## CHAPTER II.

## PHYSIOGRAPHY.

## § 1. General Description of Australia.

1. Geographical Position.-(i) General. 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 $2,974,58 \mathrm{r}$ 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 $113^{\circ} 9^{\prime} \mathrm{E}$. and $153^{\circ} 39^{\prime}$ E., while its northern and southern limits are the parallols of latitude $10^{\circ} 4^{\prime \prime} \mathrm{S}$. and $39^{\circ} 8^{\prime} \mathrm{S}$., or, including Tasmania, $43^{\circ} 39^{\prime} \mathrm{S}$. On its north are the Timor and Arafura Seas and Torres Strait-on its south the Southern Ocean and Bass Strait. 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."
(ii) Tropical and Temperate Regions. Of the total area of Australia nearly 40 per cent. lies within the tropics. Assuming, as is usual, that the latitude of the Tropic of Capricorn is $23^{\circ} 30^{\prime} \mathrm{S}$. (its mean value for 1940 was $23^{\circ} 26^{\prime} 49.52^{\prime \prime}$ ), the areas within the tropical and temperate zones are approximately as follows :-
aUSTRALIA : AREAS OF TROPICAL AND TEMPERATE REGIONS.
(States and Terbitory Partially within Tropics.)

| Area. | Queensland. | Western | Northern Territory. | Totals. |
| :---: | :---: | :---: | :---: | :---: |
| Within Tropical Zone sq. miles | 359,000 | 364,000 | 426,320 | 1,149,320 |
| . Temperate Zone | 311,500 | 611,920 | 97,300 | 1,020,720 |
| Ratio of Tropical part to whole State .. | 0.535 | 0.373 | 0.814 | -. 530 |
| : : $\because \therefore$ Temperate part to whole State | 0.465 | 0.627 | 0.186 | $0.47{ }^{\circ}$ |

Thus the tropical part is roughly about one-half ( 0.530 ) of the three territories mentioned ebove; or about five-thirteenths of the whole of Australia ( 0.386 ).
2. Area of Australia compared with Areas of other Countries.-The area of Australia is almost as great as that of the United States of America, four-fifths of that of Canada, more than one-fifth of the area of the British Empire, nearly three-fourths of the whole area of Europe, and about 25 times as large
as Great Britain and Ireland. This great area, coupled with a limited population, renders the solution of the problem of Australian development a particularly difficult one. . The areas of Australia and of certain other comntries are given in the following table:-

AREA OF AUSTRALIA AND OF OTHER COUNTRIES, Circa 1939.

| Country. | Area. | Councry. | Area. |
| :---: | :---: | :---: | :---: |
| Continental Divisions- | Sq. miles. | Africa-continued. | Sq. miles. |
| Europe | ,409,000 | Italian East Africa | 666,000 |
| Asia | 16,216,000 | Angola | 488,000 |
| Africa | 11,710,000 | Union of South Africa | 472,000 |
| North and Central America |  | Egypt | 386,000 |
| and West Indies | 8,665,000 | Tanganyika Territory | 374,000 |
| South America | 6,934,000 | Nigeria and Protectorate.. | 373,000 |
| Oceania, etc. | 3,301,000 | South-West Africa | 322,000 |
| Total, excluding Aretic |  | Mozambique . . | 298,000 |
| and Antarctic Conts. | 51,235,000 | Northern Rhodesia | 290,000 |
|  |  | Bechuanaland Protectorate | 275,000 |
| Europe |  | Madagascar | 229,000 |
| U.S.S.R. (Russia) | 2,316,000 | Kenya Colony and Protec- |  |
| Germany (a) . | 225,000 | torate .. . | 225,000 |
| France.. | 213,000 | Other | 1,126,000 |
| Spain (inc. possessions) | 194,000 | Total | 11,710,000 |
| Sweden | 173, |  |  |
| Poland | 150 | North and Central America- |  |
| Finland | 148,000 | Canada | 3,695,000 |
| Italy (b) | 131,000 | United States of America. . | 3,027,000 |
| Norway | 125, | Mexico | 760,000 |
| Rumania | 114,000 | Alaska | 586,000 |
| Yugoslavia | 96,000 | Newfoundland and Labra- |  |
| United Kingdom | 94, | dor | 163,000 |
| Other . . | 430,000 | Honduras | 59,000 |
| Total | 4,409,000 | Nicaragua | 49,000 |
|  |  | Other | 326,000 |
| Asia- |  | Total | 8,665,000 |
| U.S.S.R. (Russia) . ${ }^{\text {China }}$ |  | South Americ |  |
| China and Dependencies.. | $\begin{array}{r} 4,287,000 \\ 863,000 \end{array}$ | Brazil .. | 3,286,000 |
| Arabia.. | 1,004,000 | Argentine Republic | 1,078,000 |
| Feudatory Indian States. | 712,000 | Bolivia | 421,000 |
| Iran . . .. | 634,00 | Peru $\because \quad$ - $\quad$ - | 482,000 |
| Netherlands Indies (c) | 735,000 | Colombia (exc. of Panama) | 440,000 |
| Turkey .. | 287,000 | Venezuela | 352,000 |
| French Indo-China | 286,000 | Chile . | 287,000 |
| Japan and Dependencies. | 262,000 | Paraguay | 151,000 |
| Afghanistan | 251,000 | Ocuador | 176,000 |
| Burma | 234,000 | Othe | 261,000 |
| Thailand | 200,000 | Total | 6,934,000 |
| Other | 601,000 | Oceania, etc |  |
| Total | 16,216,000 | Commonwealth of Australia | 2,975,000 |
| Airica- Weat friea |  | New Zealand and Dependencies |  |
| French West Africa | 1,816,000 | Territory of New Guinea. | 104,000 |
| Anglo-Egyptian Sudan . . | 969,000 | Territory of New Guinea.. | 93,000 |
| French Equatorial Africa. . | 960,000 | Papua | 91,000 |
| Belgian Congo | 910,000 | Other | 38,000 |
| Algeria | 851,000 | Total | 3,301,000 |
| Libya . . . | 680,000 | British Empire | 13,354,000 |

[^0]3. Areas of Political Subdivisions.-As already stated, Australia consists of six States and the Northern and Australian Capital Territories. The areas of these, and their proportions of the total of Australia, are shown in the following table :-

AUSTRALIA : AREA OF STATES AND TERRITORIES.

| State or Territory. |  | Area. | Percentage on Total. |
| :---: | :---: | :---: | :---: |
|  |  | Sq. miles. | \% |
| New South Wales | .. | 309,433 | 10.40 |
| Victoria | $\cdots$ | 87,884 | 2.96 |
| Queensland .. | .. | 670,500 | 22.54 |
| South Australia.: | $\cdots$ | 380,070 | 12.78 32.81 |
| Western Australia | $\cdots$ | 975,920 | 32.81 |
| Tasmania .. | $\cdots$ | 26,215 | 0.88 |
| Northern Territory . . | . | 523,620 | 17.60 |
| Australian Capital Territory Total | $\cdots$ | 939 | $\underline{0.03}$ |
| Total .- | $\cdots$ | 2,974,581 | 100.00 |

4. Coastal Configuration.-(i) General. 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 Cape York Peninsula on the extreme north is the only other remarkable feature in the outline. In Official Year Book No. I, an enumeration is given of the features of the coast-line of Australia (see pp. 60-68).
(ii) Coast-line. The lengths of coast-line, exclusive of minor indentations, of each State and of the whole continent, and the area per mile of coast-line, are shown in the following table:-
aUSTRALIA : COAST-LINE AND AREA PER MILE THEREOF.

| State. | Coast-lide. | Area per Mile of Coast-line. | State. | Coast-line. | Area per Mile uf Coast-line. |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | Miles. | Sq. miles. |  | Miles. | Sq. miles. |
| New South Wales(a) | 700 | 443 | South Australia.. | 1,540 | 247 |
| Victoria. . . | 680 | 129 | Western Australia | 4,350 | 224 |
| Queensland .. | 3,000 | 223 | Continent (b) | 11,310 | 261 |
| Northern Territory | 1,040 | 503 | Tasmania | 900 | 29 |

(a) Including Au-tralian Capital Territory. (b) Area $2,948,366$ square miles.

For the entire Commonwealth of Australia this gives a coast-line of $\mathbf{1 2 , 2 1 0}$ 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, namely, 25 square miles.
(iii) 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 Nuyts' 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 recognized 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 nincteenth century have left their names all along the Western Australian, South Australian and Tasmanian coasts.
5. Geographical Features of Ausiralia. -In each of the carlier issues of the Official Year Book fairly complete information has been given concerning some special geographical element. The nature of this information and its position in the various issues can be readily ascertained on reference to the special index following the index to maps and graphs at the end of this issue.
6. Fauna, Flora, Geology and Seismology of Australia.-Special articles dealing with these features have appeared in previous issues of the Official Year Book, but limits of space naturally preclude their repetition in each volume. As pointed out in par. 5 , however, the nature and position of these articles can be readily ascertained from the special index.

## § 2. Climate and Meteorology of Australia.*

I. Introductory.-In Official Year Book No. 3, pp. 79 and 80, some account is given of the history of Australian meteorology, including a reference to the development of magnetic observations. In Official Year Book No. 4, pp. 84 and 87 , will be found a short sketch of the creation and organization of the Commonwealth Bureau of Meteorology, and a résumé of the subjects dealt with at the Meteorological Conference $i^{\mathrm{n} 1907 .}$
2. Meteorological Publications.-Reference to publications issued by the Central Meteorological Bureau appears in Official Year Book No. 22, pp. 40 and 4 r . The following publications have since been issued:-Volume of "Results of Raintall Observations made in Western Australia," for all years of record to 1927; Map of Normal Meteorological Conditions in Australia affecting Aviation; a Paper "A Basis for Seasonal Forecasting ", by H. A. Hunt; Bulletin No. 18, "Foreshadowing Monsoonal Rains in Northern Australia"; Bulletin No. 19, "Thunderstorms in Australia"; Bulletin No. 20, "Zones of Relative Physical Comfort in Australia"; Bulletin No. 21, "Air Masses over Eastern Australia"; Bulletin No. 22, "Australian Rainfall in Sunspot Cycles"; Bulletin No. 23, "Australian Rainfall in District Averages"; Bulletin Nos. 24 and 25, "Weather Conditions affecting Aviation in the Tasman Sea"; a Paper on "Frost Risks and Frost-Forecasting"; Booklet containing Meteorological Data for certain Australian Localities; a volume of "Results of Rainfall Observations made in Tasmania"; a volume of "Results of Rainfall Observations made in Victoria" (Supplementary volume to 1936); a volume of "Mean Diurnal Variations of Corrected Mean Sea Level Pressures in 1-1,000 inches"; Bulletin No. 26, "Ice Accretion on Aircraft in Australia "; Bulletin No. 27, " Discussion of Eight Years of Aerological Observations obtained by means of Aeroplanes near Melbourne"; "Climatological Atlas of Australia "; "Average Annual Rainfall Map of Australia" (revised to 1938) ; "Rainfall Observations made in Queensland (supplementary volume, 1940) ; "Rainfall Observations made in each Division of the State of Queensland" (1940) ; and "Rainfall Observations made in Papua, New Guinea and Pacific Islands" (1940).
3. Equipment.-The determination of the climatological data has been made by records of the following instruments :-
(i) Rainfall. Rainfall has been measured by a cylindrical gauge generally 8 inches in diameter.
(ii) Temperature. Temperatures have been recorded by means of self-registering maximum and minimum thermometers which are read and set daily.
(iii) Humidity. Humidities have been determined by the aid of tables from readings of dry and wet bulb thermometers.
(iv) Atmospheric Pressure. Pressures have been measured by mercurial barometers of the Kew (or Fortin) pattern.
(v) Evaporation. The standard evaporimeter in use consists of a cylindrical galvanized iron tank 3 feet in diameter with a water jacket. Concrete tanks of similar fgrm and dimensions are also used.
(vi) Wind. Data concerning wind have been obtained either by "Robinson" cup anemometer, "Dines" pressure tube anemometer or by "Machin" cup anemometer.

[^1]4. General Description of Australia.-A considerable portion (0.530) of three divisious of Australia is north of the tropic of Capricorn-that is to say, within Queensland, Western Australia and the Northern Territory, no less than I, i49,320 square miles belong to the tropical zone and $\mathrm{r}, 020,720$ to the temperate zone. The whole area of Australia within the temperate zone, however, is $1,825,261$ 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 1.588). By reason of its insular geographical position and the absence of striking physical features whether in marine gulfs or in important mountains, 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 7,300 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.

