

## CLIMATE.

THE Tropic of Capricorn divides Australia into two parts. Of these, the northern or inter-tropical portion contains 1,145,000 square miles, comprising half of Queensland, the Northern Territory of South Australia, and the north-western divisions of Western Australia. The whole of New South Wales, Victoria, New Zealand, Tasmania, and South Australia proper, half of Queensland, and more than half of Western Australia, comprising 1,932,000 square miles, are without the tropics. In a region so extensive, very great varieties of climate are naturally to be expected, but it may be stated as a general law that the climate of Australasia is milder than that of corresponding lands in the Northern Hemisphere. During July, which is the coldest month in southern latitudes, one half of Australasia has a mean temperature ranging from 40° to 64°, and the other half from 64° to 80°. The following are the areas subject to the various average temperatures during the month referred to:—

| Temperature, Fahr. | Area in sq. miles. |
|--------------------|--------------------|
| 35° — 40° .....    | 300                |
| 40° — 45° .....    | 39,700             |
| 45° — 50° .....    | 88,000             |
| 50° — 55° .....    | 617,800            |
| 55° — 60° .....    | 681,800            |
| 60° — 65° .....    | 834,400            |
| 65° — 70° .....    | 515,000            |
| 70° — 75° .....    | 275,900            |
| 75° — 80° .....    | 24,500             |

The temperature during December ranges from 50° to above 95° Fahr., half of Australasia having a mean temperature below 83°. Dividing the land into zones of average summer temperature, the following are the areas which would fall to each:—

| Temperature, Fahr. | Area in sq. miles. |
|--------------------|--------------------|
| 50° — 55° .....    | 300                |
| 55° — 60° .....    | 66,300             |
| 60° — 65° .....    | 111,300            |
| 65° — 70° .....    | 74,300             |
| 70° — 75° .....    | 362,300            |
| 75° — 80° .....    | 439,200            |
| 80° — 85° .....    | 733,600            |
| 85° — 90° .....    | 570,600            |
| 90° — 95° .....    | 584,100            |
| 95° and over ..... | 135,400            |

Judging from the figures just given, it must be conceded that a considerable area of the continent is not adapted for colonisation by European races. The region with a mean summer temperature in excess of 95° Fahr. is the interior of the Northern Territory of South Australia north of

the 20th parallel; and the whole of the country, excepting the seaboard, lying between the meridians of 120° and 140° and north of the 25th parallel, has a mean temperature in excess of 90° Fahr.

Climatically, as well as geographically, New South Wales is divided into three marked divisions. The coastal region, which lies between the parallels of 28° and 37° south latitude, has an average summer temperature ranging from 78° in the north to 67° in the south, with a winter temperature of from 59° to 52°. Taking the district generally, the difference between the mean summer and mean winter temperature may be set down as averaging not more than 20°, a range smaller than is found in most other parts of the world. The famed resorts on the Mediterranean seaboard bear no comparison with the Pacific slopes of New South Wales, either for natural salubrity or for the comparative mildness of the summer and winter.

Sydney, situated as it is midway between the extreme points of the colony, in latitude 33° 51' S., has a mean temperature of 62·9°, corresponding with that of Barcelona, the great maritime city of Spain, and of Toulon, in France; the former being in latitude 41° 22' N., and the latter in 43° 7' N. At Sydney the mean summer temperature is 71°, and that of winter 54°. The range is thus 17° Fahr. At Naples, where the mean temperature for the year is about the same as at Sydney, the summer temperature reaches a mean of 74·4°, and the mean of winter is 47·6°, with a range of 26·8°. Thus the summer is warmer, and the winter much colder, than at Sydney. The highest temperature in the shade experienced in Sydney was 108·5°, and the lowest winter temperature 35·9°, giving a range of 72·6°. At Naples the range has been as great as 81°, the winter minimum falling sometimes below the freezing-point. The mean temperature of Sydney for a long series of years was—spring 62°, summer 71°, autumn 64°, and winter 54°.

