Their formation is apparently materially assisted by the advancing high-pressures to the west of them, for they seldom or never appear without this accompaniment. The velocity and duration of the resultant gales, too, have a distinct relation to the magnitude of pressure in the anticyclones. Evidence of excess of high pressures on such occasions indicates severe gales in the cyclones, and in the case of moderate pressures, moderate gales.

These cyclones do not attain their severest phases until they reach the seaboard. The most violent winds occur in the south-western quadrant, with south-west to south-east winds. The area affected on the coast-line is not usually very great. During the visitation of one of these storms, about 500 miles in diameter, in July, 1903, a strip of

land, only 80 miles in extent, was affected. But so severe was the gale within this region that steamers of from 8000 to 10,000 tons, leaving Port Jackson, were buffeted and tossed about like corks by the turbulent sea. Notwithstanding this, vessels 200 miles to the east lay becalmed and had no indication of the violent atmospheric upheaval relatively so near.

Though storms of this type may occur at any time of the year, they are more frequent during the months of August and September. The velocity of the wind has on one occasion reached the rate of 120 miles per hour.

(iii.) *Southerly Bursters.* The "Southerly Burster" is a characteristic feature of the eastern part of Australia. It is a cool, or cold, wind peculiar to the coastal districts of New South Wales, south of latitude 30°. In a modified form, however, it also appears in the interior of that State, in Victoria, and the western districts of Queensland.

The "Southerly Bursters" invariably follow periods of hot weather, and are a great relief to the population settled over the favoured areas. They occur in all months from August to May inclusive, but most frequently in November. The preceding winds in the early and late summer months are from a north-westerly, and in the midsummer months from a north-easterly direction. A rise in the barometer always takes place before their advent, but no relation has been established between the time this rise begins and the moment of the arrival of the wind itself, neither is there any apparent connection between the velocity of the wind and the rate of gradient of the barometric rise, notwithstanding that records of nearly fifteen hundred "Bursters," extending over a period of forty years, have been analysed with a view of ascertaining if such a connection could be established. All that can be said is that, should the rise be sharp and rapid, the life of the blow will be short, while a slow and gradual one indicates a long and steady blow from the south, after the initial "Burster" has passed. "Southerly Bursters" are usually first noted on the extreme south coast, and travel northward at a rate of 20 miles an hour. The rate of translation has ordinarily no definite relation to the velocity attained by the wind itself.

"Bursters" frequently occur simultaneously at several places along the seaboard, and occasionally they have been known to progress down the coast from north to south. While they may arrive at any time during the day or night, the interval between sundown and midnight is that in which they ordinarily occur.

This type of storm is usually associated with "V"-shaped depressions, but occasionally a condition of relatively high barometric pressures in Victoria will induce their occurrence. It is most frequent during seasons of sporadic rains, and very rare during good years in the interior. In the summer of 1890, the year of the great Darling River flood, only sixteen visitations occurred, and even these were of a very mild character. The series of good years in the interior of Australia, since 1903, has been remarkable for the small annual number of "southerly bursters."

The greatest number ever experienced in a single summer was sixty-two, the average being thirty-two.

In the months of December and January they are usually short lived, and two may occur within the twenty-four hours. In the early and late summer months the intervening periods of warm weather are longer, and the winds are longer sustained, the energy being supplied from the more pronounced high pressures prevailing at these seasons of the year. The velocity varies from a rate of a few miles an hour to over 80 miles per hour, the maximum puffs occurring about an hour after the arrival of the burster. During recent years there has been a falling-off both in their number and strength, the reason for which is not yet understood, but it is suspected that the gradual extension of the agricultural and pastoral industries to the interior of the country may be one of the causes of the change.

Winds of a like character, and possibly derived from similar atmospheric actions and conditions, are—

In Europe—"The Bora," a sharp, cold north-east wind, which blows from the Croatian and Illyrian Mountains along the coast of Dalmatia from Trieste southward;

and the "Mistral," a violent northerly wind which blows from France to the Gulf of Lyons.

In North America, the "Northers" of Texas have similar characteristics, and in South America "The Pampero," a cold and strong southerly wind which blows over the Pampas of Argentina, is almost identical with the "Southerly Bursters." The "Tehuantepec" winds that blow on the Pacific side of Central America are also very similar.

All parts of Australia are subject during the summer months to hot, desiccating winds, of two kinds. The most common and general class are associated with low-pressure isobars. The more rare and local hot winds are caused by the heating of descending air on the lee-side of mountains. In Victoria the former class are known as "Brick Fielders," a name originally applied to the "Southerly Bursters" in Sydney, because of the dust they raised from the brickfields to the south of the city. When the goldfields were discovered in Victoria the miners hailing from Sydney gave the name to the dusty winds from the opposite quarter.

The hot winds on the south-eastern littoral are analogous to the "Chinook" winds which blow at the eastern foot of the Rocky Mountains; to the "Fœhn" winds of the Alpine Valleys; and to the "North-Westers" of the Canterbury Plains in the Middle Island of New Zealand.

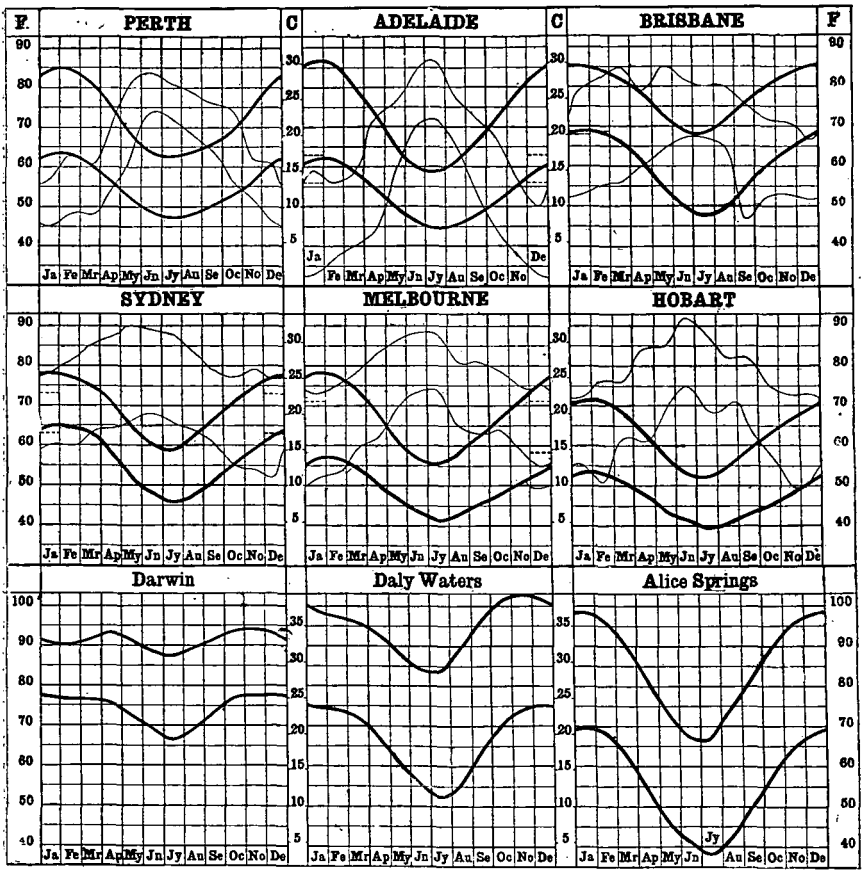
15. **Influences affecting Australian Climate.**—Australian history does not cover a sufficient period, nor is the country sufficiently occupied, to ascertain whether or not the advance of settlement has materially affected the climate as a whole. Local changes therein, however, have taken place, a fact which suggests that settlement and the treatment of the land have a distinct effect on local conditions. For example, the mean temperature of Sydney shews a rise of two-tenths of a degree during the last twenty years, a change probably brought about by the great growth of residential and manufacturing buildings within the city and in the surrounding suburbs during that period. Again, low-lying lands on the north coast of New South Wales, that originally were seldom subject to frosts, have with the denudation of the surrounding hills from forests experienced annual visitations, the probable explanation being that, through the absence of trees, the cold air of the high lands now flows, unchecked and untempered, down the sides of the hills to the valleys and lower lands.

It is pointed out by Abercromby,[1] as shewing the influence of irrigation on climate, that "Before the Suez Canal was made, the desert through which it is cut was said to be rainless; now since the Bitter Lakes have been filled up with water, rain falls on an average eight days in the year at Ismailia." And in the United States, General A. W. Greely[2] says, concerning "Heat Waves:" "It seems possible that the frequency and intensity of such visitations have diminished on the Pacific coast, since Tennant's record of hot days (classing as such those on which the temperature rose to 80° or above, at San Francisco) indicates that their annual number has very materially diminished since 1859. For seven years prior to 1859 such days averaged thirteen yearly, and since that time, up to 1871, the average yearly number is but four. The immense quantity of land placed under irrigation and the vast increase in vegetation are obvious reasons why there should be some diminution in this respect."

(i.) *Influences of Forests on Climate.* As already indicated, forests doubtless exercise a great influence on local climate, and hence, to the extent that forestal undertakings will allow, the weather can be controlled by human agency. The direct action of forests is an equalising one; thus, especially in equatorial regions and during the warmest portion of the year, they considerably reduce the mean temperature of the air. They also reduce the diurnal extremes of their shade temperatures, by altering the extent of radiating surface, by evaporation, and by checking the movement of air. While decreasing

1. "Seas and Skies," Hon. Ralph Abercromby. 8vo, London, 1888, p. 30.
2. "American Weather." 8vo, London, 1888, p. 253.

GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN MAXIMUM AND MINIMUM TEMPERATURE AND HUMIDITY IN SEVERAL PARTS OF THE COMMONWEALTH OF AUSTRALIA.



EXPLANATION OF THE GRAPHS OF TEMPERATURE AND HUMIDITY.—In the above graphs, in which the heavy lines denote 'temperature' and the thin lines 'humidity,' the fluctuations of mean temperature and mean humidity are shewn throughout the year. These curves are plotted from the data given in the Climatological Tables hereinafter. The temperatures are shewn in degrees Fahrenheit, the inner columns giving the corresponding values in Centigrade degrees. Humidities have not been obtained for Darwin, Daly Waters, and Alice Springs.