On the coast, the rainfall is often abundant and the atmosphere moist, but in some portions of the interior it is very limited, and the atmosphere dry. The distribution of forest, therefore, with its climatic influence, is very uneven. In the interior, in places, there are fine belts of trees, but there are large areas also which are treeless, and here the air is hot and parching in summer. Again, on the coast, even so far south as latitude $35^{\circ}$, the vegetation is tropical in its luxuriance, and to some extent also in character. Climatologically, therefore, Australia may be said to present a great variety of features.
5. Meteorological Divisions.-(i) General. Reference to the divisions adopted by the Commonwealth Meteorologist will be found in Official Year Book No. 22, p. 41.
(ii) Special Clinatological Stations. The latitudes, longitudes and altitudes of special stations, the climatological features of which are graphically represented hereinafter, are as follows :-

## SPECIAL CLIMATOLOGICAL STATIONS : AUSTRALIA.

| Locality. | Height above Sea Leve | $\begin{aligned} & \text { Latitude. } \\ & \text { S. } \end{aligned}$ | $\underset{\text { Longitude. }}{\substack{\text { E. }}}$ | Locallty. | Height above Sea ILevel | Latitude. <br> S. | Longitade.上. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Fert. | deg. min. | deg. min. |  | Feet. | deg. min. | deg. min. |
| Perth | 197 | 3157 | 1150 | Canberra | 1,837 | $35 \quad 20$ | 14915 |
| Adelaide | 140 | $34 \quad 56$ | 13835 | Darwin | 97 | 1228 | 13051 |
| Brisbane | 137 | $27 \quad 28$ | 1532 | Alice Springs | 1,901 | 23138 | $133 \quad 37$ |
| Sydney | 138 | $33 \quad 52$ | 151 | Dubbo . | 870 | 32 | 14835 |
| Melbourne | 114 | 3749 | 14458 | Lavertoin, W.A. | 1,530 | 2840 | 12223 |
| Hobart | 177 | $42 \quad 53$ | 14720 | Coolgardir | 1,389 | $30 \quad 57$ | 1215 |

6. Temperatures.-(i) Comparisons with other Countries. In respect of Australian temperatures generally, it may be pointed out that the mean annual isotherm for $70^{\circ}$ Fahrenheit extends in South America and South Africa as far south as latitude $33^{\circ}$, while in Anstralia it reaches only as far south as latitude $30^{\circ}$, thus showing that, on the whole, Australia has, latitude for latitude, a more temperate climate than other places in the Southern Hemisphere.

The comparison is even more favourable when the Northern Hemisphere is included, for in the United States of America the $70^{\circ}$ isotherm extends in several of the western States as far north as latitude $41^{\circ}$. In Europe, the same isotherm reaches almost to the southern shores of Spain, passing afterwards, however, 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 $40^{\circ} \mathrm{N}$. has a higher temperature than $70^{\circ}$.

The extreme range of temperature is less than $100^{\circ}$ over practically the whole of Anstralia, that figure being only slightly exceeded at a very few places; it is mostly $70^{\circ}$ to $90^{\circ}$ over inland areas, and somewhat less on the coast. In parts of Asia and North America, the extreme range exceeds $130^{\circ}$ and $150^{\circ}$ in some localities.

Along the northern shores of Australia the temperatures are very equable. At Darwin, for example, the difference in the means for the hottest and coldest months is only $8.4^{\circ}$, and the extreme readings for the year, or the highest maximum on record and the lowest minimum, show a difference of under $50^{\circ}$.
(ii) Hottest and Coldest Parts. A comparison of the temperatures recorded at coast and inland stations shows 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 $120^{\circ}$ 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. The hottest area of the continent is situated in the northern part of Western Australia about the Marble Bar and Nullagine gold-fields, where the maximum shade temperature during the summer sometimes exceeds $100^{\circ}$ continuously for days and weeks. The coldest part of Australia is the extreme south-east of New South Wales and extreme east of Victoriathe region of the Australian Alps. Here the temperature seldom, if ever, reaches $100^{\circ}$ even in the hottest of seasons, while in winter, readings slightly below zero are occasionally recorded.

Tasmania as a whole enjoys a most moderate and equable range of temperature throughout the year, although occasionally hotrwinds may cause the temperature to rise to $100^{\circ}$ in the eastern half of the State.
(iii) Monthly Maximum and Minimum Temperatures. The normal monthly maximum and minimum temperatures can be best shown by means of graphs, which exhibit the nature of the fluctuation of each for all available years. In the diagram herein for nine representative places in Australia, the upper heavy curves show the mean maximum, and the lower heavy curves the mean minimum temperatures based upon daily observations, while the length of the interval between these two heavy curver shows the average difference between the highest and the lowest temperatures of the twenty-four hours.
7. Humidity.-After temperature, humidity is the most important element of climate particularly as regards its effects on human comfort, rainfall supply, and conservation and related problems.

In this publication the humidity of the air has been graphically represented by ite vapour pressure (i.e., the partial pressure of the water vapour measured in inches of mercury). The humidity has also been expressed by the relative humidity which is the quotient of the vapour pressure divided by the saturation vapour pressure and multiplied by one hundred. The mean 9 a.m. relative humidity, as well as its highest and lowest recorded mean values at 9 a.m., have been given in the tables of climatological data for the capital cities included herein. The mean monthly vapour pressure has also been added to these tables.

The annual curve of vapour pressure derived from the normal monthly values for this element is comparable with the maximum and minimum temperature curves, but the relative humidities consisting as they do of the extremes for each month do not show the normal annual fluctuation which would be approximately midway hetween the extremes.

The order of stations in descending values of 9 a.m. vapour pressure is Darwin, Brisbane, Sydney, Perth, Melbourne, Adelaide, Canberra, Hobart and Alice Springs, while the relative humidity diminishes in the order, Sydney, Canberra, Melbourne, Darwin, Hobart, Brisbane, Perth, Adelaide and Alice Springs.
8. Evaporation.-(i) General. 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 guestion is of perhaps more than ordinary importance, since in its drier regions water bas often to be conserved in "tanks"* and dams. The magnitude of the economic loss by evaporation will be appreciated from the tabular records herein, which show that the vearly amount varies from about 31 inches at Hobart to more than 100 inches in the central parts of Anstralia. Over the inland districts of the continent it has been calculated that evaporation equals the rainfall where the annual totals are about 36 inches, the variations above and below this quantity heing inverse.
(ii) Monthly Evaporation Curves. The diagrams herein showing the mean monthly evaporation in various parts of Australia disclose how characteristically different are the amounts for the several months in different localities.
(iii) Loss by Evaporation. In the interior of Australia the possible evaporation is greater than the actual rainfall. Since the loss by evaporation depends largely on the exposed area, tanks and dams so designed that the surface shall be a minimum are advantageous. Further, 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 naturally of more than ordinary concern in the drier districts of Australia.
9. Rainfall.-(i) General. The rainfall of any region is determined mainly by the direction and route of the prevailing whds, by the varying temperatures of the earth's surface over which they blow, and by its physiographical features.

Australia lies within the zoncs of the south-east trades and prevailing westerly winds. The southern limit of the south-east trade strikes the eastern shores at ahout $30^{\circ}$ south latitude, and, 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 from the New South Wales northern border to Thursday Island, upon which the rain-laden winds blow. The converse effect is exemplified on the north-west coast of Western Australia, where the prevailing winds hlowing from the interior of the continent instead of from the ocean, result in the lightest coastal rain in Australia.

The westerly winds, which skirt the southern shores, are responsible for the reliabie, generally light to moderate rains enjoyed by the south-western portion of Western Australia, the agricultural areas of South Australia, a great part of Victoria, and the whole of Tasmania.
(ii) Distribution of Rainfall. The average annual rainfall map of Australia herein shows that the heaviest yearly falls occur on the north coast of Queensland (up to over 160 inches) and in Western Tasmania (up to $14^{\circ}$ inches), while from 50 to over foo inches is received on parts of the eastern seaboard from. Tervis Bay (New South Wales) to the northern part of Cape York Peninsula, also around Darwin (Northern Territory), on the West Kimberley coast, near Cape Leeuwin (Western Australia), about the Australian Alps in eastern Victoria and New South Wales, and on the north-eastern highlands in Tasmania. A great part of the interior of the continent, stretching from the far west of New South Wales and the south west of Queensland to the vicinity of Shark Bay in Western Anstralia, has a very low average rainfall of less than io inches a year. Between these two regions of heavy and very low rainfall are the extensive areas which experience useful to good rains, and in the southern and eastern parts of which are found the best country and most of the population and primary production.

[^2](iii) Factors Determining Occurrence, Intensity and Seasonal Distribution of Rainfall. Reference has already been made to the frequent rains occurring in the north-eastern coastal districts of Queensland with the prevailing south east trade winds and to similar rains in the west of Tasmania with the prevailing westerly winds. Other rains in Australia are associated mainly with tropical and southern depressions.

The former chiefly affect the northern, eastern, and to some extent the central parts of the continent and operate in an irregular manner during the warmer half of the year, but principally from December to March. They vary considerably in activity and scope from year to year, occasionally developing into severe storms off the east and north-west coasts. Tropical rainstorms sometimes cover an extensive area, half of the continent on occasions receiving moderate to very heavy falls during a period of a few days. Rain is also experienced, with some regularity, with thunderstorms in tropical areas, specially near the coast. All these tropical rains, however, favour mostly the northern and eastern parts of the area referred to ; the other parts further inland receive lighter, less frequent and less reliable rainfall. With the exception of districts near the east coast, where some rain falls in all seasons, the tropical parts of the continent receive useful rains only on rare occasions from May to September.

The southern depressions are most active in the winter-June to August-and early spring months. The rains associated with them are fairly reliable and frequent over Southern Australia and Tasmania, and provide during that period the principal factor in the successful growing of wheat. These depressions also operate with varying activity during the remainder of the year, but the accompanying rains are usually lighter. The southern rains favour chiefly the south-west of Western Australia, the agricultural districts of South Australia, Victoria, Tasmania, and the southern parts of New South Wales. They sometimes extend into the drier regions of the interior, but only infrequently and with irregular rains.

The map showing mean monthly distribution of rainfall over Australia gives information on the amount and occurrence of rain in graphic form.
(iv) Wettest and Driest Reqions. The wettest known part of Australia is on the north-east coast of Queensland, between Port Douglas and Cardwell, where Deeral on the north coast-line has an average annual rainfall of 185.99 inches and Tully on the Tully River 178.89 inches. In addition, three stations situated on, or adjacent to, the Johnstone and Russell Rivers have an average annual rainfall of between 143 and 169 inches. The maximum and minimum falls there are:-Deeral, 257.58 in 1939 and 143.72 inches in 1937, or a range of 113.86 inches ; Tully, 234.37 in 1936 and 133.23 inches in 1938, or a range of ror. 14 inches; Goondi, 24 I .53 in 1894 and 67.88 inches in 1915, or a range of 173.65 inches; Innisfail, 211.24 in 1894 and 69.87 inches in 1goz, or a range of 141.37 inches; Harvey Creek, 254.77 in 1921 and 80.47 inches in 1902, or a range of 174.30 inches.

On four occasions more than 200 inches have been recorded at Goondi, the last of these teing in 1910, when 204.82 inches were registered. The record at this station covers a period of 54 years.

Both Tully and Harvey Creek, in the shorter periods of 14 and 30 years respectively, have fouc times exceeded 200 inches. At Tully 234.37 inches were recorded during 1936 and at Harvey Creek the total for 1921 was 254.77 inches. At the South Johnstone Sugar Experiment Station 202.52 inches were recorded in 1921.

In Tasmania the wettest part is in the West Coast region, the average annual rainfall at Lake Margaret keing 144 inches, with a maximum of 175.12 inches in 1924.

The driest known part of the continent is in the Lake Eyre district in South Australia (the ouly part of the continent relow sea level), where the annual average is only 5 inches, and where the fall rarely exceeds to inches for the twelve months.

The inland districts of Western Australia were at one time regarded as the driest part of Australia, but authentic observations in recent vears over most settled districts in the east of that State show that the annual average is about 10 inches.
(v) Quantities and Distribution of Rainfall. The general distribution is best seen from the rainfall map herein, which shows the areas subject to average annual rainfalls lying hetween certain limits. The proportions of the total area of each State and of Australia as a whole enjoying varying quantities of rainfall determined from the latest available information are shown in the following table :-
aVERAGE ANNUAL RAINFALL DISTRIBUTION.

| Average Annual Rainfall. | N.S.W. <br> (a) | Victora. | Queensland. | South Australia | Western Australia. | Tas: <br> (b) | Northern Territory | Total. (b) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | \% | \% | \% | $\%$ | \% | \% | \% | \% |
| Under 10 inches | 19.7 | Nil | 13.0 | 82.8 | 58.0 | Nil | $24 \cdot 7$ | 37.6 |
| IO-15 ,* | 23.5 | 22.4 | 14.4 | 9.4 | 22.4 | Nil | 32.4 | 19.9 |
| $15-20$, | I7. 5 | I5.2 | 19.7 | $4 \cdot 5$ | 6.8 | 0.7 | $9 \cdot 7$ | 10.9 |
| 20-25 | 14.2 | 17.9 | 18.8 | 2.2 | $3 \cdot 7$ | II. 0 | 6.6 | 9.1 |
| 25-30 | 9.1 | 18.0 | 11.6 | 0.8 | $3 \cdot 7$ | 11.4 | $9 \cdot 3$ | $7 \cdot 3$ |
| 30-40 , | 9.9 | 16.1 | II. 1 | 0. 3 | $3 \cdot 3$ | 20.4 | $4 \cdot 7$ | 6.6 |
| Over $4^{\circ}$ " | 6.1 | 10.4 | II. 4 | Nil | 2.1 | 56.5 | 12.6 | 8.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

(a) Including Australian Capital Territory.
(b) Over an area of 2,777 square miles no records are avallable.

Referring first to the capital cities the records of which are given in the next table, it will be seen that Sydney, with a normal rainfall of 46.81 inches, occupies the chief nlace: Brisbane, Perth, Melbourne, Hobart. Canberra and Adelaide follow in that order, Adelaide with 21.12 inches heing the driest. The extreme range from the wettest to the driest year is greatest at Brishane ( 72.09 inches) and least at Adelaide (19.48 inches).

