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THE CLIMATOLOGY OF GLASGOW

BY

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Fig. 1. View of the Observatory from ESE.

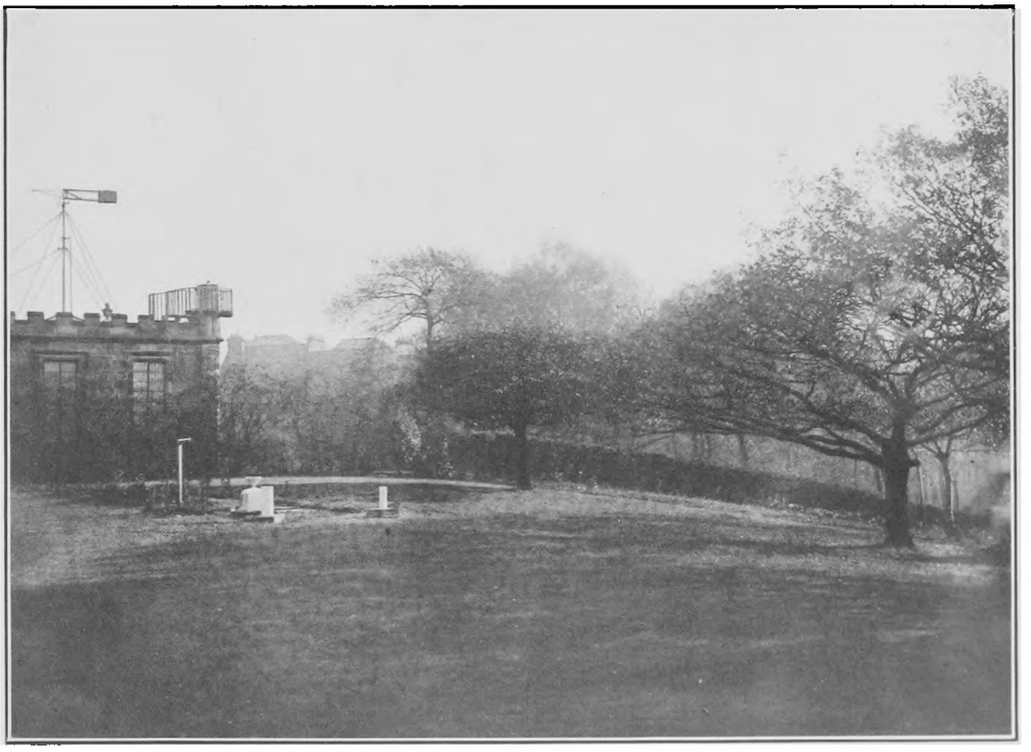

Fig. 2. View of the Observatory from WNW.

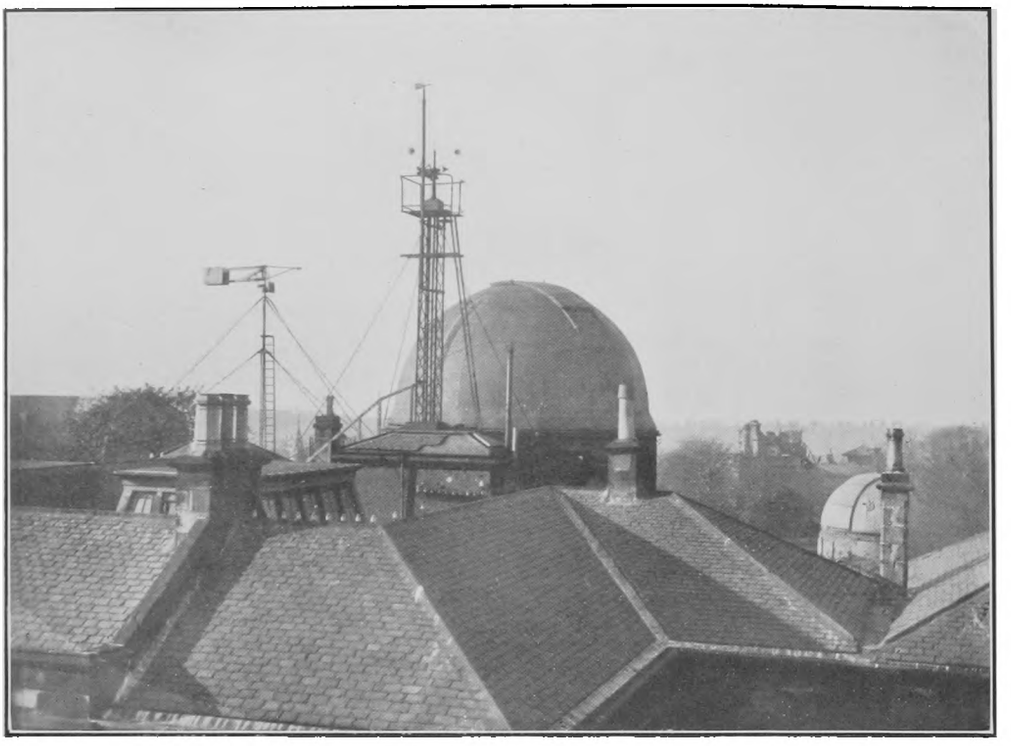

Fig. 3. Roof of the main building from ENE. showing the three Anemometers.