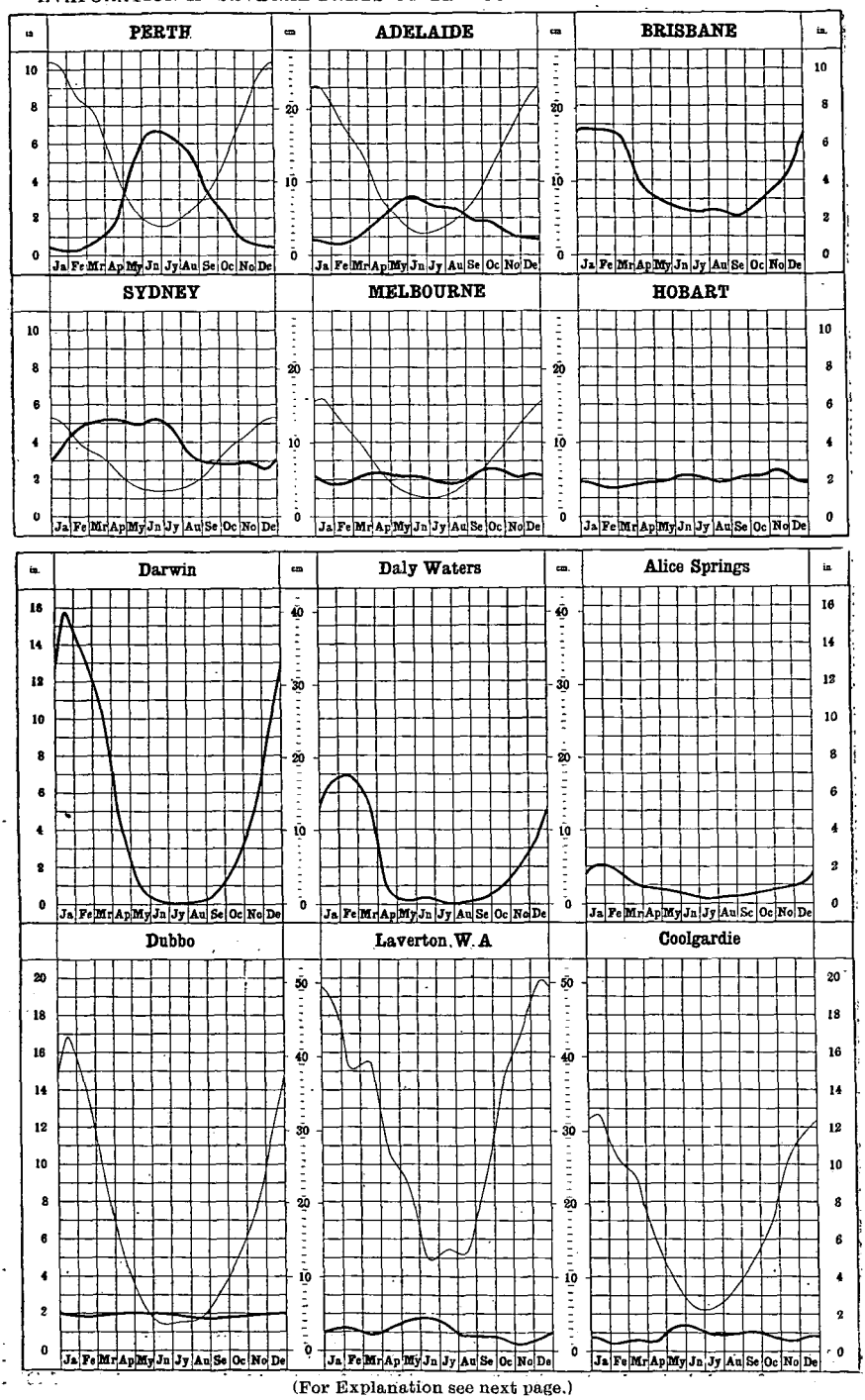
For the thin lines the degree numbers represent relative humidities, or the percentages of actual saturation on the total for the respective temperatures.

The upper temperature line represents the mean of the maximum, and the lower line the mean of the minimum results; thus the curves also shew the progression of the range between maximum and minimum temperatures throughout the year. The humidity curves shew the highest and lowest values of the mean monthly humidity at 9 a.m. recorded during a series of years

INTERPRETATION OF THE GRAPHS.—The curves denote mean monthly values. Thus, taking for example, the temperature graphs for Perth, the mean readings of the maximum and minimum temperatures for a number of years on 1st January would give respectively about 83° Fahr. and 62° Fahr. Thus the mean range of temperature on that date is the difference, viz., 21°. Similarly, observations about 1st June would give respectively about 66° Fahr. and 51° Fahr., or a range of 15°.

In a similar manner it will be seen that the greatest mean humidity, say for March, is about 62° and the least mean humidity for the month 48°; in other words, at Perth, the degree of saturation of the atmosphere by aqueous vapour for the month of March ranges between 62 % and 48 %.

GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN RAINFALL AND MEAN EVAPORATION IN SEVERAL PARTS OF THE COMMONWEALTH OF AUSTRALIA.



(For Explanation see next page.)

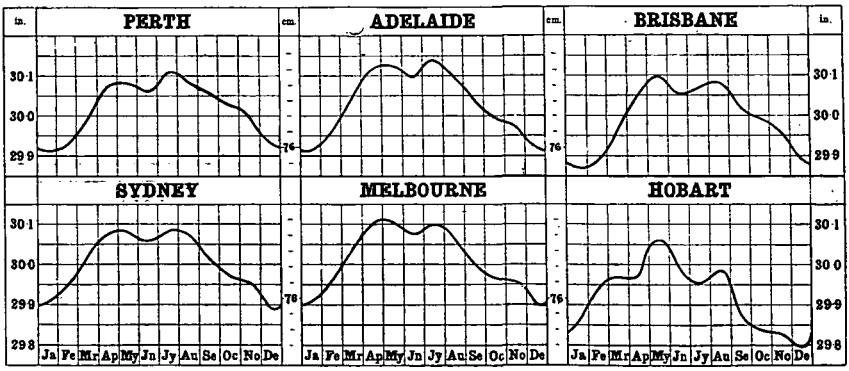
EXPLANATION OF THE GRAPHS OF RAINFALL AND EVAPORATION.—On the preceding graphs thick lines denote rainfall and thin lines evaporation, and shew the fluctuation of the mean rate of fall *per month* throughout the year. The results, plotted from the Climatological Tables hereinafter are shewn in inches (see the outer columns), and the corresponding metric scale (centimetres) is shewn in the two inner columns. The evaporation is not given for Hobart, Darwin, Daly Waters, and Alice Springs.

INTERPRETATION OF THE GRAPHS.—The distance for any date from the zero line to the curve, represents the average number of inches, reckoned as per month, of rainfall at that date. Thus, taking the curves for Adelaide, on the 1st January the rain falls on the average at the rate of about four-fifths of an inch per month, or, say, at the rate of about 9½ inches per year. In the middle of June it falls at the rate of nearly 3 inches per month, or, say, at the rate of about 36 inches per year. At Dubbo the evaporation is at the rate of nearly 17 inches per month about the middle of January, and only about 1½ inches at the middle of June.

TABLE SHEWING MEAN ANNUAL RAINFALL AND EVAPORATION IN INCHES OF THE PLACES SHEWN ON PRECEDING PAGE, AND REPRESENTED BY THE GRAPHS.

—	Rainfall.	Evaporation.	—	Rainfall.	Evaporation.
Perth ...	33.54	66.01	Port Darwin ...	62.12	—
Adelaide ...	20.62	54.44	Daly Waters ...	27.25	—
Brisbane ...	47.25	48.61	Alice Springs...	11.09	97.10
Sydney ...	47.95	37.42	Dubbo ...	22.39	81.03
Melbourne ...	25.40	38.30	Laverton, W.A.	9.87	—
Hobart ...	23.38	—	Coolgardie ...	9.37	86.60

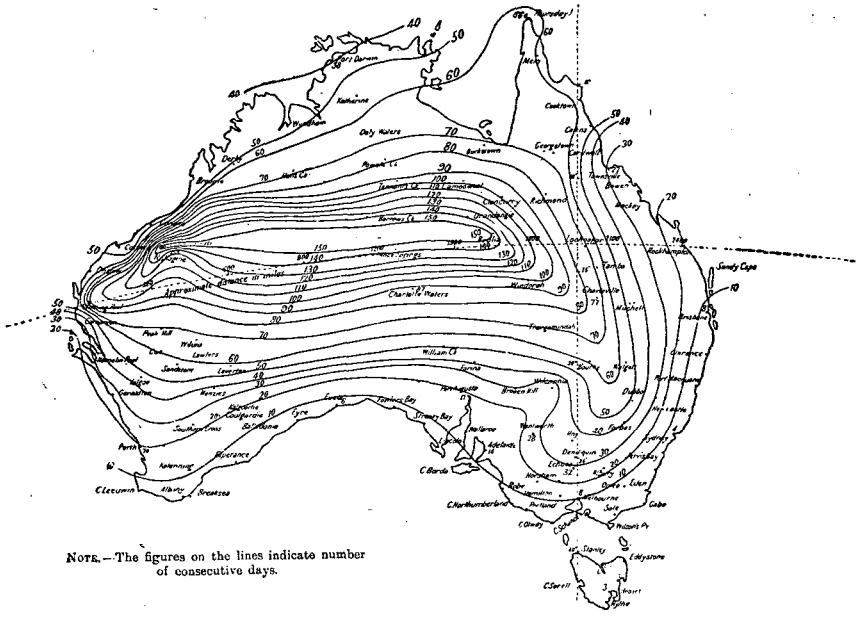
GRAPHS SHEWING ANNUAL FLUCTUATIONS OF MEAN BAROMETRIC PRESSURE FOR THE CAPITALS OF THE COMMONWEALTH OF AUSTRALIA.



EXPLANATION OF THE GRAPHS OF BAROMETRIC PRESSURE.—On the above graphs the lines representing the yearly fluctuation of barometric pressure at the State capital cities are means for long periods, and are plotted from the Climatological Tables given hereinafter. The pressures are shewn in inches on about 2⅛ times the natural scale, and the corresponding pressures in centimetres are also shewn in the two inner columns, in which each division represents one millimetre.