In order to show how the rainfall is distributed throughont the year in various parts of the continent, average figures for the various climatological districts bave been selected. (See map on P. 22.) The figures for Nortbern Rivers, District 14. show that nearly the whole of the rainfall occurs there in the summer months, while little or none falls in the middle of the year. The figures for the Central Coast, District 9, are the reverse for while the summer months are dry, the winter ones are very wet. In the districts containing Melbourne and Hobart the rain is fairly well distributed throughout the twelve months, with a maximum in October for hoth districts. In Queensland, the heaviest rains fall in the summer months, but good averages are also maintained during the other seasons in eastern parts.

On the coast of New South Wales, the first half of the year is the wettest, with heaviest falls in the autumn; the averages during the last six months are fair, and moderately uniform. Generally it may be said that approximately one-third of the area of the continent, principally in the eastern and northern parts, enjoys an annual average rainfall of from 20 to 50 or more inches, the remaining two-thirds averaging from 5 to 20 inches.
(vi) Curves of Rainfall and Eraporation. The relative amounts of rainfall and evaporation at different times through the year are clearly indicated in the graphs herein. Inspection thereof will show how large is the evaporation when water is fully exposed to the direct rays of the sun and to wind.


Explanation.-The upper and lower heave lines in each graph represent the moan maximum and mean minimum temperatures respectively. The Fahrentheit temperature scales are shown on the outer edge of the sheet under "F" and the centigrade scales in the two inner columns under " $C$."

The broken line shows the normal absolute humidity in the form of 9 a.m. vapour pressures for which the floures in the outer " F " colunns represent hundredths of an inch of barometric pressure.

The upper and lower fine lines join the greatest and the least monthly means of relative humidity respectively, the figures under the outer columns " $\mathbf{H}$ " " indicating percentage values.

The curves for temperature and vapour pressure joining the mean monthly values serve to show the annual Huctuation of these elements, but the relative humidity graphs joining the extreme values for each month do not indicate any normal annual variation.

Comparison of the maximum and minimum temperature curves affords a measure of the mean diurnal range of temperature. At Perth in the middle of January, for instance, there is normally a range of $21^{\circ}$ irom $63^{\circ} \mathrm{F}$ to $84^{\circ} \mathrm{F}$. but in July it is only $15^{\circ}$ from $43^{\circ} \mathrm{F}$. to $63^{\circ} \mathrm{F}$.

The relative humidity corves illostrate the extreme range of the mean monthly humidity over a number of years.


Fxplanation:-On the preceding graphs thick lines denote rainfall, and thin lines evaporation, and show the fluctuation of the mean rate of fall or evaporation per month throughout the year. The results, plotted from the Climatological Tables herein, are shown in inches (see the outer columns), and the corresponding metric scale (centimetres) is shown in the two inner columns. The evaporation is not given for Darwin.

At Perth, Adelaide, Krisbane, Melbourne, Hobart, Canberra, Alice Springs, and Coolgardie the results have been obtained from jacketed tanks sunk in the ground. At Sydiey and Dubbo sunken tanks without water jackets are used, whilst at Iaverton (W.A.) the records are taken from a small portable jacket evaporation dish of 8 inches in diameter.

The distance for any date from the gero line to the curve represents the average number of inches. reckoned as per month, of rainfall at that date. Thus, taking the curve for Adelaide in the middle of January, the rain falls on the average at the rate of about three-fourths of an inch per month or, saty, at the rate of about 9 inches per year. In the middle of $J$ une it falls at the rate of a little over 3 inches per month, or, say, at the rate of about 37 inches per year. At Dubho, the evaporation is at the rate of nearly in inches per month about the middle of Jantary, and only about ild inches at the middle of Jine.

The mean anoual rainfall and evaporation at the places indicated are given in the appended tate.
MEAN ANNUAL RAINFALL AND FVAPORATION.

| Plare. | Rainfall. | Evapora. tion. | Place. | Rainfall. | Fvaporation. |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | ] 11. | In. |  | In. | In. |
| Jertis | 34.90 | 66.17 | Canberra | 23.30 | 53.42 |
| Adelaide | 21.17 | 55.65 | Darwin | 58.84 | -- |
| Brishane | 4.1 .91 | 56.15 | Alice Springs . . | 10.57 | 97.21 |
| Syduey | 46.90 | 39.86 | T) ${ }^{\text {abino }}$ | 21.85 | 66.37 |
| Melbourme | 25.64 | 39.11 | Laverton, W.A. | 0.10 | $1+5.17$ |
| Hobiart | 2.08 | 31. 32 | Cooluardie | 10.22 | 8.5 .37 |

MEAN BAROMETRIC PRESSURE.-CAPITAL GITIES.


Fxplanation-The lines representing the vearly flustation of barometric pressure at the state capital cities are means for long periods, and are plotted from the Climatological Tables herein. The pressures are shown in inches on abont $2 \frac{1}{2}$ times the natural scale, and the eorresponding pressures in centimetres are also shown in the two inner columns, in which each division represents one millimetre.

Taking the Brisbane graph for purposes of illustration, it, will be seen that the mean pressure in the middle of January is about $29: 87$ inches, and there are mavima in the middle of May and August of about 30.09 inches.

Area affected and period of duration of the Longest Heat Waves when the Maximum Temperature for consecutive 24 hours reached or exceeded $100^{\circ}$.



（vii）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 va：iability 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 ：AUSTRALIAN CAPITAL CITIES．

| Year． | Canberra．（a） |  | Perth． |  | Adelaide． |  | Brisbane． |  | SydNEY． |  | Mtelbodrve， |  | Hobart． |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | $\begin{aligned} & \stackrel{\text { B }}{3} \\ & \stackrel{y}{3} \\ & \underset{y y y}{\mid c} \end{aligned}$ |  | $\begin{aligned} & \text { 苞: } \\ & \text { 邑! } \end{aligned}$ |  |  |  |  | $$ | 范 | 完 |
|  | in． |  | in． |  | in． |  | ． 8 |  | int． |  | in． |  | in． |  |
| 1906 |  | ． | 32.37 | 121 | 26.51 | 127 | 42.85 | 125 | 31.39 | 160 | 22.29 | 114 | 23.31 | 155 |
|  |  |  | 40.12 | 132 | 17.78 | 125 | 31.46 | 119 | 31.32 | 132 | 22.26 | 102 | 25.92 | 166 |
|  |  | $\cdots$ | 30.52 | 106 | 24.56 | 125 | 44.01 | 125 | 45.65 | 167 | 17.72 | 130 | 16.50 | 148 |
| 9 |  | － | 39.11 | 107 | 27.69 | 138 | 34.06 | III | 32.45 | 177 | 25.86 | 171 | 27.29 | 170 |
| 10 |  | ． | 37.02 | 135 | 24.62 | 1.6 | 49.00 | 133 | 46.91 | 160 | 24.61 | 167 | 25.22 | 205 |
| 11 |  |  | 23.38 | 108 | 15.99 | 127 | 35.21 | 128 | 50.24 | 155 | 36.61 | 168 | 26.78 | 193 |
| 12 | 19.27 | 76 | 27.85 | 123 | 19.57 | 116 | 41.30 | 114 | 17.51 | 172 | 20.37 | 157 | 23.14 | 181 |
| 13 | 16.38 | 71 | 38.28 | 141 | 18．16 | 102 | 40.81 | 115 | 57．70 | 141 | 21.17 | 157 | 19.36 | 165 |
| 14 | 18.49 | 81 | 20.21 | 128 | 11.39 | 91 | 33.99 | 14.1 | 56.42 | 149 | 18.57 | 129 | 15.42 | 154 |
| 15 | 22.31 | 87 | 43.61 | 164 | 19.33 | 117 | 25.66 | 93 | 34．79 | 117 | 20.95 | 167 | 20.91 | 198 |
| 16 | 31.26 | 119 | 35.16 | 128 | 28.96 | 142 | 52.80 | 136 | 44.91 | 161 | 38.04 | 170 | 43.39 | 203 |
| 17 | 29.70 | 144 | 45.64 | 146 | 28.90 | 153 | 40.92 | 127 | 52.40 | 151 | 30.57 | 171 | 30.62 | 214 |
| 18 | 18.27 | 95 | 39.58 | 138 | 17.41 | 107 | 24.95 | 121 | 42.99 | 149 | 27.13 | 160 | 26.04 | 179 |
| 19 | 16.31 | 85 | 30.66 | 120 | 17.21 | 108 | 19.36 | 93 | 58.71 | 152 | 24.89 | 141 | 22.48 | 15＊ |
| 20 | 29.30 | 107 | 40.35 | 124 | 26.70 | 119 | 39.72 | 122 | 43.42 | 159 | 28.27 | 162 | 18.00 | 182 |
| 21 | ． |  | 41.09 | 135 | 22.64 | 100 | 54－31 | 167 | $43 \cdot 34$ | 140 | 29.76 | 154 | 18．04 | 159 |
| 22 |  |  | 31.86 | 135 | 23.20 | 117 | 35.82 | 109 | 39.35 | 136 | 25.02 | 151 | 28.27 | 189 |
| 23 |  |  | 44.47 | 134 | 29.79 | 139 | 23.27 | 93 | 37.01 | 123 | 22.64 | 158 | 32.93 | 198 |
| 24 | 25.95 | 68 | 33.79 | 119 | 23.44 | 143 | 4 T .08 | 114 | 37.01 | 136 | 36.48 | 171 | 28.76 | 197 |
| 25 | 33.71 | 59 | 31.41 | 126 | 21.91 | 118 | 53.10 | 139 | 50.35 | 145 | 17.57 | 144 | 22.67 | 170 |
| 26 | 20.53 | 97 | 49.22 | 167 | 22.20 | $1{ }_{1} 6$ | 30.82 | IIt | 37.07 | 127 | 20.51 | 149 | 25.79 | 187 |
| 27 | 21.40 | 83 | 36.59 | 133 | 16.92 | 101 | 62.08 | 130 | 48.56 | 135 | 17.98 | 135 | 20.13 | 185 |
| 28 | 17.82 | 96 | 44.88 | 140 | 19.43 | 107 | 52.64 | 145 | 40.07 | 130 | 24.09 | 151 | 30.23 | 205 |
| 29 | 22.34 | 8 | 36.77 | 132 | 17.51 | 119 | 39.78 | 118 | 57.90 | 129 | 28.81 | 168 | 26.55 | 194 |
| 30 | 16.52 | 86 | 39.80 | 129 | 18.65 | 116 | 41.22 | 144 | 44.47 | 141 | 25.41 | 1.45 | 19.38 | 152 |
| 31 | 24.25 | 105 | 39.18 | 118 | 22.26 | 145 | 66.72 | 136 | 49.22 | 153 | 28.63 | 164 | 27.17 | 179 |
| 32 | 19 13 | 107 | 39.40 | 121 | 25.04 | 141 | 24.79 | 97 | 37.47 | 146 | 31.08 | 179 | 30.29 | 155 |
| 33 | 20.30 | 88 | 32.47 | If6 | 22.12 | 130 | 49.71 | 118 | 42.71 | 153 | 22.28 | 136 | 23.18 | 182 |
| 34 | 35.89 | 158 | 40.61 | 120 | 20.24 | 125. | 54.26 | 117 | 64.91 | 183 | 33.53 | 157 | 23.17 | 594 |
| 35 | 24.40 | 102 | 32.28 | 129 | 23.45 | 140 | 34.64 | 111 | 30.97 | 131 | 29.98 | 183 | 32.22 | 196 |
| 36 | 29.49 | 121 | 30.64 | 118 | 19.34 | 121 | 21.77 | 101 | 30.22 | 130 | 24.30 | 187 | 19.60 | 178 |
| 37 | 22.50 | 93 | 35.28 | 120 | 23.01 | 128 | 34．79 | 113 | 52.00 | 157 | 2 I .45 | 144 | 20.65 | 160 |
| 38 | 20.15 | 85 | 29.64 | 111 | 59．26 | 119 | 43.49 | 110 | 39.17 | 132 | 17.63 | 131 | 31.32 | 169 |
| 39 | 26.95 | 128 | 45.70 | 123 | 23.29 | 139 | 41.43 | 122 | 33.67 | 127 | 33.11 | 166 | 27.23 | 188 |
| 40 | 17.38 | 64 | 20.00 | 98 | 16．16 | 116 | 42.37 | 93 | 39.34 | 125 | 19.83 | 126 | 17.17 | 135 |
| A verage | 23.08 | 94 | 34.67 | 121 | 21.12 | 123 | 44.88 | 115 | 46.81 | 154 | 25.57 | 140 | 24.01 | 152 |
| No．of Years | 26 | 26 | 65 | 65 | 102 | Io2 | 89 | 89 | 82 | 82 | 85 | 85 | 98 | $9^{8}$ |

（a）Records commenced in 1912；details are not available for the years 1921 to 1923.
10．Remarkable Falls of Rain．－The following are the most remarkable falls of rain in the various States and Territories which have occurred within a period of twenty－four hours．For other very heavy falls at various localities reference may be made to Official Year Book No．14，pp．6o－64，No．22，pp． $4^{6-4}{ }^{8}$ and No．29，pp．43， 44 and 51 ：－

HEAVY RAINFALLS ：NEW SOUTH WALES，UP TO 1940，INCLUSIVE．

| Name of Town or Lucality． | Date． | Amnt． | Name of Toun or Locality． | Date． | Amnt |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Broger＇s Creek | 14 Feb．， 1898 | $\begin{gathered} \text { in. } \\ 20.05 \end{gathered}$ | South Head（near |  |  |
|  | 13 Jan．，191 1 | 20.83 | Sydney） | 16 Oct．， 1844 | 20.4 |
| Cordeaux River | 14 Feb．， 1898 | 22.58 | Towamba | 5 Mar．， 1893 | 20.0 |
| Morpeth ．． | 9 Mar．，i893 | 21.52 | Viaduct Creek | 15 ， 1936 | 20.0 |

HEAVY RAINFALLS : QUEENSLAND, UP T0 1940, INCLUSIVE.

| Name of Town or Locality. | Date. | Amnt. | Name of Town or Locality. | Date. | Amnt. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Babinda (Cairns) | ., 1935 | $\begin{gathered} \text { in. } \\ 24.14 \end{gathered}$ | Mackay | 21 Jan., 1918a | $70$ |
| Buderim Mountain | I J Jan., I898 | 26.20 | Macnade Mill | 6 ", 1901 | 23.33 |
| Crohanhurst <br> (Blackall Range | b., I |  | Plane Creek (Mackay) | 26 Feb., 1913 |  |
| Deeral | 2 Mar., 1935 | 27.60 | Port Douglas | \% Apr., 1911 | 3 F .53 |
| Goondi | 30 Jan., 1913 | 24.10 | Tully Mill | 12 Feb., 1927 | 23.86 |
| Harvey Creek | 3 , I9II | 27.75 | Woodlands (Yepp'n) | 3 Jan., 1893 | 23.07 |
| Kuranda (Cairns) | 2 Apr., 191I | 28.80 | Yarrabah | 2 Apr., 19 II | 30.65 |

(a) 37 를 hours.