Passing from the coast to the table-land, a distinct climatic region is entered. Cooma, with a mean summer temperature of 65·4° and a mean winter temperature of 41·4°, may be taken as illustrative of the climate of the southern table-land, and Armidale of the northern. The first-named town stands in the centre of the Monaro plains, at an elevation of 2,637 feet above sea-level, and enjoys a summer as mild as either London or Paris, while its winters are far less severe. On the New England table-land, the climate of Armidale and other towns may be considered as nearly perfect as can be found. The yearly average temperature is scarcely 56·5°, while the summer only reaches 67·7°, and the winter falls to 44·4°, a range of temperature approximating closely to that of the famous health-resorts in the south of France.

The climatic conditions of the western districts of the colony are entirely different from those of the other two regions, and have often been cited as disagreeable. Compared with the equable temperature of the coastal district or of the table-land, there may appear some justification for such a reputation, but only by comparison. The climate of the great plains, in spite of the heat of part of the summer, is very

healthy. The town of Bourke may be taken as an example. Seated in the midst of the great plain of the interior, it illustrates peculiarly well the defects as well as the excellences of the climate of the whole region. Bourke has exactly the same latitude as Cairo, yet its mean summer temperature is  $1\cdot3^{\circ}$  less, and its mean annual temperature  $4^{\circ}$  less than that of the Egyptian city. New Orleans also lies on the same parallel, but the American city is  $4^{\circ}$  hotter in summer. As regards winter temperature, Bourke leaves little to be desired. The mean winter reading of the thermometer is  $54\cdot7^{\circ}$ , and accompanied as this is by clear skies and an absence of snow, the season is both refreshing and enjoyable.

The rainfall of New South Wales ranges from an annual average of 64 inches at Port Macquarie, on the northern coast, and Kiandra, in the Monaro district, to 11 inches at Wilcannia, in the Trans-Darling country. The coastal districts average about 50 inches of rain per annum; on the table-land the mean rainfall is 30 inches, but in the western interior it is as low as 18 inches. The average rainfall of Sydney during forty years was 49·5 inches, while during 1899 a fall of 55·8 inches was recorded.

The climate of Victoria does not differ greatly from that of New South Wales; the heat, however, is generally less intense in summer and the cold greater in winter. Melbourne, which stands in latitude  $37^{\circ} 50' S.$ , has a mean temperature of  $57\cdot3^{\circ}$ , and therefore corresponds with Bathurst in New South Wales, Washington in the United States, Madrid, Lisbon, and Messina. The difference between summer and winter is, however, less at Melbourne than at any of the places mentioned. The mean temperature is  $6^{\circ}$  less than that of Sydney and  $7^{\circ}$  less than that of Adelaide—the result of a long series of observations being:—Spring,  $57^{\circ}$ ; summer,  $65\cdot3^{\circ}$ ; autumn,  $58\cdot7^{\circ}$ ; winter,  $49\cdot2^{\circ}$ . The highest recorded temperature in the shade at Melbourne was  $110\cdot7^{\circ}$ , and the lowest,  $27^{\circ}$ .

Ballarat, the second city of Victoria, about 100 miles west from Melbourne, and situated at a height of about 1,400 feet above sea-level, has a minimum temperature of  $29^{\circ}$ , and a maximum of  $104\cdot5^{\circ}$ , the average yearly mean being  $54\cdot1^{\circ}$ . Bendigo, which is about 100 miles north of Melbourne, and 700 feet above the level of the sea, has a rather higher average temperature, ranging from a minimum of  $31\cdot2^{\circ}$  to a maximum of  $106\cdot4^{\circ}$ , the average yearly mean being  $59\cdot4^{\circ}$ . At Wilson's Promontory, the most southerly point of Australia, the minimum heat is  $38\cdot6^{\circ}$ , and the maximum  $96\cdot4^{\circ}$ , the average yearly mean being  $56\cdot7^{\circ}$ .

During the year 1899 the rainfall at Melbourne amounted to 28·87 inches, the highest total during the last ten years, while for a long series of years it averaged 25·58 inches, with an average of 131 days during the year on which rain fell. At Echuca, during 1899, 14·33 inches fell, and 31·34 at Portland. At Wilson's Promontory the rainfall was 42·63 inches.