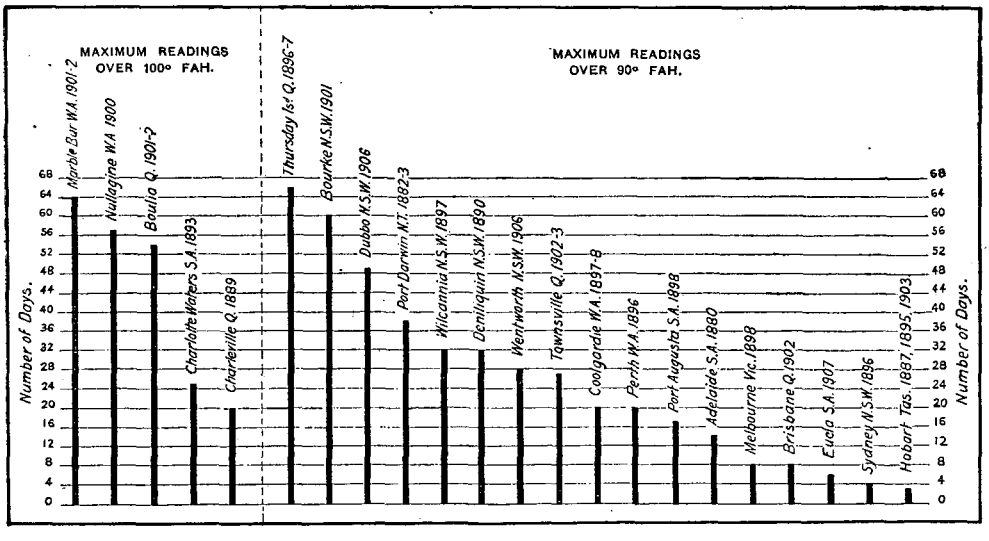
INTERPRETATION OF THE BAROMETRIC GRAPHS.—Taking the Brisbane graph for purposes of illustration, it will be seen that the mean pressure on 1st January is about 29.87 inches, and there are maxima in the middle of May and August of about 30.10 and 30.08 respectively. The double maxima appear clearly on each graph.

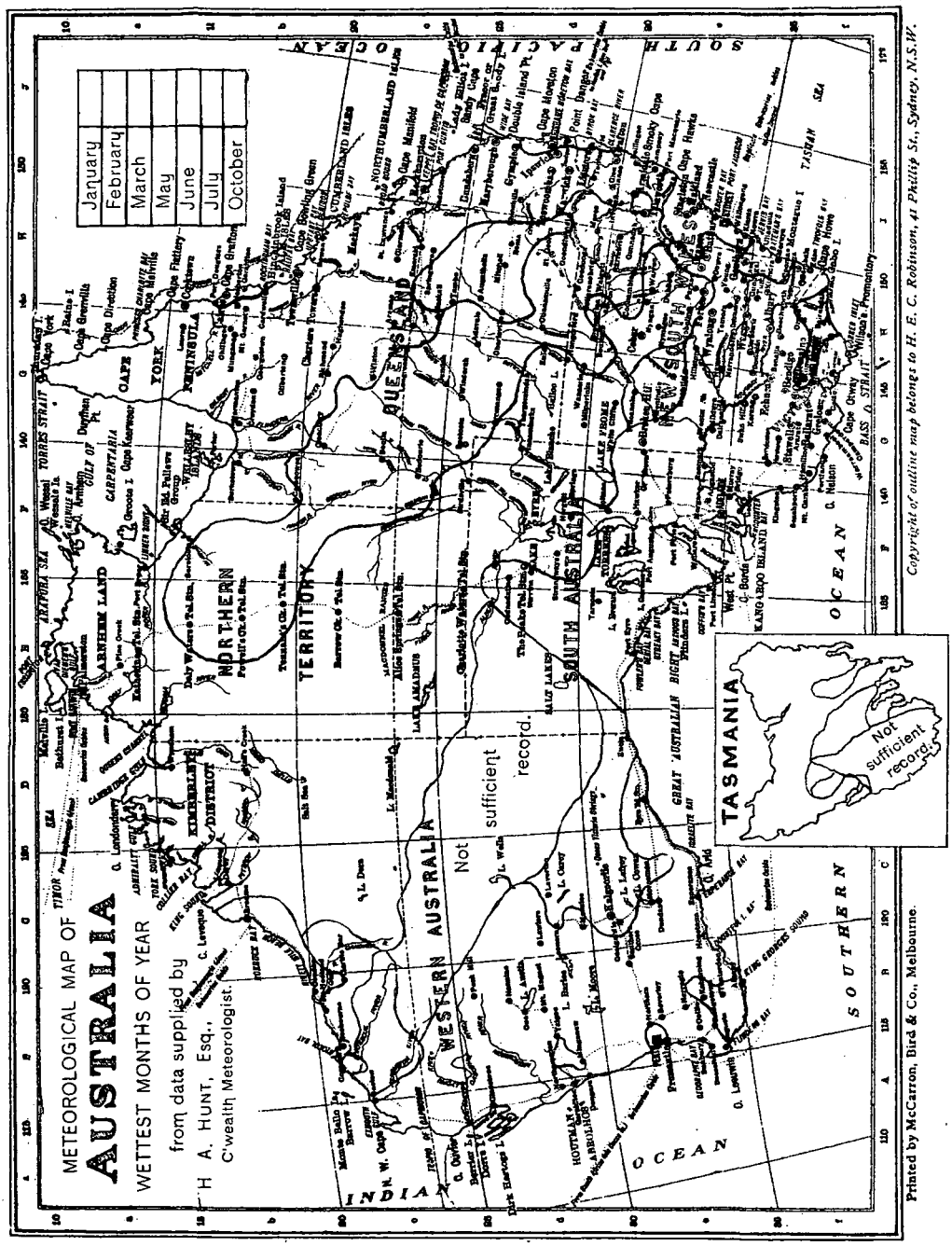
Chart indicating the area affected and period of duration of the Longest Heat Waves when the Maximum Temperature for consecutive 24 hours reached or exceeded 90° Fah.



NOTE.—The figures on the lines indicate number of consecutive days.

Diagram showing the greatest number of consecutive days on which the Temperature in the shade was over 100° and also over 90° at the places indicated.





METEOROLOGICAL SUB-DIVISIONS.

WEST AUSTRALIA.

No.
1. East Kimberley.
2. West Kimberley.
3. North-West.
4. Gascoyne.
5. South-West.
6. Eucla.
7. Eastern.

SOUTH AUSTRALIA.

8. Northern Territory.
9. Far North and N.W.
10. West.

No.
11. Upper North.
12. North-East.
13. Lower North.
14. Central.
15. Murray Valley.
16. South-East.

QUEENSLAND.

17. Peninsular.
18. Gulf.
19. Far West.
20. Central.
21. Nth-East Coast.

No.
22. Central Coast.
23. South-East Coast.
24. Darling Downs.
25. Maranoa.
26. South-West.

NEW SOUTH WALES.

27. Western.
28. North-West Plain.
29. North-West Slope.
30. Northern Tableland
31. North Coast.
32. Hunter & Manning.

No.
33. Central Tableland.
33a. Metropolitan.
34. Cent. Westn. Slope.
35. Cent. Westn. Plain.
36. Riverina.
37. South-West Slope.
38. Southern Tableland
39. South Coast.

VICTORIA.

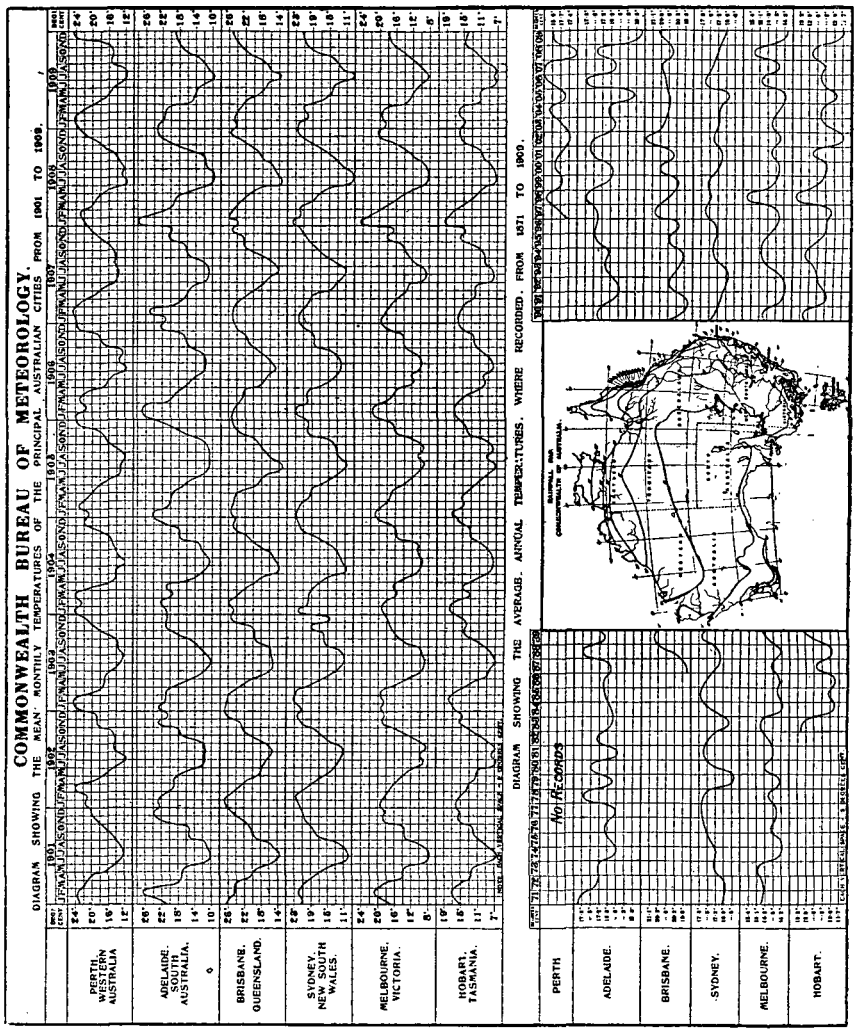
40. Gippsland.
41. North-East.
42. Central.

No.
43. North Central.
44. Northern Country.
45. Mallee.
46. Wimmera.
47. Western.

TASMANIA.

48. Northern.
49. W. Coast Mt. Region
50. Central Plateau.
51. Midland.
52. East Coast.
53. Derwent.
54. South-Eastern.

The above are the meteorological sub-divisions adopted by H. A. HUNT, Esq., C'wealth. Meteorologist.



EXPLANATION OF GRAPH.

The six continuous curves on the upper part of the diagram shew the fluctuations of mean monthly temperatures of the Australian capitals from 1901 to 1909. The base of each small square denotes one month, and the vertical side 2° Centigrade or 3.6° Fahrenheit.