HEAVY RAINFALLS: WESTERN AUSTRALIA, UP TO 1940, INCLUSIVE.

| Name of $T$ Locali | Date. | Amnt. | Name of Town or Locality. | Date. | Amnt. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Ballo Balla | Mar., 1899 | $\text { in. } 40$ | Roebuck Plains | Jan., 1917 | in. <br> 4.01 |
| Boodarie | 21 Jan., I896 | 14.53 |  | 6 " 1917 | 22.36 |
| Broome | 6 ," 1917 | 14.00 | Thangoc | 17-19 Feb.'96 | 24. 18 |
| Derby | 7 , 1917 | 16.47 | Whim Creek | 3 Apr., 1898 | 29.41 |
| Fortescue | 3 May, 1890 | 23.36 | Winderrie | 17 Jan, 1923 | 14.23 |
| Pillara | 2 Apr., 1898 | 14.0411 |  |  |  |

HEAVY RAINFALLS: NORTHERN TERRITORY, UP TO 1940, INCLUSIVE.

| Name of Town or Locality. | Date. | Amnt. | Name of Town or Locality. | Date. | Amnt. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Bathurst Island <br> Mission .. | 7 Apr., 1925 | 11.85 | Cape Don | 4 | $\frac{\ln .}{13.58}$ |
| Birrimbah | 6 Mar., 1935 | 16.50 | Darwin | 7 Dec., 1915 | II. 67 |
| Borroloola | $14 \ldots 1899$ | 14.00 | Groote Eylandt | 25 Mar., 1940 | 11.75 |
| Brook's Creek . . | 24 Dec., 1915 | 14.33 |  |  |  |

HEAVY RAINFALLS: SOUTH AUSTRALIA, UP TO 1940, INCLUSIVE.


HEAVY RAINFALLS: VICTORIA, UP TO 1940, INCLUSIVE.

| Name of Town or Locality. | Daxe. | Amnt. | Name of Town or Locality. | Date. | Amant. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Cann River |  | in. 9.94 | t. Buffalo |  |  |
| Cunninghame | 26 Dec., 1935 | 8.50 | Murrungowar | 16 Mar., 1938 | 8.36 |
| Hazel Park | 1 Dec., 1934 | 10.50 | Olinda | 1 Dec., 1934 | 9.10 |
| Kalorama | I ", " | 10.05 | Tambo Crossing | 13 July, 1925 | 8.89 |
| Korumbarra | I , , , | 8.51 | Tonghi Creek | 27 Feb., 1919 | 9.90 |

HEAVY RAINFALLS : TASMANIA, UP TO 1940, INCLUSIVE.

| Mame of Town or Locanty. | Date. | Amnt. | Name of $T$ Localit | Date. | Amnt. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Oullenswood | 5 Apr., 1929 | $\begin{gathered} \mathrm{in}_{1} \\ \text { II. } \mathrm{I2} \end{gathered}$ | Riana |  | $\begin{gathered} \text { 1n. } \\ 11.08 \end{gathered}$ |
| Gould's Country | 8-10 Mar.,'ıI | 15.33 | The Springs | 30-3I Jan., '16 | 10.75 |
| Lottah | 8-10 ", | 18.10 | Triabunna | 5 June, 1923 | 10.20 |
| Mathinna | 5 Apr., 1929 | 13.25 |  |  |  |

HEAVY RAINFALLS : AUSTRALIAN CAPITAL TERRITORY, UP T0 1940, INCLUSIVE.

| Name of Town or Locality. | Date. | Amnt. | Name of Town or Locality. | Date. | Amnt. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Canberra <br> Cotter Junction | $\begin{gathered} 27 \text { May, } 1925 \\ " \# \end{gathered}$ | $\begin{aligned} & \mathrm{in} . \\ & 6.84 \\ & 7.13 \end{aligned}$ | Uriarra . | 27 May, 1925 | $\begin{aligned} & \text { in. } \\ & 6.57 \end{aligned}$ |

1I. Snowfall.-Light snow has been known to fall occasionally as far north as altitude $31^{\circ} \mathrm{S}$., and from the western to the eastern shores of the continent. During exceptional seasons, it has fallen simultaneously over two-thirds 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, for several months, snow covers the ground to a great extent on the Australian Alps, where also the temperature falls below zero Fahrenheit during the night. In the ravines around Mt. Kosciusko and similar localities the snow never entirely disappears.
12. Hall.-Hail falls most frequently along the southern shores of the continent in the winter, and over eastern Australia during the summer months. The size of the hailstones generally increases with distance from the coast. A summer rarely passes without some station experiencing a fall of stones exceeding in size an ordinary hen-egg, and many riddled sheets of light-gange galvanized iron bear evidence of the weight and penetrating power of the stones.

The hailstones occur most frequently when the barometric readings indicate a flat and unstable condition of pressure. Tornadoes or tornadic tendencies are almost invariably accompanied by hail, and on the east coast the clouds from which the stones fall are frequently of a remarkable sepia-coloured tint.
13. 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 29.95 inches in the southern. The July mean pressure ranges from 29.90 inches at Darwin to 30.11 inches at Alice Springs. Barometer readings corrected to mean sea level and standard gravity have, under anticyclonic conditions in the interior of the continent, ranged as high as 30.78 inches (at Kalgoorlie on 28th July, 1901) and have fallen as low as 27.55 inches. This lowest record was registered at Mackay during a tropical hurricane on 21st January, 1918. An almost equally abnormal reading of 27.88 inches was recorded at Innisfail during a similar storm on 1 oth March, 1918. The mean barometric pressure for the capitals of Australia is shown on the graphs herein.
14. Wind.-(i) Trade Winds. The two distinctive wind currents in Australia are as previously stated, the south-east trade and the prevailing westerly 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 $30^{\circ}$ south latitude. The prevailing westerly winds retreat a considerable distance to the south of Australia, and are 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 come 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, and ocassionally penetrate to almost tropical latitudes.
(ii) Land and Sea Breezes. The prevailing winds second in order of importance are the land and sea breezes. On the east coast the sea hreezes 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 bourly velocity, ordinarily attained about 3 p.m., not infrequently 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 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 outward 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 Dirertion at the Capital Cities. In Canberra, the winds are mainly from easterly and north-westerly directions, the former predominating to a somewhat greater degree in the mornings, the latter in the afternoons and in the colder half of the year.

In Perth, southerly (south-west to south-east) is the prevailing direction for August to April inclusive and north-north-west to north-north-east for the midwinter 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 from January to A pril.

In Sydney from March to October the prevailing direction in the morning is westerly, and for the remaining four months north-easterly to easterly. In the afternoons the prevailing direction is mainly from the east-north-east, except during June and July, when it is westerly.

Melbourne winter winds are from north-west to north-east, and those of the summer from south-west to south-east, with a moderate percentage of northerly.

At Hobart the prevailing direction for the year is from north-west.
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 storims occur at other times during the year, the time varying with the latitude.
15. Cyclones and Storms.-The "elements" in Australia are ordinarily peaceful, and while destructive 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 Strait, 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, or in that part of them which has a north-westerly to a south-westerly circulation.

The north-east coast of Queensland is occasionally visited by hurricanes from the north-east tropics. During the first four 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 first to the S.W. and finally towards the S.E. Only a small percentage, however, reach Australia, the majority recurving in their path to the east of New Caledonia.

Very severe cyclones, locally known as "willy willies." are peculiar to the northwest coast of Western Australia from the months of November to April, 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 $20^{\circ}$ and $22^{\circ}$ South. The winds in these storms, like those from the north-east tropics, are very violent and destructive, and cause 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 br toirential rains, as much as 29.4 I inches, for example, heing recorded in 24 hours at Whim Creel from one such occurrence. Falls of ro inches and over hare frequently been recorded in the northern interior of Western Australia from similar storms.

Some further notes on severe cyclones and on "southerly bursters " a characteristio feature of the eastern part of Australia, appear in previous issues of the Official Year Book (see No. 6, pp. 84-86).

A special article dealing with "Australian Hurricanes and Related Storms" appears in Official Year Book No. 16, pp. 80-84.
16. Influences affecting Australian Climate.-(i) General. Australian history does not corer 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 have, however, taken place, a fact which suggests that settlement and the treatment of the land have a distinct effect on local conditions. For example, low-lying lands on the north coast of New South Wales, which 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 highlands now flows unchecked and untempered down the sides of the hills to the valleys and lower lands.
(ii) Influence of Forest 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 equalizing 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 shade temperatures by altering the extent of radiating surface by evaporation, and by checking the movement of air, and while decreasing 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, and when a region is protected by trees, a steadier water supply is ensured, and the rainfall is better conserved. In regions of snowfall, the supply of water to rivers is aimilarly regulated, and without this and the sheltering influence of ravines and "gullies," watercourses supplied mainly by melting snow would be subject to alteraative periods of flooding and dryness. This is borne out in the case of the inland rivers, the River Murray, for example, which has never been known to become dry, deriving its steadiness of flow mainly through the causes indicated.
(iii) Direct Infuence of Forests 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 take the opposite view.

Sufficient evidence exists, however, to prove that, even if the rainfall has not increased, the beneficial climatic effect of forest lands more than warrants their protection and extension. Rapid rate of evaporation, induced by both hot and cold winds, injures crops and makes life uncomfortable on the plains, and, while it may be doubted that the forest aids in increasing precipitation, it must be admitted that it does check winds and the rapid evaporation due to them. Trees as wind-breaks have been successfully planted in central parts of the United States of America, and there is no reason why similar experiments should not be successful in many parts of the treeless interior of Australia. 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.

In previous issues some notes on ohservations made in other countries were added (see Official Year Book No. 6, pp. 86 and 95).
17. Rainfall and Temperatures, Various Cities.-The following table shows rainfall and temperature for various important cities throughont the world, for the Australian capital, and for the capitals of the Australian States.

RAINFALL AND TEMPERATURES : VARIOUS CITIES.