As about one-half of the colony of Queensland lies within the tropics, it is but natural to expect that the climate should be very warm. The temperature, however, has a daily range less than that of other countries under the same isothermal lines. This circumstance is due to the sea-breezes, which blow with great regularity and temper what would otherwise be an excessive heat. The hot winds which prevail during the summer in some of the other colonies are unknown in Queensland. Of course, in a territory of such large extent there are many varieties of climate, and the heat is greater along the coast than on the elevated lands of the interior. In the northern parts of the colony the high temperature is very trying to persons of European descent.

The mean temperature at Brisbane, during December, January, and February, is about  $76^{\circ}$ , while during the months of June, July, and August it averages about  $60^{\circ}$ . Brisbane, however, is situated near the extreme southern end of the colony, and its average temperature is considerably less than that of many of the towns farther north. Thus the winter in Rockhampton averages nearly  $65^{\circ}$ , while the summer heat rises almost to  $85^{\circ}$ ; and at Townsville and Normanton the average temperature is still higher.

The average rainfall of Queensland is high, especially along the northern coast, where it ranges from 60 to 70 inches per annum. At Brisbane 50.01 inches is the average of thirty-five years, and even on the plains of the interior from 20 to 30 inches usually fall every year. During 1898, 60.06 inches of rain fell in Brisbane, the number of wet days being 131.

South Australia, extending as it does over about 26 degrees of latitude, naturally presents considerable variations of climate. The southern portions have a climate greatly resembling that of the coast of Italy. The coldest months are June, July, and August, during which the temperature is very agreeable, averaging for a series of years  $53.6^{\circ}$ ,  $51.7^{\circ}$ , and  $54^{\circ}$  for those months respectively. On the plains slight frosts occasionally occur, and ice is sometimes seen on the highlands. The summer is the only really disagreeable portion of the year. The sun at that season has great power, and the temperature frequently reaches  $100^{\circ}$  in the shade, with hot winds blowing from the interior. The weather on the whole is remarkably dry. At Adelaide there are on an average 120 rainy days per annum; during the last sixty years the mean rainfall has been 20.88 inches per annum, while farther north the quantity recorded was considerably less. The country is naturally very healthful, and in evidence of this it may be mentioned that no great epidemic has ever visited the colony.

The climate of the Northern Territory of South Australia is extremely hot, except on the elevated table-lands. Altogether, the temperature of this part of the colony is very similar to that of Northern Queensland, and the climate is equally unfavourable to Europeans. It is a fact worthy of notice that the malarial fevers which are so troublesome to the pioneers of the northern parts of Australia almost, and in some cases

entirely, disappear after the land has been settled and consolidated by stock. The rainfall in the extreme north, especially in January and February, is exceedingly heavy. The average yearly rainfall in the coast districts is about 63 inches.

Western Australia has practically only two seasons—the winter, or wet season, which commences in April and ends in October; and the summer, or dry season, which comprises the remainder of the year. During the wet season frequent and heavy rains fall, and thunderstorms with sharp showers occur in the summer. The extremes of drought and flood experienced in the other colonies are almost unknown in Western Australia, but during the summer months the north-west coast is sometimes visited by hurricanes of great violence. In the southern and early-settled parts of the colony the mean temperature is about  $64^{\circ}$ ; but in the more northern portions the heat is excessive, though the dryness of the atmosphere makes it preferable to most tropical climates. At Perth, in 1898, the mean temperature was  $65.5^{\circ}$ , the maximum being  $106.9^{\circ}$  and the minimum  $37.4^{\circ}$ ; and the rainfall for the same year was 32.04 inches, rain having fallen on 109 days. Observations extending over a period of twenty-two years show the average rainfall at Perth as 33 inches. Although the heat is very great during three months of the year, the nights and mornings are almost always cool, and camping out is not attended with danger owing to there being so little moisture in the air.