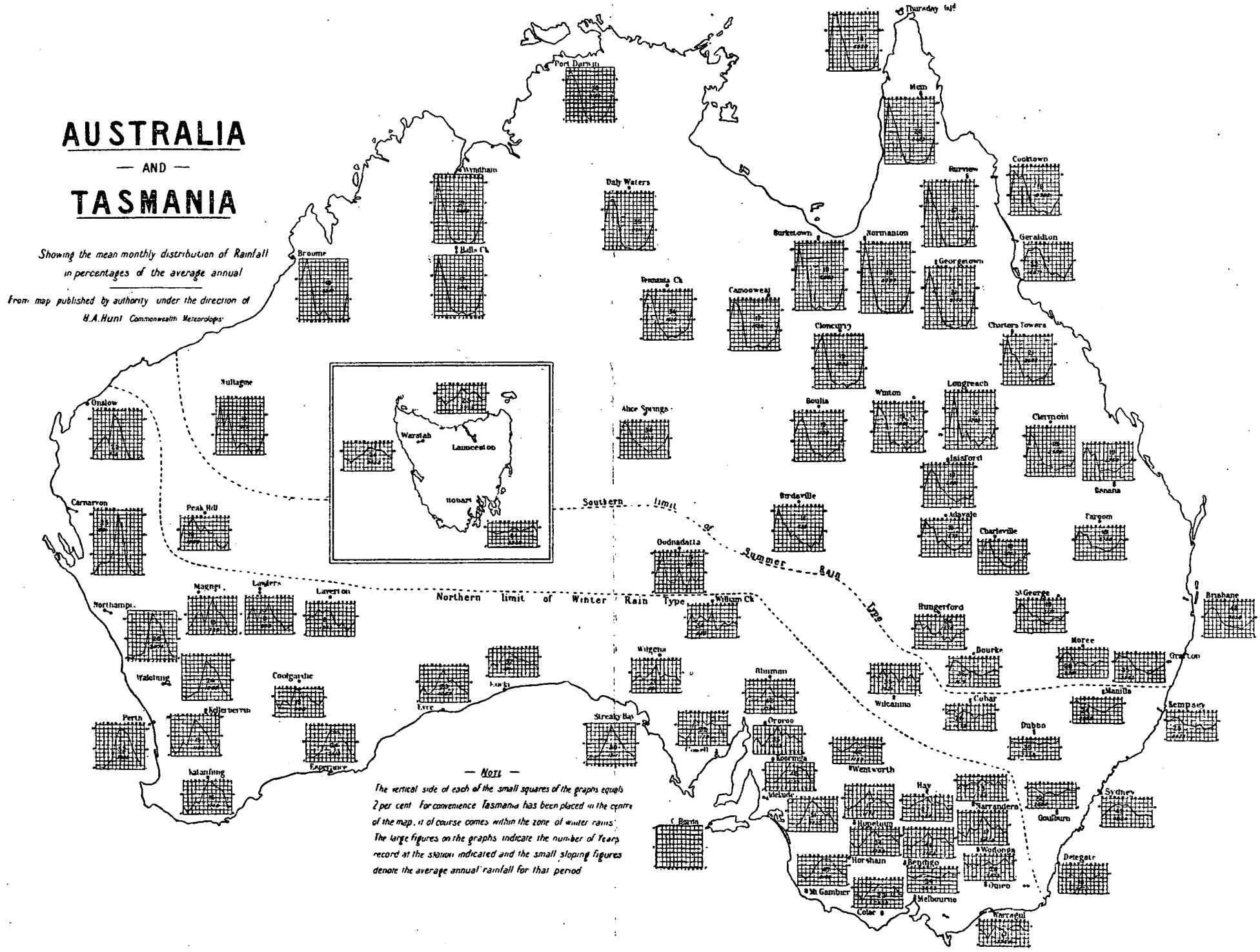
The six curves in lower portion of the diagram similarly shew the fluctuations of the mean annual temperatures, from 1871 in the case of Adelaide, Sydney and Melbourne, from 1883, 1887 and 1897 in the case respectively of Hobart, Brisbane and Perth. The base of each rectangle represents one year, and the vertical side 0.3° Centigrade or 0.54° Fahrenheit.

The map shews the areas affected by given amounts of annual rainfall, and is elsewhere given.

AUSTRALIA
— AND —
TASMANIA

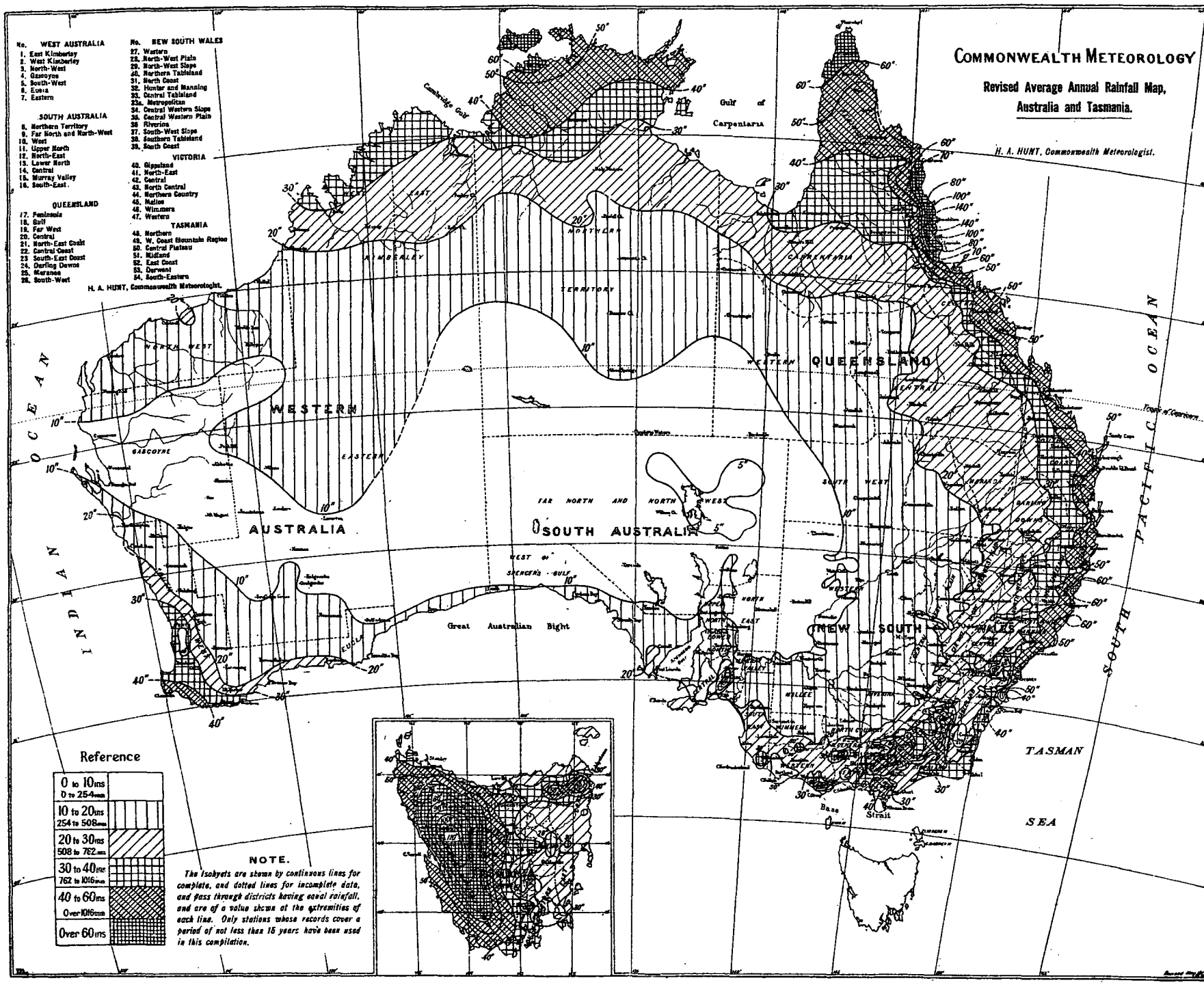
Showing the mean monthly distribution of Rainfall in percentages of the average annual

From map published by authority under the direction of H.A. Hunt Commonwealth Meteorologist



— NOTE —

The vertical side of each of the small squares of the graphs equals 2 per cent. For convenience Tasmania has been placed in the centre of the map, it of course comes within the zone of winter rains. The large figures on the graphs indicate the number of years record at the station indicated and the small sloping figures denote the average annual rainfall for that period



McCarron, Bird & Co., Printers, Melbourne.

evaporation from the ground, they increase the relative humidity. Vegetation greatly diminishes the rate of flow-off of rain, and the washing away of surface soil. Thus, when a region is protected by trees, steadier water supply is ensured, and the rainfall is better conserved. In regions of snowfall the supply of water to rivers is similarly regulated, and without this and the sheltering influence of ravines and "gullies," watercourses supplied mainly by melting snow would be subject to alternate periods of flooding and dryness. This is borne out in the inland rivers. Thus, the River Murray, which has never been known to run dry, derives its steadiness of flow mainly through the causes above indicated.

(ii.) *Direct Influences of Forest on Rainfall.* Whether forests have a direct influence on rainfall is a debatable question, some authorities alleging that precipitation is undoubtedly induced by forests, while others contend the opposite. According to Dr. Hann, observations have been made in India and Germany which support the idea that the destruction of trees has had a most deteriorating effect upon the climate.[1] In the Cordilleras, clouds with rain falling from them can be seen hanging over forests, while over contiguous lands covered with shrubs or used for agriculture the sky is blue and the sun is shining.

In America the influence of forests on the rainfall is still debated, but in Europe authorities contend that forests encourage frequent rainfalls. Hann states that a surface which keeps the air moist and cool, and from which there is as great an evaporation as takes place from extended forests, must have a tendency to increase the amount and frequency of precipitation, as contrasted with an open country which is dry, but over which conditions are otherwise similar.

Obviously the settlement of this very important question is difficult. Observations would have to be taken, with different treatments of the land, over very extended periods. Sufficient evidence exists, however, to establish that, even if the rainfall has not increased, the beneficial effect of forest lands in tempering the effects of the climate is more than sufficient to disclose the importance of their protection and extension. Curtis, in a paper read before the Meteorological Congress in 1893, sets forth important evidence of the ill-effects on orchard and wheat country of the felling of trees for the timber trade.

In Michigan, where half a century ago peach trees flourished and were rarely injured by cold, the crops have now nearly disappeared, owing to the removal by timbermen of the shelter afforded by the forests. In Northern Kansas, too, from the same cause, the growing of peaches has been largely abandoned. Many of the South Californian citrus fruit-growers protect their orchards from the destructive effects of wind by the judicious planting of eucalyptus and other trees.

It is the rapid rate of evaporation (says Dr. Fernow), induced by both hot and cold winds, which injures crops and makes life uncomfortable on the plains. Whether the forest aids in increasing precipitation there may be doubt, but nobody can say that it does not check the winds and the rapid evaporation due to them.