| Place. |  | Annual Raintall. |  |  | Temperature. |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Height above M.S.L. | $\begin{aligned} & \dot{8} \\ & \frac{8}{3} \\ & \stackrel{3}{0} \\ & 8 \end{aligned}$ |  |  |  |  |  |  |  |  |
|  | Ft. | In. | In. | In. | Fahr. | Fahr. | Fahr. | Fahr. | Tahr. | Fahr. |
| Arastardam (Gar- dens) | 3 | 31.26 | 38.39 | 20.24 | 61.3 | 37.4 | 93. |  | 64.0 | 37.0 |
| Auckland | 160 | 44.85 | 74.15 | 26.32 | 65.8 | 52.3 | 85.0 | 35.0 | 65.6 | 51.6 |
| Athens | 351 | 15.48 | 33.33 | 4.56 | 79.2 | 49.1 | 109.4 | 19.6 | 81.0 | 47.4 |
| Bergen | 116 | 73.43 | 107.32 | 54.33 | 56.1 | 34.7 | 86.0 | 7.3 | 57.4 | 34.2 |
| Berlin (Central) | 161 | 22.72 | 30.04 | 14.25 | 64.8 | 33.0 | 98.6 | $-13.4$ | 66.0 | 31.8 |
| Berne .. | 1,877 | 36.30 | 58.23 | 24.69 | 62.2 | 30.1 | 91.4 | - 3.6 | 64.4 | 28.0 |
| Bombay | 32 | 70.54 | 114.39 | 33.42 | 82.7 | 74.7 | 100.2 | 53.2 | 84.3 | 73.9 |
| Breslan | 410 | 22.60 | 32.51 | 15.91 | 64.2 | 30.9 | 99.9 | $-25.6$ | 64.2 | 30.9 |
| Brussels | 328 | 28.35 | 4 I .18 | 17.73 | 62.6 | 36.0 | 95.4 | - 4.4 | 63.7 | 34.5 |
| Budapest | 425 | 24.96 | 37.05 | 16.81 | 69.3 | 32.2 | 101.7 | -10.1 | 71.2 | 30.2 |
| Buenos Alres | 82 | 38.78 | 79.72 | 20.04 | 72.7 | 50.9 | 104.0 | 22.3 | 73.8 | 50.0 |
| Calcutta | 21 | 61.82 | 98.48 | 38.43 | 85.6 | 68.0 | III. 3 | 44.2 | 86.0 | 66.4 |
| Capetorin | 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 | 33.28 | 45.86 | 24.52 | 70.0 | 26.1 | 103.0 | -23.0 | 72.4 | 23.7 |
| Christchurch | 22 | 25.21 | 35.30 | 13.54 | 60.8 | 43-5 | 95.7 | 2 I .3 | $6 \mathrm{6r} .6$ | 42.7 |
| Christiania (Oslo) | 82 | 25.39 | 36.18 | 16.24 | 6r. 0 | 25.5 | 95.0 | $-13.4$ | 63.1 | 24.4 |
| Colombo . | 24 | 88.53 | 123.96 | 53.56 | 8 I .6 | 78.7 | 97.2 | 6 I .6 | 82.0 | 78.6 |
| Constantínople | 245 | 28.75 | 42.74 | 14.78 | 74.0 | 43.5 | 103.6 | 13.0 | 75.7 | 42.0 |
| Copenhagen | 43 | 22.80 | 32.52 | 14.02 | 60.9 | 32.7 | 9 9 .4 | $-13.0$ | 62.6 | 31.8 |
| Dresden | 115 | 24.22 | 34.42 | II. 73 | 64.6 | 33.2 | 93.4 | - 15.3 | 66.0 | 31.6 |
| Dublin (City) | 54 | 27.66 | 35.56 | 16.60 | 59.1 | 42.8 | 87.0 | 13.0 | 60.4 | 42.5 |
| Dunedin | 300 | 36.92 | 54.51 | 21.86 | 57.3 | 43.5 | 94.0 | 23.0 | 58.0 | 42.5 |
| Durban | 260 | 40.79 | 71.27 | 27.24 | 75.6 | 64.4 | 110.6 | 41.1 | 76.7 | 63.8 |
| Edinburgh (Leith) | 441 | 25.21 | 32.05 | 16.44 | 55.9 | 39.0 | 90.0 | 6.0 | 57.3 | 38.7 |
| Geneva . | 1,332 | 32.13 | 47.60 | 18.73 | 64.0 | 33.4 | 100.0 | $-13.5$ | 65.8 | 31.8 |
| Genoa .. | 157 | 51.29 | 108.22 | 28.21 | 73.8 | 46.8 | 94.5 | 16.7 | 75.4 | 45.5 |
| Glasgov | 139 | 38.49 | 56.18 | 29.05 | 57.0 | 39.5 | 84.9 | 6.6 | 58.3 | 39.3 |
| Greenwich | 149 | 23.50 | 35.54 | 16.38 | 61.7 | 40.4 | 100.0 | 4. | 63.3 | 40.1 |
| Hong Kong | 109 | 85.6 x | 119.72 | 45.84 | 8 I .5 | 60.5 | 97.0 | 32.0 | 82.0 | 58.8 |
| Johannesburg | 5,750 | 3 I .63 | 50.00 | 21.66 | 65.4 | 54.4 | 93.6 | 20.8 | 68.2 | 48.0 |
| Leipzig | 394 | 24.69 | 31.37 | 17.10 | 63.9 | 31.6 | 96.4 | $-16.6$ | 64.8 | 30.0 |
| Leningrad | 16 | 21.30 | 29.52 | 13.75 | 61. 1 | 17.4 | 89.6 | $-30.3$ | 63.7 | 15.2 |
| Lishon | 313 | 26.97 | 52.82 | 16.34 | 70.0 | 52.9 | r02.9 | 29.3 | 71.1 | 51.8 |
| London (Kew) | 18 | 23.80 | 38,18 | 12.16 | 60.8 | 39.9 | 94.0 | 9.0 | 62.3 | 39.1 |
| Madras | 22 | 49.85 | 78.92 | 21.74 | 89.0 | 76.8 | 113.0 | 57.5 | 89.9 | 76.1 |
| Madrid | 2,149 | 16.23 | 27.48 | 9.13 | 73.0 | 4 I .2 | 107.1 | 10.5 | 75.7 | 39.7 |
| Marseilles | 246 | 22.10 | 43.04 | IIT.II | 70.4 | 45.5 | 101.5 | 6.3 | 72.0 | 44.3 |
| Moscow | 526 | 18.94 | 29.07 | 12.07 | 63.4 | 14.7 | 95.0 | -4x.4 | 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 | 44.63 | 58.68 | 33.17 | 71.4 | 31.8 | 102.0 | $-13.0$ | 73.5 | 30.2 |
| Ottawa | 236 | 33.51 | 51.25 | 25.63 | 66.6 | 14.0 | 98.0 | -33.0 | 69.1 | II. |
| $\begin{aligned} & \text { Paris } \\ & \text { Maur) } \end{aligned} \text { (Parc-st. }$ | 174 | 22.68 | 29.80 | 10.94 | 63.5 | 37.9 | roi.I | $-19.5$ | 64.8 | 36.7 |
| Pekin . | 123 | 22.66 | 36.00 | 18.00 | 77.9 | 26.8 | 100.2 | 2.7 | 79.3 | 23.7 |
| Quebec | 296 | 41.25 | 53.79 | 32.12 | 63.4 | 12.6 | 97.0 | -34.0 | 65.6 | 9.8 |
| Rome | 166 | 32.57 | 57.89 | 12.72 | 74.3 | 46.0 | 103.0 | 2 x .4 | 76.1 | 4.4 .6 |
| San Francisco | 155 | 22.27 | 38.82 | 9.00 | 58.8 | 50.5 | 101.0 | 29.0 | 59.3 | 49.5 |
| Shanghai | 2 I | 45.00 | 62.52 | 27.92 | 78.0 | 41.1 | 102.9 | 10.2 | 80.4 | 37.8 |
| Singapore | 8 | 91.99 | 158.68 | 32.71 | 81.2 | 78.6 | 94.2 | 63.4 | 81.5 | 78.3 |
| Stockholm | 146 | 21.60 | 28.47 | 11.77 | 62.2 | 26.4 | 9 F .8 | -22.0 | 59.7 | 27.3 |
| T.oki $\cdot$. | 65 | 61.45 | 86.37 | 45.72 | 74.8 | 39.2 | 9 c .0 | 29.7 | 77.7 | 37.5 |
| Trieste. | 85 | 42.94 | 63.14 | 26.57 | 73.9 | 41.3 | 99.5 | 14.0 | 76.3 | 39.9 |
| Vienna | 654 | 25.51 | 35.55 | 16.54 | 653 | 31.3 | 97.2 | - 14.4 | 66.7 | 29.5 |
| Vladivostock (Mt.) | 420 | 29.23 | 38.48 | 21.17 | 65.5 | 9.7 | 92.3 | -22.2 | 69.4 | 3.6 |
| Washington .. | 112 | 43.50 | 61.33 | 30.85 | 74.7 | 34.5 | 106.0 | - 15.0 | 76.8 | 32.9 |
| Wellington | 10 | 39.86 | 67.68 | 27.83 | 61.9 | 48.7 | 88.0 | 28.6 | 62.6 | 48. |
| Zürich | 1,542 | 45.15 | 78.27 | 29.02 | 63.3 | 31.3 | 94.1 | $-0.8$ | 65.1 | 29.5 |

australian Capital.

| Canberra | 1,837 | 23.08 | 35.89 | 16.31 | 68.1 | 43.9 | 109.0 | 14,0 | 69.0 | 42.7 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |


| State Capitals. |  |  |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Perth | 197 | 34.67 | 49.22 | 20.00 | 73.2 | 56.1 | 112.2 | 34.2 | 74.2 | 55.3 |
| Adelaide | 140 | 21.12 | 30.87 | 11.39 | 72.9 | 53.1 | 1177 | 38.2 | 74.2 73.9 | 51.9 |
| Brisbane | 137 | 44.88 | 88.26 | 16.17 | 76.7 | 59.8 | 109.8 | 36.1 | 77.3 | 58.6 |
| Sydney | 138 | 46.81 | 82.76 | 23.01 | 71.0 | 54.4 | 113.6 | 35.7 | 71.6 | 53. |
| Melbourne | 114 | 25.57 | 38.04 | 15.61 | 66.6 | 50.0 | 114.1 | 27.0 | 67.6 | 48.8 |
| Hobart | 177 | 24.01 | 43.39 | 13.43 | 61. 4 | 47.0 | 105.2 | 27.0 | 62.2 | 45.9 |

[^3]18. Climatological Tables.-The averages and extremes for a number of olimatological elements have been determined from long series of observations at the Australian capitals up to and including the year 1940. These are given in the following tables:-

## CLIMATOLOGICAL DATA ：CANBERRA，AUSTRALIAN CAPITAL TERRITORY．

Lat． $35^{\circ} 20^{\prime}$ S．，Lova． $149^{\circ} 15^{\prime}$ E．Heioht above M．S．L．i， 837 Ft．
Barometer，Wind，Evaporation，Lightning，Clouds and Clear Days．


Temperature and Sunshine．

| Month． |  | Mean Tempera－ ture（Fahr．）． |  |  | Extreme Shade Temperature（Fahr．）． |  | $\begin{aligned} & \text { 品 } \\ & \text { 品 } \\ & \text { 荡 } \\ & \text { 苞 } \end{aligned}$ | Extreme Temperature（Fahr．）． |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Mean Max | $\begin{gathered} \text { Mean } \\ \text { Min. } \end{gathered}$ | Sean． | Highest． | Lowest． |  | Highest <br> In Sin． | Lowest on Grass． |  |
| No．of yrs． observatio | over which ns extend． | 24 | 24 | 24 | 24 | 24 | 24 | （a） | 22 | 17 |
| January |  | 82.4 | 55.5 | 69.0 | 109．0 11／39 | $38.281 / 38$ | 70.8 |  | $33.217 / 33$ | 247.6 |
| February |  | 82.2 | 55.2 | 68.7 | $102.616 / 19$ | $33.021 / 33$ | 69.6 |  | 26.8 21／33 | 210.7 |
| March |  | 76.4 | 51.2 | 63.8 | $99.26 / 3^{8}$ | $31.024 / 35$ | 68.2 | － | 25．5 24／17 | 222.6 |
| April |  | 66.9 | 44．1 | 55.5 | 91．0 6／38 | 26.5 29／17 | 64.5 | － | $17.5129 / 17$ | 194.4 |
| May |  | 59.6 | 37.2 | 48.4 | 74．7 $9 / 19$ | $19.030 / 24$ | 55.7 | － | 12.0 28／20 | 160.1 |
| June |  | 53.2 | 34.3 | 43.7 | $\begin{array}{lll}66.2 & 5 / 17\end{array}$ | 17.8 20／35 | 48.4 | － | 9.9 20／35 | 127.7 |
| July |  | 52.1 | 33.2 | 42.7 | $65.08 / 19$ | 14.019 124 | 51.0 |  | 10．0 $24 / 35$ | 147.3 |
| August |  | 55.6 | 3.1 .9 | 45.3 | 73.0 （b） | 18.0 5／19 | 55.0 |  | 1 l .8 5／19 | 176.9 |
| September |  | 61.4 | 38.2 | 49.8 | $83.22 \% / 19$ | 24.0 12／39 | 59.2 | － | 15.5 5／40 | 212.5 |
| October |  | 68.2 | 43.1 | 55.6 | $93.831 / 19$ | 27.0 2／18 | 66.8 | － | $20.013 / 23$ | 238.0 |
| November |  | 74.6 | 48.3 | 6 I .5 | 97．7 29／36 | $28.1524 / 15$ | 69.6 | － | 22.4 11／36 | 234.9 |
| December |  | 79.7 | 53.2 | 66.5 | $103.427 / 38$ | $32.0 \quad 3 / 24$ | 71.4 | － | 30.2 2／39 | 247.3 |
| Year $\left\{\begin{array}{l}\text { Ave } \\ \text { Ext }\end{array}\right.$ | rages remes | 67.7 |  | 55.9 | 109．0 11／x／39 | 14．0 19／7／24 | 95．0 | － | 9.9 20／6／35 | 2，420．0（c） |

（a）No record．
（b） $28 / 1923$ and $23 / 1924$ ．
（c）Total for year．
Humidity，Ratnpatl and Dew．


## CLIMATOLOGICAL DATA : PERTH, WESTERN AUSTRALIA.

Lat. $31^{\circ} 57^{\prime}$ S., Long. $115^{\circ} 50^{\circ}$ E. Height above M.S.L. 197 Ft.
Barometer, Wind, Evaporation, Lightning, Clouds and Clear Days.