Fig. 4. North front of a detached building, showing the Thermometer Screen.

PREFACE

METEOROLOGICAL observations have been recorded at the Glasgow University Observatory since 1843 under the successive superintendence of Professors Nichol and Grant and myself. In the first 25 years, 1843 to 1867, they comprise eye-observations at 9 a.m. and 9 p.m., Sundays excepted, of the atmospheric pressure and of the temperatures indicated by dry and wet bulb thermometers. Since 1845 they further include the daily maximum and minium temperatures in the shade. Systematic observations of the daily rainfall were begun in 1860, the rain until then having been measured at irregular intervals. The records from 1858 May to 1859 December are missing. During the same period of 25 years the direction and pressure of the wind were automatically registered but not tabulated.

In 1868 January Dr. Robert Grant inaugurated an extensive programme of meteorological observations under the auspices of the Meteorological Office, London.

The Meteorological Office, with the sanction of the University, equipped the Observatory as one of their Stations of the First Order with self-registering and other apparatus, and maintained it as such for 15 years. In 1884 the Office placed it among the Stations of the Second Order, reducing the annual grant at the same time, but agreed to leave their instruments on the condition that the work of the meteorological department of the Observatory be continued to its whole extent and that adequate local support be given towards its maintenance. In the two years, 1886 and 1887, and, after a lapse of ten years, again, from 1898 till 1917, the department obtained substantial yearly grants from the Corporation of Glasgow and the Clyde Trustees. In March 1913 the Office discontinued the arrangement made in 1884 and withdrew its financial support. In consequence the barograph and thermograph were returned to them after having been in operation for 45 years, while the other recording instruments, which were purchased by the University, have been continued in use as in former years. Until 1913 the instruments were tested annually by an inspector on behalf of the Meteorological Office.

The Observatory lies in its own grounds of two acres, in the north-western section of the city, about half-a-mile from the nearest boundary. It has been encircled more and more in the course of time by buildings which, from the east round by south to west, now extend to a distance of from two to ten miles. In the other directions the houses in the immediate neighbourhood are detached villas. The Observatory occupies the top of one of the numerous hills on which Glasgow is built, and only towards the south the ground gradually falls off for a mile to the extent of 50 metres. On the roof of the Observatory building, where the anemometers are erected, the horizon is practically unobstructed (see Fig. 3), except on the eastern horizon, where neighbouring high dwelling houses rise to 3° above the horizon. The sunshine recorder is mounted on the roof (see Fig. 2, corner of building). The three rain-gauges stand on a large lawn to the west of the Observatory buildings, and are partly sheltered by three old trees (see §§ 20, 21). At the same place the radiation thermometers are kept (see Fig. 2). The other thermometers are placed in a screen at the north front of a detached observing tower, which stands towards the east of the Observatory proper, the ground in the neighbourhood being partly covered with grass, partly with bushes and evergreen shrubs (see Fig 4). The position of the Robinson Anemometer was changed in 1893. Otherwise no change whatever has taken place in the positions and housing of the instruments.

In 1893, when I took up the direction of the Observatory, 25 years' observations had accumulated, which had been duly tabulated and combined to monthly mean values. I then began to work out the statistics on the lines published in this paper which were suggested by inquiries from engineers and lawyers. Thanks to the

successive grants of the public bodies above mentioned, which enabled me to employ a clerk, this work has been kept up-to-date. Since 1908, when 40 years' observations were available, these statistics have been ready for the press, but could not be published for want of funds.

Owing to the circumstances above mentioned the tables published in this *Memoir* are not based on observations of the same period. Those which utilise the data obtained with the barograph and thermograph belong to the 45 years 1868 to 1912; others referring to the extremes of temperature and wind contain the 50 years' observations, 1868 to 1917. Rainfall and sunshine have been recorded from 1874 and 1880 onwards, and the respective tables belong to the periods 1874 to 1917 and 1881 to 1920. A few tables giving the frequency of wind and rain have not been extended beyond the original limit 1908 because the results are quite definite.

The yearly variations of the several meteorological elements have been calculated not only at intervals of a month but also at intervals of five days, with the exception of the atmospheric pressure.