Trees as wind-breaks have been successfully planted in central parts of the United States, and there is no reason why similar experiments should not be successful in many parts of our treeless interior. The belts should be planted at right angles to the direction of the prevailing parching winds, and if not more than half a mile apart will afford shelter to the enclosed areas.[2]

16. **Comparison of Rainfalls and Temperatures.**—For the purpose of comparison the following lists of rainfalls and temperatures are given for various important cities throughout the world, for the site of the federal capital, and for the capitals of the Australian States :—

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1. "Climatology," p. 194.

2. See A. Woeikof, Petermann's Mittheilungen, 1885; and W. M. Fulton and A. N. Salisbury, "Convention of U.S.A. Weather Bureau Officials, 1898."

COMPARISON OF RAINFALLS AND TEMPERATURES
OF CITIES OF THE WORLD WITH THOSE OF AUSTRALIA.

Place.	Height above M.S.L.	Annual Rainfall.			Temperature.					
		Average.	Highest.	Lowest.	*Mean Summer.	†Mean Winter.	Highest on Record.	Lowest on Record.	Average Hottest Month.	Average Coldest Month.
	Ft.	Ins.	Ins.	Ins.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.	Fahr.
Amsterdam ...	6	27.29	40.59	17.60	63.2	36.8	90.0	4.1	64.4	35.4
Auckland ...	125	43.31	63.72	26.32	66.1	52.5	91.0	31.9	67.2	51.8
Athens	351	15.48	33.32	4.55	79.2	49.1	106.5	19.6	81.1	47.5
Bergen	146	89.10	102.80	73.50	56.8	34.5	88.5	4.8	57.9	33.6
Berlin	115	22.95	30.04	14.25	64.7	32.2	98.6	—13.0	66.0	30.0
Berne	1,877	36.30	58.23	24 69	62.2	30.1	91.4	— 3.6	64.4	28.0
Bombay	37	71.15	114.89	33.41	83.5	75.1	100.0	55.9	84 8	74.2
Breslau	482	22.00	28.01	16.45	63.9	30.0	100.0	—23.4	65.5	29.3
Brussels	328	28.35	41.18	17.73	62.6	36.0	95.5	— 4.4	63.7	34.5
Budapest... ...	500	25.20	35.28	16.79	68.6	30.2	98.6	— 5.1	70.4	28.2
Buenos Ayres ...	72	36.82	80.73	21.53	73.2	51.5	103.1	25.9	74.2	50.5
Calcutta	21	61.98	89.32	39.38	84.9	67.1	108.2	44.2	85.4	65.5
Capetown ...	40	25.50	36.72	17.71	68.1	54.7	102.0	34.0	68.8	53.9
Caracas	3,420	30.03	47.36	23.70	68.3	65.3	87.8	48.2	69.2	63.7
Chicago	823	33.54	45.86	24.52	69.2	25.4	103.0	—23.0	72.4	24.0
Christchurch ...	25	25.45	35.30	13.54	61.1	43.4	95.7	21.3	61.6	42.4
Christiania ...	82	22.52	31.73	16.26	61.0	24.4	95.0	—21.1	62.6	23.9
Colombo... ...	40	83.83	139.70	51.60	81.5	79.9	95.8	65.0	82.6	79.1
Constantinople ...	245	28.75	42.74	14.78	74.0	43.5	103.6	13.0	75.7	42.0
Copenhagen ...	46	22.33	28.78	13.94	60.7	32.1	90.5	—13.0	62.2	31 4
Dresden	115	26.80	34.49	17.72	62.9	32.4	93.4	—15.3	64.4	31.6
Dublin	47	27.66	35.56	16.60	59.4	42.0	87.2	13.3	60.5	41.7
Dunedin	300	37.06	53.90	22.15	57.3	43.1	94.0	23.0	57.9	42.6
Durban	260	40.79	71.27	27.24	75.6	64.4	110.6	41.1	76,7	63.8
Edinburgh ...	441	25.21	32.05	16.44	55.8	38.8	85.3	16.6	57.2	38.3
Geneva	1,328	33.48	46.89	21.14	64.4	33.7	...	...	62.2	32.2
Genoa	157	51.29	108.22	28.21	73.8	46.8	94.5	16.7	75.4	45.5
Glasgow	184	38.49	56.18	29.05	52.7	41.0	84.9	6.6	58.0	38.4
Greenwich ...	159	24.12	35.54	16.38	61.3	39.3	100.0	4.0	62.7	38.6
Hong Kong ...	110	84.10	119.72	45.83	81.3	60.3	97.0	32.0	81.8	58.1
Johannesburg ...	5,750	31.63	50.00	21.66	65.4	54.4	94.0	23.3	68.2	48.9
Leipzig	384	24.69	31.37	17.10	63.1	31.5	97.3	—14.8	64.8	30.6
Lisbon	312	29.18	52.79	17.32	69.6	51.3	94.1	32.5	70.2	49.3
London	18	24.04	38.20	18.23	61.2	39.3	94.0	9.4	62.8	38.7
Madras	22	49.06	88.41	18.45	86.7	76.0	113.0	57.5	87.6	75.3
Madrid	2,149	16.23	27.48	9.13	73.0	41.2	107.1	10.5	75.7	39.7
Marseilles ...	246	21.88	43.04	12.28	70.3	45.3	100.4	11.5	72.1	43.3
Moscow	526	18.94	29.28	12.07	63.4	14.7	99.5	—44.5	66.1	11.9
Naples	489	34.00	56.58	21.75	73.6	48.0	99.1	23.9	75.4	46.8
New York ...	314	42.47	59.68	28.78	72.1	31.7	100.0	— 6.0	74.5	30.3
Ottawa	294	33.40	44.44	26.36	67.2	14.1	98.5	—33.0	69.7	12.0
Paris	165	21.92	29.56	16.44	63.5	37.1	101.1	—14.1	65.8	36.1
Pekin	143	24.40	36.00	18.00	77.7	26.6	114.0	— 5.0	79.2	23.6
Quebec	296	40.46	47.57	32.12	63.5	12.4	95.5	—34.3	66.3	10.1
Rome	166	32.57	57.89	12.72	74.3	46.0	104.2	17.2	76.1	44.6
San Francisco ...	155	22.83	38.82	9.31	59.0	51.0	101.0	29.0	61.0	50.0
Shanghai ...	14	44.13	62.52	27.91	77.4	39.4	102.9	10.2	79.7	37.4
Singapore ...	8	91.99	158.68	32.71	81.2	76.6	94.2	63.4	81.5	78.3
Stockholm ...	146	18.31	25.46	11.78	59.7	27.0	91.8	—22.0	62.1	25.7
St. Petersburg ...	16	21.30	29.52	13.75	61.1	17.4	97.0	—38.2	63.7	15.2
Tokio	70	59.17	77.10	45.72	73.9	38.9	97.9	15.4	77.7	37.1
Trieste	85	42.94	63.14	26.57	73.9	41.3	99.5	14.0	76.3	39.9
Vienna	663	24.50	33.90	16.50	65.7	30.4	97.7	— 8.0	67.1	28.0
Vladivostock ...	55	19.54	33.60	9.39	63.9	11.0	95.7	—21.8	69.4	6.1
Washington ...	75	43.80	61.33	18.79	74.7	34.5	104.0	—15.0	76.8	32.9
Wellington (N.Z.)	110	49.70	67.68	30.02	61.7	48.4	98.0	30.0	62.4	47.5
FEDERAL CAPITAL SITE.										
Canberra (Dist.) Queanbeyan ...	2,000 to 2,900	22.50	41.29	10.45	* 67.5	† 41.8	104.0	11.1	68.4	39.7
THE STATE CAPITALS.										
Perth	197	33 26	46.73	20.48	* 72.9	† 55.7	107.9	35.3	74.1	55.0
Adelaide	140	21.06	30.87	13.43	73.1	52.9	116.3	32.0	74.2	51.5
Brisbane	137	47.05	88.26	16.17	76.5	59.5	108.9	36.1	77.1	58.0
Sydney	146	47.97	82.81	23.01	70.9	53.9	108.5	35.9	71.6	52.3
Melbourne ...	115	25.60	36.61	15.61	66.5	49.9	111.2	27.0	67.5	48.5
Hobart	160	23.57	40.67	13.43	61.4	47.0	105.2	27.7	62.2	45.7

* Mean of the three hottest months. † Mean of the three coldest months.

17. **Climatological Tables.**—The means, averages, extremes, totals, etc., for a number of climatological elements have been determined from long series of observations at the Australian capitals. These are given in the following tables:—

CLIMATOLOGICAL DATA FOR PERTH, W.A.

LAT. 31° 57′ S., LONG. 115° 51′ E. HEIGHT ABOVE M.S.L. 197 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 9 a.m. and 3 p.m. readings	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds. 9 a.m. & 3 p.m.	No. of Clear Days.
No. of yrs. over which observation extends	27	14	14	14	14	13	14	15	14
January ...	29.910	797 27/98	0.72	11,501	S	10.32	1.0	2.6	16.7
February ...	29.927	650 6/09	0.67	10,052	S S E	8.70	1.2	2.8	14.4
March ...	29.994	601 17/99	0.56	10,168	S S E	7.64	1.0	3.3	14.3
April ...	30.072	955 25/00	0.45	8,850	S E	4.82	0.8	4.4	8.9
May ...	30.080	722 22/10	0.36	8,184	E N E	2.60	2.3	5.4	6.1
June ...	30.060	861 27/10	0.40	8,310	N N E	1.66	1.9	5.9	4.8
July ...	30.100	949 11/99	0.40	8,618	N N E	1.64	2.6	5.5	6.5
August ...	30.087	966 15/03	0.44	8,990	W S W	2.36	1.6	5.2	7.0
September ...	30.061	864 11/05	0.47	9,030	S W	3.34	1.8	5.2	7.1
October ...	30.034	686 15/98	0.55	10,137	S S W	5.29	1.1	5.1	8.2
November ...	29.994	777 18/97	0.61	10,290	S	7.69	0.9	3.9	12.4
December ...	29.932	672 31/98	0.68	11,253	S	9.97	1.3	3.0	16.6
Year Totals ...	—	—	—	—	—	66.03	17.5	—	123.0
Year Averages ...	30.020	—	0.52	9,615	S	—	—	4.4	—
Year Extremes ...	—	966 15/8/03	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Greatest Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Sea water mn. 3 ft. below surface.
No. of yrs. over which observation extends	15	15	15	15	15	15	14	13	—
January ...	84.1	62.9	73.5	107.0 16/97	50.6 25/01	56.4	171.1 4/04	42.4 25/02	—
February ...	84.9	63.3	74.1	106.8 6/98	47.7 1/02	59.1	169.0 4/99	41.2 1/02	—
March ...	81.5	60.7	71.1	104.3 6,7/06	45.8 8/03	58.5	161.6 †	36.7 8/03	—
April ...	75.9	56.8	66.4	99.7 9/10	42.4 2/01	57.3	152.0 11/01	35.0 2/01	—
May ...	68.4	52.4	60.4	90.4 2/07	39.9 *	50.5	138.8 15/02	31.9 18/99	—
June ...	63.6	48.9	56.2	77.1 9/09	36.9 14/98	40.2	131.0 5/04	30.2 14/98	—
July ...	62.5	47.4	55.0	73.8 24/99	36.4 19/06	37.4	131.0 31/98	27.6 21/11	—
August ...	63.8	48.0	55.9	80.4 30/02	35.3 31/08	45.1	134.1 ‡	27.9 10/11	—
September ...	65.8	50.1	58.0	86.4 28/00	39.0 18/00	47.4	144.8 19/02	33.2 15/99	—
October ...	69.2	52.6	60.9	93.4 17/06	41.2 10/03	52.2	152.6 30/01	33.4 1/10	—
November ...	74.7	56.0	65.4	100.9 27/01	42.0 1/04	58.9	161.5 17/03	35.5 6/10	—
December ...	80.8	60.5	70.6	107.9 20/04	48.0 2/10	59.9	168.3 20/04	39.1 2/10	—
Year Averages ...	72.9	55.0	64.0	—	—	—	—	—	—
Year Extremes ...	—	—	—	107.9 20/12/04	35.3 31/8/08	72.6	171.1 4/1/04	27.6 21/7/11	—