| Month. |  |  |  | Wind. |  |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Highest Mean speed in One Day (miles per hour). |  | Mean Speed (miles hour). | Prevailing Direction. |  |  |  |  |  |
|  |  |  | $9 \mathrm{a} . \mathrm{m}$. | 3 F.m. |  |  |  |  |  |
| No. of yrs. observat | $\begin{aligned} & \text { iver } \\ & \text { cons e } \end{aligned}$ |  |  |  | 56 |  | 43 | 43 | 43 | 43 | 42 | 43 | 33 | 44 |
| January | $\cdots$ |  | 29.904 | 33.2 | 27/98 | 14.7 | LSE | SSW | 10.37 | 1.9 | 2.9 | 14.2 |
| February |  |  | 29.923 | 27.1 | 6/08 | 14.0 | ESE | SSW | 8.65 | I. 4 | 3.0 | 12.3 |
| March |  | . | 29.983 | 27.1 | 6/13 | 13.1 | ESE | SSW | 7.55 | x. 6 | 3.5 | 12.3 |
| April |  |  | 30.072 | 39.8 | 25/00 | 11.1 | ENE | SSW | 4.72 | 1.5 | 4.2 | 8.6 |
| May |  | $\cdots$ | 30.069 | 34.4 | 29/32 | 10.7 | NE | sw | 2.73 | 2.4 | 5.5 | 5.9 |
| June |  |  | 30.063 | 38.1 | 17/27 | 10.9 | NNE | WNW | 1.77 | 2.3 | 5.8 | 4.1 |
| July | $\cdots$ | $\cdots$ | 30.092 | 42.3 | 20/26 | 11.3 | NNE | W ${ }_{\text {W }}$ | 1.73 | 2.0 | 5.6 | 5.1 |
| August |  | $\cdots$ | 30.085 30.067 | 40.3 36.0 | 15/03 | 11.9 12.2 12.8 | ${ }^{\text {NNE }}$ | WSWV | 2.36 3 | I. 6 | 5.5 | 5.9 |
| September |  | $\cdots$ | 30.067 30.032 | 36.0 33.7 | $11 / 05$ $6 / 16$ | 12.2 12.9 | NSE | WSW | 3.41 5.34 | I. 1.0 | 4.9 4.8 | 6.5 |
| November |  | $\cdots$ | 39.992 | 36.7 32.4 | 18/97 | 12.9 13.7 | SE | SW | 5.4 7.65 | 1.4 | 4.8 | 8.5 |
| December |  |  | 29.927 | 32.3 | 6/22 | 14.3 | SE | SSW | 9.78 | 1.9 | 3.2 | 12. |
| $\text { Year }\left\{\begin{array}{l} \text { Tota } \\ \text { Ave } \\ \text { Exre } \end{array}\right.$ | ls | $\cdots$ | 30.017 | $42.3$ | $20 / 7 / 26$ | 12.6 | E | SW | 66.07 $=$ | $\stackrel{20.2}{-2}$ | 4.4 | - |

Temperature and Sunshine.

| Month. |  | Mean Temperature (Fahr.). |  |  | Extreme Shade Temperature (Fahr.). |  |  | Extreme Temperature (Fahr.). |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{aligned} & \text { Mean } \\ & \text { Max. } \end{aligned}$ | Mean Min. | Mean | Highest. | Lowest. |  | Highest in Sun. | Lowest on Grass. |  |
| No. of yrs. over which observations extend. |  | 44 | 44 | 44 | 44 | 44 | 44 | 42 | 42 | 43 |
| January |  | 84.5 | 63.2 | 73.9 | 110.2 12/34 | $48.620 / 25$ | 61.6 | $177.322 / 14$ | 39.5 20/25 | 323.5 |
| February |  | 85.0 | 63.4 | 74.2 | $112.28 / 33$ | 47.7 1/02 | 64.5 | 173.74 4/34 | 39.8 1/13 | 275.2 |
| March |  | 8 I .5 | 61.3 | 71.4 | $106.414 / 22$ | 45.8 8/03 | 60.6 | 167.0 19/18 | 36.7 8/03 | 270.5 |
| April |  | 76.2 | 57.2 | 66.7 | 99.7 9/10 | 39.3 20/14 | 60.4 | $157.081 / 16$ | 31.0 20/14 | 220.7 |
| May |  | 68.9 | 52.8 | 60.9 | 90.4 2/07 | $34.311 / 14$ | 56.1 | $146.0 \quad 4 / 25$ | 25.3 II/ 4 | 176.8 |
| June |  | 64.1 | 49.6 | 56.9 | $8 \mathrm{I} .712 /{ }^{\text {2 }}$ | $35.030 / 20$ | 46.7 | $135.518 / 14$ | 26.3 11/37 | 145.4 |
| July |  | 62.8 | 47.8 | 55.3 | 76.4 21/21 | 34.2 7/16 | 42.2 | $133.213 / 15$ | 25.1 30/20 | 165.8 |
| August |  | 63.9 | 48.4 | 56.5 | $8 \mathrm{~F} .012 / 14$ | $35.431 / 08$ | 45.6 | 145.1 29/21 | 26.7 24/35 | 186.8 |
| September |  | v0.0 | 30.3 | 58.5 | $90.930 / 18$ | 38.8 18/00 | 52.1 | 153.6 29/16 | $29.221 / 16$ | 210.7 |
| October |  | 69.3 | 52.6 | 60.9 | 95.3 30/22 | $40.016 / 31$ | 55.3 | $157.531 / 36$ | 29.8 16/31 | 245.0 |
| November |  | 76.0 | 56.9 | 66.5 | 104.6 24/13 | $42.01 / 04$ | 62.6 | 167.0 30/15 | 35.4 6/10 | 289.4 |
| December |  | 8 I .2 | 60.9 | 71.1 | 107.9 20.04 | 48.0 2/10 | 59.9 | $168.311 / 27$ | 39.0 (a) | 325.7 |
| $\text { Year }\left\{\begin{array}{l} \text { Ave } \\ \text { Ext } \end{array}\right.$ | ages | 73.3 | 55.4 | 64.3 | 112.2-8/2/33 | 34.27/7/16 | 78.0 | 177.3 22/1/14 | $25.1530 / 7 / 20$ | 835.56 |

(a) $2 / 1910$ and $12 / 1920$. (b) Total for year.

Hemidity, Ratnfall and Dew.

(a) Various years.
(b) Various months in various years.

## CLIMATOLOGICAL DATA ：ADELAIDE，SOUTH AUSTRALIA．

Lat． $34^{\circ} 56^{\prime}$ S．，Long． $3_{3} s^{\circ} 35^{\prime}$ E．Heiget above M．S．L．i4o Fr． Barometer，Wind，Evaporation，Lightning，Clouds and Clear Days．

| Month． |  | Wind． |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Highest Mean Speed in | Mean <br> Speed <br> （miles |  | ling ion. |  |  |  |  |
|  |  |  | hour）． | $9 \mathrm{arm}$. | 3 p．th． |  |  |  |  |
| $\overrightarrow{\text { No．of yrs．over which }}$ observations extend． | 84 | 63 | 63 | 63 | 63 | 71 | 69 | 73 | 59 |
| January | 29.914 | $31.6019 / 99$ | 10.5 | SW | SW | 9.11 | 2.3 | 3.6 | 8.7 |
| February | 29.952 | $28.8 \quad 22 / 96$ | 9.7 | NE | SW | 7.44 | 2.0 | 3.5 | 7.8 |
| March | 30.038 | 26.2 9／12 | 8.8 | S | SW | 6.05 | 2.0 | 4.0 | 7.5 |
| April | 30.118 | $32.210 / 96$ | 8.5 | NE | SW | 3.57 | I． 6 | 5.0 | 4.6 |
| May | 30.126 | 31.7 9／80 | 8.3 | NE | NW | 2.10 | I． 6 | 5.8 | 2.4 |
| June | 30.104 | $31.3 \quad 12 / 78$ | 8.9 | NE | N | 1.29 | 1.8 | 6.2 | 1． 8 |
| July | 30.125 | $28.1525 / 82$ | 8.9 | NE | NW | I． 31 | 1.6 | 5.9 | 1.9 |
| August | 30.094 | $32.231 / 97$ | 9.6 | NE | SW | 1.91 | 2.1 | 5.6 | 2.7 |
| September | 30.045 | $30.0 \quad 2 / 87$ | 10.0 | NNF | SW | 2.92 | 2.2 | 5.2 | 3.5 |
| October | 29.999 | $32.0 \quad 28 / 98$ | 10.4 | NNE | SW | 4.86 | 3.2 | 5.1 | 4.0 |
| November | 29.979 | $28.2 \quad 2 / 0_{4}$ | 10.4 | SW | SW | 6.69 | 3.2 | 4.6 | 5.4 |
| $\begin{aligned} & \text { December } \\ & \text { Year }\left\{\begin{array}{l} \text { Totals } \\ \text { Averages } \\ \text { Extremes } \end{array}\right. \end{aligned}$ | 29.921 | $28.112 / 91$ | 10.5 | SW | SW | 8.55 | 2.5 | 4.0 | 6.9 |
|  | 30.035 |  | $9.5$ | $\overline{+}$ | － | 55.80 | 26.1 | － | 57.2 |
|  |  |  |  | NL | SW | － | － | $4 \cdot 9$ | － |
|  |  |  |  |  | $\cdots$ |  |  | － |  |

（a）10／4／96 and 31／8／97．
Temperature and Sunshine．

（a） $26 / 1895$ and 24／1904．
（b） $16 / 186 \mathrm{I}$ and $4 / 1906$ ．
（c） $2 / 1918$ aud $4 / 1931$
（d）Total for year．
Homidity，Rainfall and Dew．

| Month． |  |  | $\|$Vapour <br> Pres－ <br> sure <br> （inches）． <br> Mean <br> 9 a．m． | Rel．Hum．（\％） at 9 a．m． |  |  | Rainfall（inches）． |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | $\begin{gathered} \text { 䔍 } \\ \text { By } \end{gathered}$ |  |  | 童 |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| observations extend． |  |  | 73 | 73 | 73 | 73 | 102 | 102 | 10 |  | 102 |  | 102 | 69 |
| January |  |  | 0.339 | 38 | 59 | 29 | 0.75 | 5 | 4.00 | 1850 | 0.00 | （a） | 2.30 2／89 | 3.5 |
| February | ． |  | 0.355 | 41 | 56 | 30 | 0.74 | 4 | 6.09 | 1925 | 0.00 | （a） | 5.57 7／25 | 5.6 |
| March |  |  | 0． 344 | 46 | 58 | 29 | 1．01 | 6 | 4.60 | 1878 | 0.00 | （a） | 3.50 5／78 | 10.4 |
| April | ． |  | 0.334 | 55 | 72 | 37 | 1.77 | 10 | 6.78 | 1853 | 0.03 | 1923 | 3.15 5／60 | 13.9 |
| May |  |  | 0.317 | 67 | 76 | 49 | 2.69 | 13 | 7.75 | 1875 | 0.10 | 1934 | 2.75 1／53 | 16.3 |
| June |  | ． | 0.297 | 76 | 84 | 67 | 3.05 | 16 | 8.58 | 1916 | 0.42 | 1886 | 2.11 1／20 | 16.3 |
| July |  |  | 0.277 | 76 | 87 | 66 | 2.62 | 16 | 5.38 | 1865 | 0． 37 | 1899 | 1.75 10／65 | 17.5 |
| August |  |  | 0.286 | 69 | 78 | 54 | 2.55 | 16 | 6.24 | 1852 | 0.35 | 1914 | $2.2319 / 51$ | 16.9 |
| September |  |  | 0.296 | 60 | 72 | 44 | 2.05 | 14 | 5.83 | 1923 | 0.45 | 1896 | 1.59 20／23 | 15.8 |
| October |  |  | 0.297 | 50 | 67 | 29 | 1.70 | 10 | 3.83 | 1870 | 0.17 | 1914 | 2.24 16／08 | 12.8 |
| November |  |  | 0.307 | 42 | 57 | 3 I | 1.16 | 8 | 4．10 | 1934 | 0.04 | 1885 | 2.08 7／34 | 6.5 |
| December |  |  | 0.323 | 39 | 50 | 31 | 1.03 | 6 | 3.98 | 1861 | 0.00 | 1904 | $2.42 \quad 23 / 13$ | 4．3 |
| Year $\left\{\begin{array}{l}\text { Tot }\end{array}\right.$ |  |  | 300 | － 53 | 二 | － | 21.12 | 124 |  |  |  |  | － | 139.8 |
| Year $\left\{\begin{array}{l}\text { Aver } \\ \text { Frut }\end{array}\right.$ | rages | $\cdots$ | 0.309 | 53 | $8_{7}$ | 29 |  | － | 8.58 | 6／16 | 0.00 | （b） | 57－7／2／25 | － |

[^4]Climatological data ：Brisbane，queensland．
Lat． $27^{\circ} 28^{\prime}$ S．，Long． $153^{\circ} 2^{\prime}$ E．Hergit above M．S．L． 137 Fr．
Barometer，Wind，Evaporation，Lightnleg，Clouds and Clear Dats．

| Month． |  |  |  | Wind． |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  | Highest Mean Speed in One Day （miles per hour）． | Mean <br> Speed <br> （miles <br> hour）． | Prevailing <br> Direction． |  |  |  |  |  |
|  |  |  | 9 a．m． |  | 3 p．m． |  |  |  |  |
| No．of yrs． observat | $\overline{\text { over } \bar{x}}$ ons ex |  |  | ． 54 | 30 | 26 | 54 | 54 | 32 | 54 | 49 | 32 |
| January |  |  | 29.865 | 15.0 1／22 | 7.0 | SE | E \＆NE | 6.702 | 7.3 | 5.7 | 3.5 |
| February | ． | $\ldots$ | 29.902 | 21.0 5／31 | 7.0 | S \＆SE | NE \＆E | 5.467 | 5.7 | 5.7 | 2.5 |
| March |  |  | 29.966 | 20.3 I／29 | 6.7 |  | SE \＆E | 5.031 | 4.5 | 5.3 | 5. |
| April | ． |  | 30.040 | $\begin{array}{lll}16.7 & 3 / 25\end{array}$ | 6.1 | S | SE \＆${ }_{\text {S }}$ | 3.979 | 3.9 | 4.5 | 7.7 |
| May |  |  | 30.087 | 17．9 17／26 | 5.9 |  |  | 3.073 | 3.2 | $4 \cdot 3$ | 8.2 |
| June | $\cdots$ |  | 30.075 30.078 | $\begin{array}{ll}19.0 & 14 / 28 \\ 15.0 & 2 / 23\end{array}$ | 5.8 5.7 | SW ${ }_{\text {S }}$ SW | S ${ }_{\text {SW }}^{8}$ | 2.411 2.672 | 2.3 2.5 |  | 9.2 12.3 |
| July |  |  | 30.078 30.096 | $\begin{array}{ll}15.0 & 2 / 23 \\ 14.8 & 4 / 35\end{array}$ | 5.7 5.9 | S\＆SW | SW \＆NE | 2.672 3.445 | 2.5 3.6 | 3.8 3.4 3 | 12.3 12.8 |
| September |  |  | 30.049 | 13．7 $7 / 3 / 31$ | 6.0 | S\＆SW | NE \＆ | 4．45I | 5.6 | 3.4 | 12.7 |
| October |  |  | 30.008 | 14.8 14／36 | 6.4 |  | NE | 5.763 | 6.8 | 4.1 | 8.5 |
| November |  |  | 29.959 | 15.5 $10 / 28$ <br> $10.515 / 26$  | 6.8 | SE \＆$\underset{S E}{ }$ | NE | 6.279 | 8.6 | 4.9 | 5.8 |
| December |  |  | 29.889 | 19.5 15／26 | 7.1 | SE | NE | 7.015 | 9.4 | 5.3 | 3.7 |
| $\text { Year }\left\{\begin{array}{l} \text { Tota } \\ \text { Aver } \\ \text { Extr } \end{array}\right.$ | lages | $\cdots$ | 30.001 | 21．0 $\overline{5 / 2 / 31}$ | $\stackrel{7}{6.4}$ | S | NE | 56.288 | 63.4 | － 4.6 | 92.0 |