Tasmania, protected as it is by its geographical position and by the tempering influence of the surrounding ocean from extremes of heat or cold, enjoys an exceedingly genial climate. The greater part of the island in the settled regions is characterised by a mild and equable temperature, ranging between the extremes of  $20^{\circ}$  to  $44^{\circ}$  in winter and  $78^{\circ}$  to  $96^{\circ}$  in summer. Spring and autumn are the most pleasant seasons of the year, especially the latter, when the mean reading of the thermometer is about  $57^{\circ}$ . The mean temperature of Hobart for the last fifty years has been  $55^{\circ}$ . The richness of its flora is an evidence of the genial nature of the climate of the colony, while the purity of its atmosphere is proved by the small proportion of zymotic diseases recorded in the bills of mortality. The hot winds of the continent of Australia are felt in the northern parts of the island only, and even there they are greatly reduced in temperature by their passage across Bass Straits. Generally speaking, all through the summer months there are alternate land and sea breezes which tend to cool the atmosphere even in the hottest days. The climate is fresh and invigorating, and is much recommended as a restorative for those whose constitutions have been enfeebled by residence in hotter climes. Large numbers of tourists in search of health visit the island every summer. The rainfall, except in the mountain districts, is moderate and regular. The average downfall at Hobart for a long series of years was 25.10 inches, with 167 wet days per annum. In 1898 rain fell on 164 days, the total recorded for the year being 20.40 inches.

The climate of New Zealand is in some respects similar to that of Tasmania, but the changes of weather and temperature are often very

sudden. As the colony extends over more than 10 degrees of latitude, its climate is very varied. That of the North Island is somewhat similar to the climate of Rome, Montpellier, and Milan; while the Middle or Southern Island more resembles Jersey, in the Channel Islands. The mean annual temperature of the North Island is 57°, and of the Middle Island 52°, while the yearly average of the whole colony for each season is as follows:—Spring, 55°; summer, 63°; autumn, 57°; and winter, 48°. The mean temperature of New Zealand is lower than that of similar latitudes in Europe, though higher than is experienced in America on corresponding parallels. The mean temperature of the South or Middle Island is less by about 5° than that of the North Island. Snow very seldom lies on the ground at the sea-level in the North Island, and only occasionally in the South Island. The summits of Ruapehu, the highest mountain in the North Island, and of the great mountain chain in the South Island, are covered with perpetual snow from an altitude of 7,500 feet above the level of the sea. Ice is occasionally seen in winter-time in all parts of New Zealand. The whole colony is subject to strong breezes, which frequently culminate in gales. The rainfall during 1898 varied very much at the several observing stations. At Auckland it amounted to 40·75 inches, while at Wellington there was a fall of 41·96 inches. At Rotorua, in the North Island, 49·98 inches fell during the year, and at New Plymouth, on the west coast, 49·06 inches were recorded. At Dunedin, on the east coast of the Middle Island, the rainfall amounted to 34·14 inches, while at Hokitika, on the west coast, no less than 124 inches fell during the year. Periods of lasting drought are almost unknown in the colony; indeed, it is very seldom that the records of any station show the lapse of a whole month without rain. The number of days in the year on which rain fell varied from 101 at Lincoln to 204 at the Chatham Islands.

The following table shows the distribution of rainfall area in Australasia:—

| Rainfall.           | Rainfall area in square miles. |           |              |              |
|---------------------|--------------------------------|-----------|--------------|--------------|
|                     | Australia.                     | Tasmania. | New Zealand. | Australasia. |
| Under 10 inches ... | 1,219,600                      | .....     | .....        | 1,219,600    |
| 10 to 20 „ ...      | 843,100                        | 9,440     | .....        | 852,540      |
| 20 to 30 „ ...      | 399,900                        | .....     | 69,650       | 469,550      |
| 30 to 40 „ ...      | 225,700                        | 8,380     | 17,410       | 251,490      |
| 40 to 50 „ ...      | 140,300                        | 8,380     | 17,410       | 166,090      |
| 50 to 60 „ ...      | 47,900                         | .....     | .....        | 47,900       |
| 60 to 70 „ ...      | 56,100                         | .....     | .....        | 56,100       |
| Above 70 „ ...      | 14,100                         | .....     | .....        | 14,100       |
| Total.....          | 2,946,700                      | 26,200    | 104,470      | 3,077,370    |