* 17 and 18, 1899. † 1/99 and 1/09. ‡ 29/1898 and 18/1902.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Dew. Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends	15	15	15	36	36	36	36	36	—	15
January ...	53	57	45	0.33	3	2.17 1879	nil *	1.74 28/79	—	2.8
February ...	54	63	48	0.31	2	2.30 1883	nil †	0.90 10/83	—	2.2
March ...	55	61	48	0.73	4	4.50 1896	nil ‡	1.53 17/76	—	3.9
April ...	63	70	54	1.69	7	4.97 1882	0.05 ‖	2.62 30/04	—	8.5
May ...	74	81	63	4.94	14	12.13 1879	0.98 1903	2.80 20/79	—	11.7
June ...	79	84	74	6.58	16	12.11 1890	2.16 1877	2.65 16/00	—	12.1
July ...	78	81	72	6.38	16	10.90 1902	2.42 1876	3.00 4/91	—	11.9
August ...	75	79	68	5.62	17	10.33 1882	0.46 1902	2.79 7/03	—	10.7
September ...	69	76	64	3.31	14	7.72 1903	0.69 1877	1.73 23/09	—	8.7
October ...	64	75	56	2.05	11	7.87 1890	0.49 1892	1.38 15/10	—	5.5
November ...	57	62	52	0.77	6	2.12 1880	nil 1891	1.11 30/03	—	4.5
December ...	52	61	46	0.55	4	3.05 1888	nil 1886	1.72 1/88	—	2.9
Year Totals ...	—	—	—	33.26	114	—	—	—	—	85.4
Year Averages ...	63	—	—	—	—	—	—	—	—	—
Year Extremes ...	—	84	45	—	—	12.13 5/79	nil §	3.00 4/7/91	—	—

* 1888, 1894, 1897, and 1911. † 1885, 1891, 1896, and 1903. ‡ 1877, 1884, and 1886. ‖ 1890 and 1894.
§ January, February, March, November, and December, various years.

CLIMATOLOGICAL DATA FOR ADELAIDE, S.A.

LAT. 34° 56′ S., LONG. 138° 35′ E. HEIGHT ABOVE M.S.L. 140 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 9 a.m. and 3 p.m. readings.	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds 9 a.m. 3 p.m., & 9 p.m.	No. of Clear Days.
No. of yrs. over which observation extends	55	34	34	34	34	42	40	44	30
January	29.914	758 19/99	0.36	8,189	S W & S	8.96	2.3	3.5	7.5
February	29.951	691 22/96	0.31	6,925	S W & S	7.30	2.0	3.4	7.0
March	30.039	592 12/85	0.26	6,897	S W to S E	5.77	2.2	4.0	6.7
April	30.116	773 10/96	0.23	6,358	S W & S †	3.40	1.6	4.9	3.8
May	30.123	760 9/80	0.21	6,275	N E to N	1.98	1.8	5.7	1.6
June	30.098	750 12/78	0.27	6,765	N E to N	1.22	2.2	6.2	1.3
July	30.133	674 25/82	0.26	6,880	N E to N	1.29	1.5	5.8	1.3
August	30.100	773 31/97	0.29	7,300	N E to N ‡	1.85	2.2	5.7	1.9
September	30.042	720 2/87	0.32	7,412	N E & S W ‖	2.82	2.4	5.2	2.6
October	29.997	768 28/98	0.36	8,116	S W & N E ‖	4.73	3.5	4.9	3.8
November	29.974	677 2/04	0.35	7,774	W S W to S	6.57	4.0	4.5	5.5
December	29.919	675 12/91	0.36	8,172	W S W to S	8.40	2.8	3.8	6.8
Year Totals	—	—	—	—	—	54.29	28.5	—	49.8
Year Averages	30.034	—	0.30	7,255	S W	—	—	4.8	—
Year Extremes	—	773*	—	—	—	—	—	—	—

* 10/4/96 and 31/8/97. † With tendency N.E. ‡ With tendency S.W ‖ Equal.

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.		Lowest.		Greatest Range.	Extreme Temperature. Highest in Sun.		Lowest on Grass.		* Sea water mn. 3 ft. below surface
No. of yrs. over which observation extends	55	55	55	55		55		55	34		51		38
January	86.6	61.8	74.2	116.3	26/58	45.1	21/84	71.2	180.0	18/82	36.5	14/79	70 8
February	86.0	61.9	73.9	113.6	12/99	46.4	13/05	67.2	170.5	10/00	36.7	24/78	70.9
March	80.8	58.9	69.9	108.0	12/61	44.8	—/57	63.2	174.0	17/83	33.8	27/80	68.2
April	73.3	54.6	64.0	98.0	10/66	39.6	15/59	58.4	155.0	1/83	30.3	27/08	64.0
May	65.3	50.0	57.7	88.3	5/66	36.9	†	51.4	148.2	12/79	25.9	10/91	59.1
June	60.1	46.6	53.4	76.0	23/65	32.5	27/76	43.5	138.8	18/79	24.5	20/79	54 7
July	58.6	44.4	51.5	74.0	11/06	32.0	24/08	42.0	134.5	26/90	23.3	25/11	52.2
August	61.9	45.8	53.8	85.0	31/11	32.3	17/59	52.7	140.0	31/92	23.5	7/88	53.3
September	66.2	47.8	57.0	90.7	23/82	32.7	4/58	58.0	160.5	23/82	26.2	15/08	56.5
October	72.4	51.3	61.9	100.5	30/59	36.0	—/57	64.5	158.8	19/82	28.5	7/96	60.7
November	78.9	55.4	67.1	113.5	21/65	40.8	2/09	72.7	166.9	20/78	31.5	2/09	65.2
December	83.4	58.8	71.1	114.2	14/76	43.0	‡	71.2	175.7	7/99	32.5	4/84	68.6
Year Averages	72.8	53.1	62.9	—		—		—	—		—		62.0
Year Extremes	—	—	—	116.3	26/1/58	32.0	24/7/08	84.3	180.0	18/1/82	23.3	25/7/11	—

* Taken at Lighthouse at entrance to Port River. † 26/1895 and 24/1904. ‡ 16/61 and 4/06.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.		Least Monthly.		Greatest in One Day.		Dew. Mean Amount of Dew.	Mean No. days Dew
No of yrs. over which observation extends	44	44	44	73	73	73		73		73		—	40
January	36	59	33	0.74	4	4.00	1850	nil	*	2.30	2/89	—	4
February	42	56	37	0.60	3	2.67	1858	nil	†	1.81	5/90	—	5
March	47	58	40	1.07	6	4.60	1878	nil	‡	3.50	5/78	—	10
April	57	72	44	1.87	10	6.78	1853	0.06	1910	3.15	5/60	—	14
May	69	76	58	2.77	14	7.75	1875	0.20	1891	2.47	5/75	—	15
June	77	84	70	3.09	16	7.80	1847	0.42	1886	1.45	2/49 ‖	—	15
July	76	87	72	2.66	16	5.38	1865	0.36	1899	1.75	10/65	—	17
August	71	77	65	2.51	16	6.24	1852	0.76	1911	2.23	19/51	—	16
September	63	72	54	1.94	14	4.64	1840	0.45	1896	1.42	25/93	—	15
October	52	67	44	1.75	11	3.83	1870	0.31	1888	2.24	16/08	—	12
November	44	57	38	1.13	8	3.55	1851	0.04	1885	1.88	28/58	—	7
December	39	50	33	0.93	6	3.98	1861	nil	1904	1.89	29/40	—	4
Year Totals	—	—	—	21.06	124	—		—		—		—	134
Year Averages	54	—	—	—	—	—		—		—		—	—
Year Extremes	—	87	33	—	—	7.80	6/47	nil	§	3.50	5/3/78	—	—

* 1848, 1849, 1878 and 1906. † 1848, 1860, etc. ‡ 1859, etc. § January, February, March and December, various years. ‖ and 25/84.

CLIMATOLOGICAL DATA FOR BRISBANE, QUEENSLAND.