Temperature and Sunshine．

| Month． | Mean Tempera－ ture（Fahr．）． |  |  | Extreme Shade Temperature（Fahr．）． |  |  | Extreme Temperature（Pahr．）． |  | 范客官 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Mean Max． | Mean Min. | Mean | Highest． | Lowest． |  | Highest． in Sun． | Lowest on Grass． |  |
| No．of yrs．over which observations extend． | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 54 | 32 |
| January | 85.5 | 69.0 | 77.3 | 109.8 26／40 | 58.8 4／93 | 51.0 | 169.0 2／37 | $49.9 \quad 4 / 93$ | $234 \cdot 9$ |
| February | 84.5 | 68.6 | 76.6 | 105．7 21／25 | 58.5 23／3I | 47.2 | $165.26 / 10$ | 49．1 22／31 | 209.3 |
| March | B2．2 | 66.4 | 74.3 | $99.45 / 19$ | $52.429 / 13$ | 47.0 | 161．7 $7 / 25$ | $45.429 / 13$ | 214.6 |
| April | 78.9 | 6 x .5 | 70.2 | 95.2 （a） | 44．4 25／25 | 50.8 | 153.8 11／16 | 36.7 24／25 | 212.7 |
| May | 73.6 | 55.5 | 6.6 | $90.321 / 23$ | $\begin{array}{lll}41.3 & 24 / 99\end{array}$ | 49.0 | 142.0 I／10 | $\begin{array}{ll}29.8 & 8 / 97 \\ 25.4 & 23 / 88\end{array}$ | 203.7 |
| June | 69.3 | 51.1 | 60.2 | 88.9 19／18 | 36.3 29／08 | 52.6 | 136．0 $3 / 18$ | 25.4 23／88 | 186.1 |
| July | 68.4 | 48.7 | 58.6 | 83.4 28／98 | 36.1 （b） | 47.3 | $146.120 / 15$ | 23.9 11／90 | 210.6 |
| August | 71.2 | 50.0 | 60.6 | 88.5 25／28 | $37.46 / 87$ | 5 I． 1 | $141.920 / 17$ | 27.15199 | 239.3 |
| September | 75.5 | 54.7 | 65.2 | 95.2 16／12 | 40.7 1／96 | 54.5 | $155.526 / 03$ | 30.4 1／89 | 245.0 |
| October | 79.5 | 60.1 | 69.8 | 101．4 18／93 | $43 \cdot 3 \quad 3 / 99$ | 58.1 | 157.4 31／18 | $34.988 / 89$ | 258.4 |
| November | 82.4 | 64.3 | 73.4 | 106．1 18／13 | $48.5 \quad 2 / 05$ | 57.6 | 162.3 7／89 | 38.8 x／05 | 244.2 |
| Dccember | 84.8 | 67.4 | 76.2 | 105．9 26／93 | 56.4 13／12 | 49.5 | $162.126 / 37$ | 49.15194 | 254.5 |
| Year $\left\{\begin{array}{l}\text { Averages } \\ \text { Extremes }\end{array}\right.$ | 78.0 | 59.8 | $\underline{68.9}$ |  | 36.1 （c） | 73.7 | ${ }_{169.0}{ }_{2 / 1 / 37}$ | 23.9 $11 / 7 / 90$ | 2713.30 |

（a）9／1896 and 5／1903．
（b） $12 / 1894$ and $2 / 1896$ ．
（c） $12 / 7 / 94$ and $2 / 7 / 96$ ．
（d）Total for year．
Hemidity，Rainfall and Dew．


[^5]（b）Various months in various years．
（c） $15 / 1876$ and $16 / 1889$ ．

## CLIMATOLOGICAL DATA ：SYDNEY，NEW SOUTH WALES．

Lat． $33^{\circ} 5 z^{\prime}$ S．，Long． $151^{\circ}$ 12＇E．Height above M．S．L． 138 Ft． Barombter，Wind，Evaporation，Lightnina，Clouds and Clear Dayb．

| Month． |  | Wind． |  |  |  |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Highest Mean Speed in | Mean Speed （miles | Prevailing <br> Direction． |  |  |  |  |  |
|  |  | （miles per hour）． | $\begin{gathered} \text { per } \\ \text { hour). } \end{gathered}$ | 9 a ．m． | 3 p．m． |  |  |  |  |
| No．of yrs．over which observations extend． | 31 | 74 | 74 | 74 | 74 | 61 | 81 | 79 | 30 |
| January | 29.875 | 26．1 3／93 | $9 \cdot 3$ | NE | ENE | 5.439 | 5.0 | 5.7 | 4.8 |
| February | 29.943 | $29.012 / 69$ | 8.8 | NE | ENE | 4.329 | 4.3 | 5.5 | 5.5 |
| March | 30.011 | 31.4 20／70 | 7.8 | W | ENE | 3.703 | 4.1 | 5.2 | 5.8 |
| April | 30.065 | $26.76 / 82$ | 7.3 | W | ENE | 2.677 | 3.7 | 5.0 | 7.0 |
| Say | 30.098 | 28.46198 | 7.2 | W | NE | 1.875 | 2.9 | 4.9 | 7.4 |
| June | 30.078 | $26.713 / 08$ | 8.0 | W | W | 1.482 | 2.1 | 4.8 | 8.3 |
| July | 30.066 | $31.017 / 79$ | 8.0 | W | W | 1．556 | 2.2 | 4.5 | 10.1 |
| August | 30.063 | 27.0 22／72 | 7.8 | W | NE | 2.007 | 3.1 | 3.9 | 11.1 |
| September | 30.021 | $32.156 / 74$ | 8.4 | W | NE | 2.785 | 3.8 | 4.3 | 10.0 |
| October | 29.976 | $30.9 \quad 4 / 72$ | 8.8 | W | ENE | 3.930 | 4.8 | 4.9 | 7.4 |
| November | 29.936 | 24.3 12／87 | 9.0 | ENE | ENF | 4.726 | 5.4 | 5.5 | 5.7 |
| December | 29.876 | $31.3 \quad 3 / 84$ | 9.3 | E | ENE | 5.505 | 5.8 | 5.7 | 4.8 |
| $\text { Year }\left\{\begin{array}{ll} \text { Totals } & \ldots \\ \text { Averages } & \because \\ \text { Extremea } \end{array} \quad .\right.$ | 30.001 | $32.1 \overline{6 / 9 / 74}$ | $\stackrel{\square}{8.3}$ | W | ENE | 40.014 $=$ | 47．2 | 5.0 | 87.9 |

Temperature and Sunshine．

| Month． |  | Mean Tempera． ture（Fahr．）． |  |  | Extreme Shade Temperature（Falir．）． |  |  | Extreme Temperature（Fahr．）． |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | Mean Max． | Mean Min． | Mean | Highest． | Lowest． |  | Highest in Sun． | Lowest on Grass． |  |
| No．of yrs．over which observations extend． |  | 82 | 82 | 82 | 82 | 82 | 82 | 78 | 82 | 20 |
| January |  | 78.4 | 64.9 | 71.6 | $113.614 / 39$ | 51．2 14／65 | 62.4 | 164.3 26／15 | 43.7 6／25 | 228.4 |
| February |  | 77.7 | 65.0 | 71.3 | 107.8 8／26 | 49.3 28／63 | 58.5 | 168．3 $14 / 39$ | $42.8122 / 33$ | 206.4 |
| March |  | 75.8 | 63.1 | 69.4 | 102.6 3／69 | 48.8 14／86 | 53.8 | 158.3 10／26 | $39.917 / 13$ | 200.7 |
| April |  | 71.4 | 58.0 | 64.7 | 91.4 1／36 | $44.6 \quad 27 / 64$ | 46.8 | $144.1510 / 77$ | 33.3 24／09 | 18 I .9 |
| May |  | 65.7 | 52.1 | 58.9 | $86.01 / 19$ | 40.2 22／59 | 45.8 | $129.71 / 96$ | $29.3 \quad 25 / 17$ | 176.6 |
| June |  | 61.3 | 48.2 | 54.8 | $80.411 / 31$ | 35.7 22／32 | 44.7 | $125.512 / 23$ | $28.0 \quad 22 / 32$ | 162.1 |
| July |  | 59.9 | 45.9 | 52.9 | $78.322 / 26$ | $35.912 / 90$ | 42.4 | $124.719 / 77$ | $24.0 \quad 4 / 93$ | 187.9 |
| August |  | 63.0 | 47.6 | 55.3 | $82.031 / 84$ | 36.8 3／72 | 45.2 | $149.0 \quad 30 / 78$ | 26.1 4／09 | 218.2 |
| September |  | 67.1 | 51.3 | 59.2 | 92．3 27／19 | 40.818164 | 51.5 | $142.212 / 78$ | 30.1 17／05 | 220.2 |
| October |  | 71.3 | 55.8 | 63.6 | 98.9 19／98 | $42.26 / 27$ | 56.7 | $152.220 / 33$ | 32.7 9／05 | 232.9 |
| November |  | 74.3 | 59.6 | 67.0 | $\begin{array}{cc}102.7 & 21 / 78 \\ 107.5 & \end{array}$ | $\begin{array}{ll}43.2 & 7 / 39 \\ 48.4 & 3 / 24\end{array}$ | 59.5 | $158.528 / 99$ | $36.06 / 06$ | $\begin{array}{r}232.4 \\ \hline\end{array}$ |
| December |  | 77.1 | 62.9 | 70.0 | $107.531 / 0.4$ | $48.4 \quad 3 / 24$ | 59.1 | $164.527 / 89$ | $41.4 \quad 3 / 24$ | 230.9 |
| Year $\left\{\begin{array}{l}\text { Avet } \\ \text { Ext }\end{array}\right.$ | emages | 70.3 | 56.2 | 63.2 | 113.6 $14 / 1 / 39$ | $35 \cdot 7$ $22 / 6 / 32$ | 77.9 | 168.3 $14 / 2 / 39$ | $24.0^{4 / 7 / 92}$ | $2478.6 a$ |

（a）Total for year．
Humidtty，Ramfanl and Dew．

| Month． | $\left\|\begin{array}{c}\text { Vapour } \\ \text { Pres－} \\ \text { sure } \\ \text {（inches）．}\end{array}\right\|$ | $\begin{aligned} & \text { Rel. Hum. (\%) } \\ & 9 \text { a.m. } \end{aligned}$ |  |  | Rainfall（Inches）． |  |  |  |  |  |  | Dew． <br> $\dot{\circ}$ <br> 家 <br> 品 <br> 定 |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | 总 |  |  | － |  | $\stackrel{y}{c}$ |  |  |
| No．of yrs．over which observations extend． | 65 | 65 | 65 | 65 | 82 | 82 | 8 |  |  | 2 | 82 | 81 |
| Januxry | 0.546 | 67 | 78 | 58 | 3.60 | 14 | 15.26 | 1911 | 0.25 | 1932 | $7.0813 / 11$ | 1.7 |
| February | 0.562 | 70 | 81 | 60 | 4.13 | 13 | 18.56 | 1873 | 0.12 | 1939 | 8.90 25／73 | 3.0 |
| March | 0.532 | 73 | 85 | 62 | 4.88 | 14 | 18.70 | 1870 | 0.42 | 1876 | 6.52 9／13 | 5.0 |
| April | 0.442 | 76 | 87 | 63 | 5.41 | 14 | 24.49 | 1861 | 0.60 | 1868 | $7.52 \quad 29 / 60$ | 7.0 |
| May | 0.360 | 78 | 90 | 63 | 5.00 | 14 | 23.03 | 1919 | 0.18 | 1860 | $8.3628 / 89$ | 8.2 |
| June | 0.299 | 77 | 89 | 68 | 4.69 | 13 | 16.30 | 1885 | 0.19 | 1904 | $5.1716 / 84$ | 7.0 |
| July | 0.278 | 76 | 88 | 63 | 4.72 | 12 | 13.21 | 1900 | 0.12 | 1862 | $7.80 \quad 7 / 31$ | 7.8 |
| August | 0.290 | 70 | 84 | 56 | 2.93 | 11 | 14.89 | 1899 | 0.04 | 1885 | 5.33 2／60 | 7.1 |
| September | 0． 330 | 65 | 79 | 49 | 2.85 | 12 | 14.04 | 1879 | 0.08 | 1882 | 5.69 10／79 | 4.9 |
| October | 0.382 | 62 | 77 | 46 | 2.84 | 12 | 11.14 | 1916 | 0.21 | 1867 | 6.37 I $3 / 02$ | 3.4 |
| November | 0.444 | 63 | 79 | 42 | 2.79 | 12 | 9.88 | 1865 | 0.07 | 1915 | $4.2319 / 00$ | 2.4 |
| December | 0.503 | 65 | 77 | 51 | 2.97 | 13 | 15.82 | 1920 | 0.19 | 1939 | $4.7513 / 10$ | 1.9 |
| $\text { Year }\left\{\begin{array}{l} \text { Totals } \\ \text { Averages } \\ \text { Extremes } \end{array}\right.$ | 0.702 | $\overline{70}$ | － | 二 | 46.81 <br> - | 154 | 24.49 | 4／1861 | 0.04 | 8／1885 | 二．00 25／2／73 | 59.4 |