Secular variations have been derived for the period 1868 to 1920. In the case of atmospheric pressure and temperature, which were observed only twice a day from 1913, the observations were duly reduced for daily variations.

An attempt has been made to represent the average records (till 1908) by formulae (see Nos. 10, 19, 24, 31, 38, 40, 45, 67), and special investigations are included in the text in §§ 46 and 56.

Greenwich Mean Time has been used throughout, except for sunshine.

I have to express my indebtedness to Mr. James Connell, who extended most of the tables from 1908 onwards and whose long acquaintance with the meteorological register has been of great value to me.

I desire to thank Dr. G. C. Simpson, F.R.S., Director of the Meteorological Office, whose initiative has made possible the publication of these statistics.

L. BECKER.

The University, Glasgow,

1921 *September* 20.

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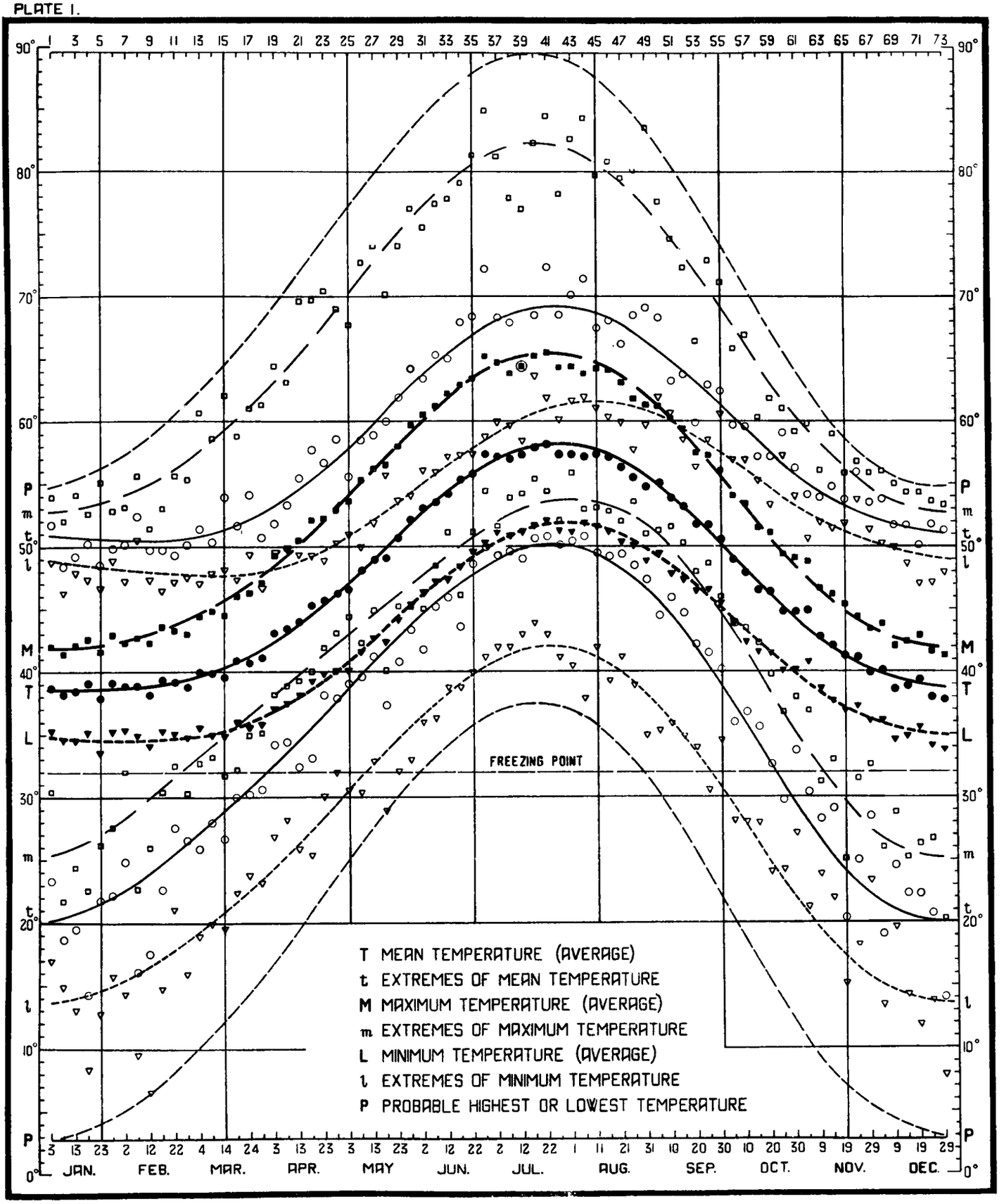