LAT. 27° 28′ S., LONG. 153° 2′ E. HEIGHT ABOVE M.S.L. 137 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mean Sea Level and Standard Gravity from 9 a.m. & 3 p.m. Readgs.	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds. 9 a.m. & 3 p.m.	No. of Clear Days.
No. of yrs. over which observation extends	25	—	—	—	25	2	—	25	—
January	29.869	—	—	—	E	5.66	—	6.2	—
February	29.889	—	—	—	S E	4.26	—	6.2	—
March	29.953	—	—	—	S	4.54	—	6.0	—
April	30.043	—	—	—	S	3.62	—	5.1	—
May	30.095	—	—	—	S	2.80	—	4.9	—
June	30.056	—	—	—	S & W	2.28	—	4.2	—
July	30.064	—	—	—	S & W	2.42	—	3.8	—
August	30.087	—	—	—	S & S W	2.43	—	4.0	—
September	30.027	—	—	—	S	3.52	—	3.9	—
October	29.996	—	—	—	N & N E	4.78	—	4.5	—
November	29.960	—	—	—	N E & E	5.53	—	5.2	—
December	29.886	—	—	—	N E & E	7.11	—	5.6	—
Year Totals ...	—	—	—	—	—	48.95	—	—	—
Year Averages ...	29.993	—	—	—	S'ly to E'ly	—	—	5.0	—
Year Extremes ...	—	—	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.		Lowest.		Greatest Range.	Extreme Temperature. Highest in Sun.		Lowest on Grass.		Sea water mn. 3 ft. below surface
No. of yrs. over which observation extends	25	25	25	25		25		25	25		25		—
January	85.3	68.9	77.1	108.9	14/02	58.8	4/93	50.1	162.7	20/89	49.9	4/93	—
February	84.3	68.5	76.4	101.9	11/04	58.7	*	43.2	165.2	6/02	49.3	9/89	—
March	82.1	66.5	74.3	96.8	16/88	55.6	30/95	41.2	160.0	1/87	46.0	28/02	—
April	78.8	61.5	70.2	95.2	†	48.6	17/00	46.6	150.1	1/08	37.0	17/00	—
May	73.4	55.4	64.4	88.8	18/97	41.3	24/99	47.5	147.0	1/05	29.8	8/97	—
June	69.2	50.5	59.8	81.5	6/06	36.3	29/08	45.2	133.9	6/06	25.4	23/88	—
July	68.2	47.8	58.0	83.4	28/98	36.1	‡	47.3	134.4	29/89	23.9	11/90	—
August	71.2	49.9	60.6	87.5	28/07	37.4	6/87	50.1	140.7	30/88	27.1	9/99	—
September	75.6	54.7	65.2	90.2	20/04	40.7	1/96	49.5	155.5	26/03	30.4	1/89	—
October	79.8	59.8	69.8	101.4	18/93	43.3	3/99	58.1	156.5	31/89	34.9	8/89	—
November	82.7	63.9	73.3	105.4	13/98	48.5	2/05	56.9	162.3	7/89	38.8	1/05	—
December	85.4	67.5	76.2	105.9	26/93	57.0	16/90	48.9	159.5	23/89	49.1	3/94	—
Year Averages ...	78.0	59.6	68.8	—		—		—	—		—		—
Year Extremes ...	—	—	—	108.9	14/1/02	36.1	‖	72.8	165.2	6/2/10	23.9	11/7/90	—

* 10-11/04. † 9/96 and 5/03. ‡ 12/94 and 2/96. ‖ 12/7/94 and 2/7/96.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.		Least Monthly.		Greatest in One Day.		Dew. Mean Amount of Dew.	Mean No. days Dew.
No. of yrs. over which observation extends	25	25	25	60	52	60		60		—		—	—
January	65	79	53	6.74	14	27.72	1895	0.61	1882	18.31	21/87	—	—
February	69	82	55	6.71	14	40.39	1893	0.77	1904	8.36	16/93	—	—
March	72	85	56	6.12	16	34.04	1870	0.58	1868	11.18	14/08	—	—
April	72	79	60	3.69	13	15.28	1867	0.04	1897	3.93	20/92	—	—
May	74	85	64	2.96	10	13.85	1876	0.00	1846	5.62	9/79	—	—
June	74	82	67	2.55	8	14.03	1873	0.02	1895	6.01	9/93	—	—
July	73	80	67	2.33	8	8.46	1889	0.00	1841	3.54	‡	—	—
August	71	80	65	2.37	7	14.67	1879	0.00	*	4.89	12/87	—	—
September	65	76	47	2.07	8	5.43	1886	0.10	1907	2.46	2/94	—	—
October	61	72	52	2.73	10	9.99	1882	0.14	1900	1.95	27/89	—	—
November	59	71	53	3.65	10	10.43	1846	0.00	1842	4.46	16/86	—	—
December	61	67	52	5.13	12	13.97	1910	0.35	1865	6.60	28/71	—	—
Year Totals ...	—	—	—	47.05	130	—		—		—		—	—
Year Averages ...	68	—	—	—	—	—		—		—		—	—
Year Extremes ...	—	85	47	—	—	40.39	2/1893	0.00	†	18.31	21/1/87	—	—

— signifies no record kept.

* 1862, 1869, 1880. † 5/1946, 7/1841, 8/1862, 1869, 1880, 11/1842 ‡ 15/76, 16/89.

CLIMATOLOGICAL DATA FOR SYDNEY, N.S.W.

LAT. 33° 52′ S., LONG. 151° 12′ E. HEIGHT ABOVE M.S.L. 146 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 24 hourly Readings.	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles, mean.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds.	No. of Clear Days.
No. of yrs. over which observation extends	53	45	45	45	53	32	48	50	48
January	29.901	721 1/71	0.38	8,322	N E	5.08	4.7	5.9	1.8
February	29.943	871 12/69	0.34	7,216	N E	3.96	4.1	6.1	1.1
March	30.020	943 20/70	0.26	6,902	N E	3.35	4.1	5.7	1.7
April	30.073	803 6/82	0.23	6,339	N E	2.44	3.9	5.1	2.5
May	30.082	758 6/98	0.23	6,456	W	1.64	3.6	4.9	3.1
June	30.060	712 7/00	0.30	7,230	W	1.36	2.2	4.8	3.3
July	30.079	930 17/79	0.29	7,355	W	1.41	2.5	4.4	4.1
August	30.076	756 22/72	0.27	7,080	W	1.72	3.4	4.1	4.5
September	30.016	964 6/74	0.31	7,299	W	2.53	4.2	4.4	3.5
October	29.966	926 4/72	0.34	7,983	N E	3.68	5.0	5.0	2.1
November	29.953	720 13/63	0.35	7,806	N E	4.40	5.5	5.6	1.5
December	29.881	938 3/84	0.36	8,213	N E	5.25	5.6	5.4	1.8
Year Totals	—	—	—	—	—	36.82	48.8	—	31.0
Year Averages	30.004	—	0.31	7,351	N E	—	—	5.1	—
Year Extremes	—	964 6/9/74	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Greatest Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Sea water mn. 3 ft. below surf'ce*
No. of yrs. over which observation extends	53	53	53	53	53	*53	52	53	51
January	78.3	64.9	71.6	108.5 13/96	51.2 14/65	57.3	160.9 13/96	44.2 18/97	71.4
February	77.2	64.8	71.0	101.0 19/66	49.3 28/63	51.7	162.1 16/98	43.4 25/91	71.9
March	75.4	63.0	69.2	102.6 3/69	48.8 14/86	53.8	172.3 4/89	42.3 13/93	71.0
April	70.9	58.2	64.6	89.0 4/09	44.6 27/64	44.4	144.1 10/77	38.0 13/92	68.4
May	65.0	52.0	58.5	83.5 1/59	40.2 22/59	43.3	129.7 1/96	30.9 7/88	64.2
June	60.4	48.2	54.4	74.7 24/72	38.1 20/62	36.6	123.0 14/78	28.1 24/11	59.9
July	58.9	45.6	52.3	74.9 17/71	35.9 12/90	39.0	144.3 15/98	24.0 4/93	57.3
August	62.2	47.5	54.9	82.0 31/84	36.8 3/72	45.2	149.0 30/78	27.7 30/95	57.6
September	66.3	51.3	58.9	91.1 24/07	40.8 18/64	50.3	142.2 12/78	30.1 17/05	60.0
October	71.0	55.8	63.4	99.7 19/98	43.3 2/99	56.4	149.9 13/96	32.7 9/05	63.3
November	74.2	59.6	66.9	102.7 21/78	45.8 1/05	56.9	158.5 28/99	38.8 1/05	66.9
December	77.2	62.8	70.0	107.5 31/04	49.3 2/59	58.2	171.5 4/88	42.2 8/75	69.6
Year Averages	69.8	56.1	63.0	—	—	—	—	—	65.1
Year Extremes	—	—	—	108.5 13/1/96	35.9 12/7/90	72.6	172.3 4/3/89	24.0 4/7/93	—

* Taken at Fort Dension.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 9 a.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Dew. Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends	53	53	53	53	53	53	53	53	52	52
January	70	78	60	3.67	14.3	15.26 1911	0.42 1888	7.08 13/11	0.002	1.3
February	73	81	60	4.70	14.2	18.56 1873	0.34 1902	8.90 25/73	0 004	2.0
March	75	85	63	5.07	15.3	18.70 1870	0.42 1876	5.66 25/90	0.007	3.3
April	77	87	64	5.24	13.2	24.49 1861	0.06 1868	7.52 29/60	0.016	6.0
May	77	90	66	4.95	15.4	20.87 1889	0.21 1885	8.36 28/89	0.022	6.6
June	79	89	68	5.18	12.9	16.30 1885	0.19 1904	5.17 16/84	0.018	5.5
July	77	88	66	4.68	12.3	13.21 1900	0.12 1862	5.72 28/08	0.016	5.4
August	74	84	64	3.29	11.6	14.89 1889	0.04 1885	5.33 2/60	0.014	5.0
September	70	79	60	2.89	12.2	14.05 1879	0.08 1882	5.69 10/79	0.008	4.0
October	68	77	55	2.82	12.7	10.81 1902	0.21 1867	6.37 13/02	0.006	3.0
November	68	79	54	2.92	12.5	9.88 1865	0.19 1910	4.23 19/00	0.004	2.3
December	68	77	52	2.60	12.8	8.47 1910	0.45 1876	4.75 13/10	0.003	1.6
Year Totals	—	—	—	48.01	159.4	—	—	—	0.120	46.0
Year Averages	73	—	—	—	—	—	—	—	—	—
Year Extremes	—	90	55	—	—	24.49 4/1861	0.04 8/1885	8.90 25/2/73	—	—

CLIMATOLOGICAL DATA FOR MELBOURNE, VICTORIA.