## CLIMATOLOGICAL DATA ：MELBOURNE，VICTORIA．

Lat． $37^{\circ} 49^{\prime}$ S．，Long， $144^{\circ} 58^{\prime}$ E．Height above M．S．L． 114 Ft． Barometer，Wind，Evaporation，Lightning，Clouds and Clear Days．


Temperature and Sunshine．

（a） $17 / 1884$ and $20 / 1897$ ．
（b）Total for year．
Humidty，Rainfall and Dew．

| Month． | $\left(\begin{array}{c}\text { Vapour } \\ \text { Pres－} \\ \text { sure } \\ \text {（inches）．} \\ \hline \text { Mean } \\ 0 \text { a．m．}\end{array}\right.$ | $\begin{aligned} & \text { Rel. Hum. (\%). } \\ & 9 \text { a.m. } \end{aligned}$ |  |  | Rainfall（Inches）． |  |  |  |  |  |  | Dew． |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  |  |  |  | 空 |  |  |  |  | $\underset{玉}{ \pm}$ |  |  |
| No．of gTs．over which observations extend． | 33 | 33 | 33 | 33 | 85 | 85 |  | 85 |  |  | 82 | 33 |
| January | 0.384 | 58 | 65 | 50 | 1.88 | 8 | 5.68 | 1904 | 0.01 | 1932 | $\overline{2.97}$－9／97 | 2.7 |
| February | 0.413 | 62 | 69 | 48 | 1.80 | 7 | 7.72 | 1939 | 0.03 | 1870 | $3.42 \quad 26 / 39$ | 4.1 |
| March | 0.382 | 64 | 73 | 50 | 2.15 | 9 | 7.50 | 1911 | 0.14 | 1934 | 3．55 5 ／ 19 | 7.5 |
| April | 0.346 | 72 | 82 | 66 | 2.33 | 11 | 6.71 | 1901 | 0.00 | $\underline{8} 923$ | 2.28 22／01 | 9.0 |
| May | 0.308 | 79 | 86 | 71 | 2.07 | 13 | $4 \cdot 31$ | 1862 | 0.14 | 1934 | $1.85 \quad 7 / 91$ | 10.1 |
| June | 0.276 | 83 | 92 | 75 | 2.08 | 14 | 4.5 I | 1859 | 0.73 | 1877 | 1.74 21／04 | 8.1 |
| July | 0． 266 | 82 | 86 | 76 | 1.88 | 15 | 7.02 | 1891 | 0.57 | 1902 | 2．71 12／91 | 7.9 |
| August | 0.268 | 76 | 82 | 70 | 1.89 | 15 | $4 \cdot 35$ | 1939 | 0.48 | 1903 | $1.9426 / 24$ | 7.3 |
| September | 0.288 | 68 | 76 | 60 | 2.29 | $\mathrm{r}_{4}$ | 7.93 | 1916 | 0.52 | 1907 | $2.62 \mathrm{I} 2 / 80$ | 6.3 |
| October | 0.306 | 62 | 67 | 52 | 2.65 | 13 | 7.61 | 1869 | 0.29 | 1914 | $3.0017 / 69$ | 5.8 |
| November | 0.333 | 60 | 69 | 52 | 2.25 | 11 | 6.71 | 1916 | 0.25 | 1895 | $2.5716 / 76$ | 2.3 |
| December | 0．364 | 59 | 69 | 48 | 2.30 | 10 | 7.18 | 1863 | 0．11 | 1904 | $3.20 \mathrm{I} / 34$ | 1.7 |
| $\text { Year }\left\{\begin{array}{l} \text { Totals } \\ \text { Averages } \\ \text { Extremes } \end{array}\right.$ | $0 . \overline{322}$ | －69 | － 02 | 二 ${ }_{48}$ | 25.57 － | 140 $\square$ | 7.03 | $\bar{\square}_{\text {／20if }}$ | 0.00 | 4／inza | －三－55／8／10 | 72.8 |

## CLIMATOLOGICAL DATA : HOBART, TASMANIA.

Lat. $4^{\circ} 53^{\prime}$ S., Long. $147^{\circ} 20^{\prime}$ E. Height above M.S.L. 177 Ft.
Barometer, Wind, Evaporation, Iightining, Clouds and Clear Days.


Temperature and Sunshine.

| Month. |  | Mean Temperature (F'ahr.). |  |  | Extreme Shade Temperature (Fahr.). |  |  | Extreme Temperature (Pahr.). |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | $\begin{aligned} & \text { Mean } \\ & \text { Max. } \end{aligned}$ | Mean Min. | Mean. | Highest. | Lowest. |  | Highest <br> in Sun. | Lowest on Grass. |  |
| No. of yrs. over which observations extend. |  | 70 | 70 | 70 | 94 | 94 | 94 | 51 | 73 | 20(a) |
| January |  | 71.0 | 5\%.0 | 61.8 | 105.0 (b) | 40.03112 | 65.0 | 160.0 (c) | $30.619 / 27$ | 236.5 |
| February |  | 71.1 | 53.3 | 62.2 | 104.4 12,99 | 39.0 20/87 | 65.4 | 165.0 24/98 | $28.3-187$ | 198.3 |
| March |  | 67.9 | 50.9 | 59.4 | $99.113 / 40$ | $35.231 / 26$ | 63.9 | $150.0 \quad 3 / 05$ | 27.5 30/02 | 199.3 |
| April |  | 62.5 | 47.7 | 55.1 | $90.01 / 56$ | 30.0 25/56 | 60.0 | 142.0 18/93 | $25.0-186$ | 143.7 |
| Kay |  | 57.5 | 43.9 | 50.7 | 77.8 5/31 | 29.2 20/02 | $4^{8.6}$ | 128.0 (d) | 20.0 19.\%2 | 141.2 |
| Jane |  | 52.7 | 41.0 | 46.9 | $75.0 \quad 7 / 74$ | $28.022 / 79$ | 47.0 | $122.012 / 94$ | $21.06 / 87$ | 118.0 |
| July |  | 52.1 | 39.6 | 45.9 | 72.0 22/77 | 27.0 18/66 | 45.0 | $121.012 / 93$ | 18.7 16/86 | 130.3 |
| August |  | 55.1 | 41.2 | 48.1 | $77.03 / 76$ | 30.0 10/73 | 47.0 | $129.0-/ 37$ | 20.1 7/09 | 158.4 |
| September |  | 58.8 | 43.2 | 51.0 | 81.7 23/26 | 30.0 12/41 | 51.7 | 138.0 23/93 | 18.3 16/26 | 172.6 |
| October |  | 62.6 | 45.6 | 54.1 | $92.024 / 14$ | $32.012 / 89$ | 60.0 | 156.0 9/93 | 23.8 (e) | 192.2 |
| Norember |  | 65.9 | 48.2 | 57.1 | 98.3 26/37 | $35.2 \quad 5 / 13$ | 63.1 | 154.0 19/92 | 26.0 1/08 | 218.8 |
| December |  | 69.0 | 51.2 | 60.1 | $105.230 / 97$ | 38.0 13/06 | 67.2 | 161.5 10/39 | $27.2-186$ | 218.0 |
| Year $\left\{\begin{array}{l}\text { Ave } \\ \text { Ext }\end{array}\right.$ | mes | 62.4 | 46.5 | 54.4 | $\begin{aligned} & 105.2 \\ & 30 / 12 / 97 \\ & \hline \end{aligned}$ | $\begin{aligned} & 27.0 \\ & 18 / 7 / 66 \end{aligned}$ | 78 | $\begin{aligned} & 165.0 \\ & 24 / 2 / 9^{\circ} \end{aligned}$ | $\begin{gathered} 18.3 \\ 16 / 9 / 26 \\ \hline \end{gathered}$ | $2127.3 f$ |

(a) Harly records discarded owing to faulty instrument.
(b) $27 / 49$ and $1 / 00$.
(c) $5 / 86$ and $13 / 05$.

## (d) $-/ 89$ and $-/ 93$.

(e) $x / 86$ and $-1 / 99$.
(f) Total for year.

Humidtty, Rainfall and Dew.

(a) 4.18 on $28 / 54$ also.

## § 3．Standard Times im Australia．

Prior to 1895 the official time adopted in the several colonies was for most purposes the mean solar time of the capital eity of each．

In November，1892，an intercolonial conference of surveyors was held in Melbourne to consider，among other things，the advantages of introducing the system of standard time．In this system it was proposed to make the initial meridian that of Greenwich， and to change local standard time by whole hours according to the longitude east or west of that of Greenwich．Thus for every difference of $15^{\circ}$ in longitude a change of one hour would be required．The minutes and seconds would then be identical everywhere．

To give effect to this proposal it was suggested that Australia should be divided into three zones，the standard times for which should be respectively the mean solar times of the meridians of $120^{\circ}, 135^{\circ}$ and $150^{\circ} \mathrm{E}$ ．longitude，thus giving standard times 8， 9 and to hours respectively，abead of Greenwich time．It was proposed that the $120^{\circ}$ zone should comprise Western Australia，that the $135^{\circ}$ zone should comprise South Australia and the Northern Territory，and that the $55^{\circ}$ zone should comprise Queensland， New South Wales，Victoria and Tasmania．

The matter was also considered by several intercolonial postal conferences，and eventually in 1894 and 1895 legislation was enacted by each of the colonies in accord with the recommendations of the surveyors＇conference of 1892.

In 1898 the South Australian legislature amended its earlier provision，and adopted the mean solar time of the meridian $142^{\circ} 30^{\prime} \mathrm{E}$ ．longitude as the standard time for that colony，thus reducing the difference between the standard time of Adelaide and that of the capitals of the eastern colonies from an hour to half－an－hour，and forfeiting the great advantage of the system，namely，that the minutes and eeoonds should be identical throughout the world．

Particulars concerning these enactments are as follows ：－
Standard Times in Austraifa．

| State． | Date when Act came Operation． | Meridian Selected． | $\begin{aligned} & \text { Time } \\ & \text { Ahead of } \\ & \text { Greawich. } \\ & \text { Hours. } \end{aligned}$ |
| :---: | :---: | :---: | :---: |
| New South Wales | 1st February， 1895 | $150^{\circ} \mathrm{E}$ ． | 10 |
| Victoria | 1st February， 1895 | $150^{\circ} \mathrm{E}$ ． | 10 |
| Queensland | 1st January， 1895 | $150^{\circ} \mathrm{E}$ | 10 |
| South Australia | Ist February， 1895 | $135^{\circ} \mathrm{E}$ ． | 9 |
| South Australia | 1st May， 1899 ．． | $142^{\circ} 30^{\circ} \mathrm{E}$ ， | $9{ }^{9}$ |
| Western Australia | Ist December， 1895 | $120^{\circ} \mathrm{E}$ ． | 8 |
| Tasmania | 1st September， 1895 | $150^{\circ} \mathrm{E}$ ． | 10 |

The standard time in the Australian Capital Territory is the same as in New South Wales．

Consequent upon the opening of the Trans－Australian Railway an arrangement has keen made by which the change of time between South Australia and Western Australia （namely，I⿱亠䒑⿱日一 hours）is divided into two changes of 45 minntes each．Going east from Kalgoorlie the first change is made at Rawlinna， 235.18 miles out，where the time is put forward by 45 minutes．The second change of the same amount is made at Tarcoola， 794.05 miles out．Thenceforward South Australian standard time is kept．The advantage of standard time has thus been still further sacrificed，as there is not now even a whole half－hour difference；the essential idea of standard zone time has to this extent， therefore，been abandoned．The State Observatories at Sydney，Melbourne，Adelaide and Perth derive time by astronomical observation．By arrangement with the Australian Broadcasting Commission observatory time－signals are broadcast in the several States at intervals during the day．In addition，the Amalgamated Wireless（Australasia）Ltd． re－broadcasts the daily time－signals of certain oversea stations．


[^0]:    (a) Including Austria and part of Czochoslovakia. Dutch New Guinea
    (b) Incinding Albania.
    (c) Including

    The countries and areas given in the table are those obtaining before the 1939 War and have been extracted from the Statistical Year Book of the League of Nations or the Statesman's Year Book:

[^1]:    - Prepared from data supplied by the Director, Commonwealth Bureau of Meteorology.

[^2]:    * In Australia, artificial storage ponds or reservoirs are called " tanks."

[^3]:    (a) Mean of the three hottest months. (b) Mean of the three coldest months.

[^4]:    （a）Various years．
    （b）Various months in various years．

[^5]:    （a） $\mathbf{1 8 6 2}, 1869,1880$.