LAT. 37° 50′ S., LONG. 144° 59′ E. HEIGHT ABOVE M.S.L. 115 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mn. Sea Level and Standard Gravity from 9 a.m., 3 & 9 p.m. readings	Wind. Greatest Number of Miles in one day.	Wind. Mean Hourly Pressure. (lbs.)	Wind. Total Miles.	Wind. Prevailing Direction.	Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds.	No. of Clear Days.
No. of yrs. over which observation extends	54	43	43	43	43	39	—	54	—
January	29.913	583 10/97	0.29	7,345	S W, S E	6.32	—	5.1	—
February	29.960	566 8/68	0.28	6,441	S W, S E	4.98	—	5.1	—
March	30.038	677 9/81	0.22	6,398	S W, S E	3.86	—	5.5	—
April	30.100	597 7/68	0.19	5,719	S W, N W	2.35	—	5.8	—
May	30.104	693 12/65	0.19	5,958	N W, N E	1.46	—	6.5	—
June	30.076	761 13/76	0.24	6,461	N W, N E	1.11	—	6.7	—
July	30.097	755 8/74	0.23	6,482	N W, N E	1.05	—	6.3	—
August	30.067	637 14/75	0.26	6,882	N W, N E	1.47	—	6.3	—
September ...	30.000	617 11/72	0.29	7,108	N W, S W	2.26	—	6.1	—
October	29.965	899 5/66	0.29	7,377	S W, N W	3.26	—	6.0	—
November	29.952	734 13/66	0.29	7,083	S W, S E	4.50	—	5.8	—
December	29.896	655 1/75	0.30	7,503	S W, S E	5.69	—	5.5	—
Year Totals ...	—	—	—	—	—	38.31	—	—	—
Year Averages ...	30.014	—	0.26	6,730	S W, N W	—	—	5.9	—
Year Extremes ...	—	899 5/10/66	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature. Mean Max.	Mean Min.	Mean	Extreme Shade Temperature. Highest.	Lowest.	Greatest Range.	Extreme Temperature. Highest in Sun.	Lowest on Grass.	Sea, water mn. 3 ft. below surface.
No. of yrs. over which observation extends	56	56	56	56	56	56	51	51	—
January	78.3	56.7	67.5	111.2 14/62	42.0 28/85	69.2	178.5 14/62	30.2 28/85	—
February	77.8	56.7	67.2	109.5 7/01	40.3 9/65	69.2	167.5 15/70	30.9 6/91	—
March	74.9	54.6	64.7	105.5 2/93	37.1 17/84	68.4	164.5 1/68	28.9 *	—
April	68.5	50.6	59.6	94.0 6/65	34.8 24/88	59.2	152.0 8/61	25.0 23/97	—
May	61.5	46.7	54.1	83.7 7/05	31.3 26/95	52.4	142.6 2/59	23.2 21/97	—
June	56.7	43.9	50.3	72.2 1/07	28.0 11/66	44.2	129.0 11/61	20.4 17/95	—
July	55.4	41.5	48.5	68.4 24/78	27.0 21/69	41.4	125.8 27/80	20.5 12/03	—
August	58.7	43.3	51.0	77.0 20/85	28.3 11/63	48.7	137.4 29/69	21.3 14/02	—
September ...	62.5	45.4	53.9	82.3 30/07	31.1 16/08	51.2	142.1 20/67	24.7 13/07	—
October	66.9	48.1	57.5	96.1 30/85	32.1 3/71	64.0	154.3 28/68	25.9 3/71	—
November	71.5	51.0	61.3	105.7 27/94	36.5 2/96	69.2	159.6 29/65	24.6 2/96	—
December	75.3	53.7	64.5	110.7 15/76	40.0 4/70	70.7	170.3 20/69	33.2 1/04	—
Year Averages ...	67.3	49.4	58.3	—	—	—	—	—	—
Year Extremes ...	—	—	—	111.2 14/1/62	27.0 21/7/69	84.2	178.5 14/1/62	20.4 17/6/95	—

* 17/1884 and 20/1897.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity. Mean 3 a.m. 3 p.m.	Highest Mean.	Lowest Mean.	Rainfall. Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.	Least Monthly.	Greatest in One Day.	Dew. Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends	54	54	54	56	56	56	56	53	—	—
January	64	73	52	1.87	7	5.68 1904	0.04 1878	2.97 9/97	—	—
February	65	75	53	1.76	7	6.24 1904	0.03 1870	2.14 7/04	—	—
March	67	78	59	2.21	8	7.50 1911	0.18 1859	3.05 15/78	—	—
April	72	83	62	2.32	11	6.71 1901	0.33 1908	2.28 22/01	—	—
May	79	86	69	2.16	13	4.31 1862	0.45 1901	1.85 7/91	—	—
June	80	88	73	2.13	14	4.51 1859	0.73 1877	1.74 21/04	—	—
July	80	88	74	1.85	13	7.02 1891	0.57 1902	2.71 12/91	—	—
August	75	81	65	1.81	14	3.59 1909	0.48 1903	1.87 17/81	—	—
September ...	72	81	63	2.35	14	5.87 1870	0.52 1907	2.62 12/80	—	—
October	70	79	63	2.67	13	7.61 1869	0.57 1895	3.00 17/69	—	—
November	66	75	53	2.19	10	5.05 1881	0.25 1895	2.57 16/76	—	—
December	64	75	49	2.28	9	7.18 1863	0.11 1904	2.62 28/07	—	—
Year Totals ...	—	—	—	25.60	133	—	—	—	—	—
Year Averages ...	71	—	—	—	—	—	—	—	—	—
Year Extremes ...	—	88	49	—	—	7.61 10/69	0.03 2/70	3.05 15/3/78	—	—

— signifies no record kept.

CLIMATOLOGICAL DATA FOR HOBART, TASMANIA.

LAT. 42° 53′ S., LONG. 147° 20′ E. HEIGHT ABOVE M.S.L. 160 FT.

BAROMETER, WIND, EVAPORATION, LIGHTNING, CLOUDS, AND CLEAR DAYS.

Month.	Bar. corrected to 32° F. Mean Sea Level and Gravity from 9 a.m. Readings.	Wind.				Mean Amount of Evaporation.	No. of Days Lightning.	Mean Amount of Clouds.	No. of Clear Days.
		Greatest Number of Miles in one day.	Mean Hourly Pressure. (lbs.)	Total Miles.	Prevailing Direction.				
No. of yrs. over which observation extends	18	—	—	—	5	2	—	18	—
January	29.857	—	—	—	S E	5.45	—	5.9	—
February	29.939	—	—	—	S E & N	4.06	—	5.9	—
March	29.967	—	—	—	N & S E	2.87	—	6.0	—
April	29.971	—	—	—	N to N W	2.47	—	6.0	—
May	30.062	—	—	—	N to N W	1.32	—	6.1	—
June	29.987	—	—	—	N to N W	0.77	—	6.2	—
July	29.953	—	—	—	N to N W	0.78	—	5.8	—
August	29.985	—	—	—	N to N W	1.28	—	5.7	—
September	29.877	—	—	—	N to N W	1.73	—	6.3	—
October	29.840	—	—	—	N	1.97	—	6.3	—
November	29.829	—	—	—	N & S E	3.02	—	6.2	—
December	29.792	—	—	—	N W & S E	3.14	—	5.7	—
Year Totals	—	—	—	—	—	28.86	—	—	—
Year Averages	29.919	—	—	—	N	—	—	6.0	—
Year Extremes	—	—	—	—	—	—	—	—	—

TEMPERATURE.

Month.	Mean Temperature.			Extreme Shade Temperature.				Greatest Range.	Extreme Temperature.				Sea water min. 3 ft. below surface
	Mean Max.	Mean Min.	Mean	Highest.		Lowest.			Highest in Sun.		Lowest on Grass.		
No. of yrs. over which observation extends	28	28	28	28		28		28	26		24*a*		—
January	70.8	53.1	62.0	105.0	1/00	40.3	2/06	64.7	160.0	‡	30.6	1897	—
February	71.2	53.1	62.2	104.4	12/99	39.0	20/87	65.4	165.0	24/98	28.3	1887	—
March	68.0	50.7	59.4	97.5	7/91	36.0	31/05	61.5	147.5	1/06	27.5	30/02	—
April	62.9	47.8	55.4	82.4	6/88	33.3	24/88	49.1	138.5	12/05	25.0	1886	—
May	57.6	43.6	50.6	75.3	3/88	29.2	20/02	46.1	128.0	1889	20.0	19/02	—
June	52.8	41.4	47.1	69.2	1/07	29.5	26/02	39.7	122.0	12/94	21.0	6/87	—
July	52.0	39.4	45.7	65.4	15/98	27.7	11/95	37.7	118.7	19/96	18.7	16/86	—
August	55.1	41.1	48.1	71.5	17/02	30.5	4/97	41.0	129.0	1887	20.1	7/09	—
September	58.5	43.0	50.8	79.5	*	31.0	16/97	48.5	134.0	7/94	22.7	1886	—
October	62.6	45.3	54.0	86.0	29/07	32.0	12/89	54.0	146.0	1885	23.8	§	—
November	66.4	48.2	57.3	98.0	23/88	37.0	†	61.0	151.8	7/09	26.0	1/08	—
December	68.9	50.8	59.9	105.2	30/97	38.0	3/06	67.2	156.0	18/05	27.2	1886	—
Year Averages	62.2	46.5	54.4	—		—		—	—		—		—
Year Extremes	—	—	—	105.2	30/12/97	27.7	11/7/95	77.5	165.0	24/2/98	18.7	16/7/86	—

a Records only continuous since 1896.

* 30/91 and 17/97. † 24/84, 13/87, 11/85, and 7/00. ‡ 5/86 and 13/05. § 1886 and 1899.

HUMIDITY, RAINFALL, AND DEW.

Month.	Humidity.			Rainfall.						Dew.	
	Mean 9 a.m.	Highest Mean.	Lowest Mean.	Mean Monthly.	Mean No. of Days Rain.	Greatest Monthly.		Least Monthly.		Greatest in One Day.		Mean Amount of Dew.	Mean No. days Dew
No. of yrs. over which observation extends	18	18	18	69	54	69		69		29		—	—
January	63	72	55	1.82	9	5.91	1893	0.03	1841	2.59	30/05	—	—
February	63	76	51	1.47	8	9.15	1854	0.07	1847	1.60	22/03	—	—
March	68	76	62	1.64	9	7.60	1854	0.02	1843	2.06	14/11	—	—
April	73	84	61	1.81	10	6.50	1909	0.07	1904	5.02	20/09	—	—
May	78	85	68	1.92	12	6.37	1905	0.10	1843	1.62	31/05	—	—
June	81	92	75	2.21	13	8.15	1889	0.22	1852	4.11	14/89	—	—
July	80	87	69	2.11	13	5.98	1849	0.30	1850	1.56	8/94	—	—
August	78	82	70	1.83	13	10.16	1858	0.23	1854	2.28	13/90	—	—
September	73	82	65	2.11	14	7.14	1844	0.39	1847	1.57	24/85	—	—
October	67	75	58	2.22	14	6.67	1906	0.26	1850	2.58	4/06	—	—
November	62	73	50	2.51	12	8.92	1849	0.16	1868	3.70	30/85	—	—
December	59	73	51	1.92	11	9.00	1875	0.11	1842	2.27	27/07	—	—
Year Totals	—	—	—	23.57	—	—		—		—		—	—
Year Averages	70	—	—	—	138	—		—		—		—	—
Year Extremes	—	92	50	—	—	10.16	8/1858	0.02	3/1843	5.02	20/4/09	—	—

— signifies no record kept.