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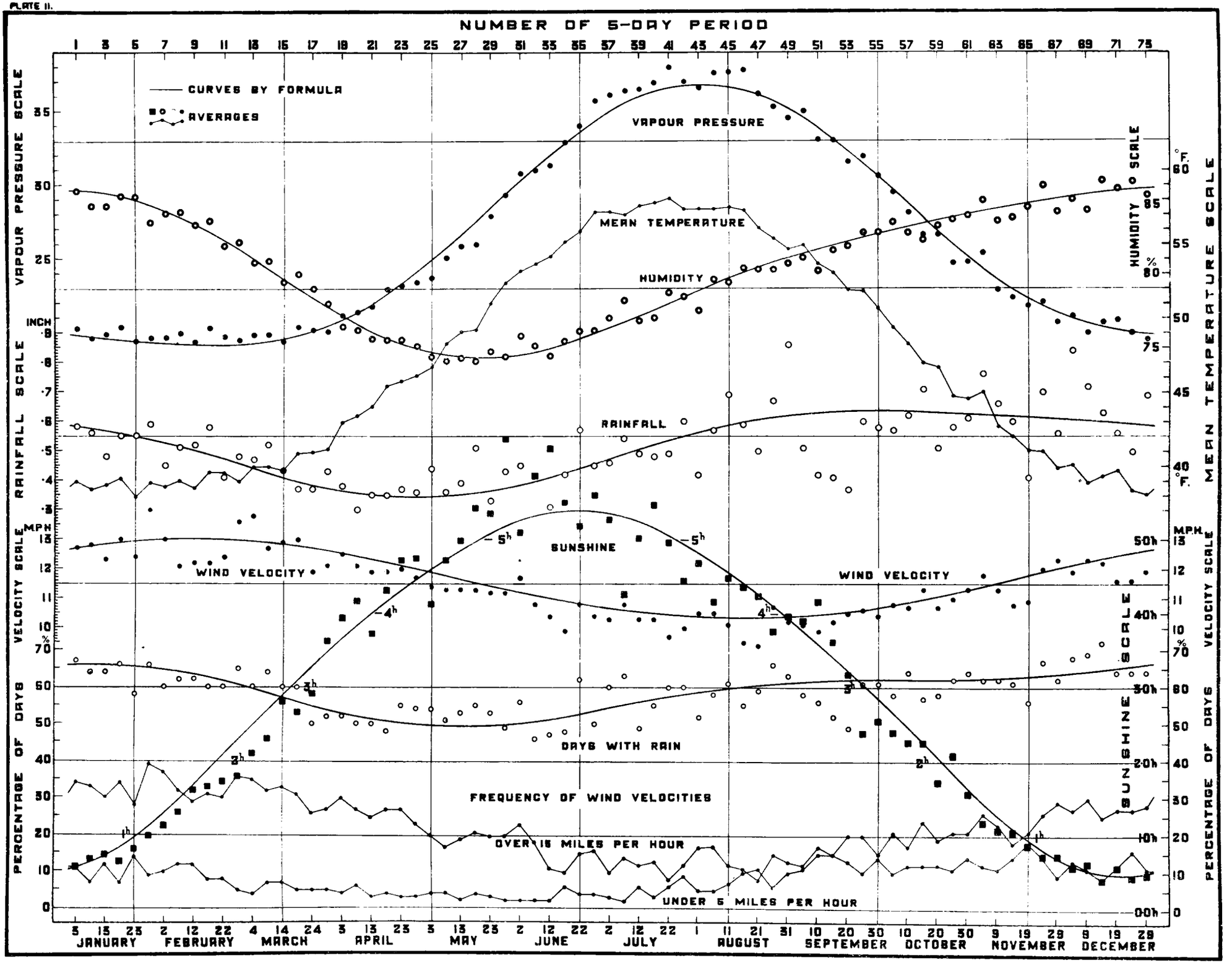
PLATE II.


NUMBER OF 5-DAY PERIOD
1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51 53 55 57 59 61 63 65 67 69 71 73
CURVES BY FORMULA
AVERAGES
VAPOUR PRESSURE
MEAN TEMPERATURE
HUMIDITY
RAINFALL
SUNSHINE
WIND VELOCITY
DAYS WITH RAIN
FREQUENCY OF WIND VELOCITIES
OVER 15 MILES PER HOUR
UNDER 5 MILES PER HOUR
VAPOUR PRESSURE SCALE
RAINFALL SCALE
INCH
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%
°F.
MEAN TEMPERATURE SCALE
MPH.
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PERCENTAGE OF DAYS
SUNSHINE SCALE
5 15 25 2 12 22 4 14 24 5 13 25 5 13 25 2 12 22 2 12 22 1 11 21 31 10 20 30 10 20 30 9 19 29 8 19 29
JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER

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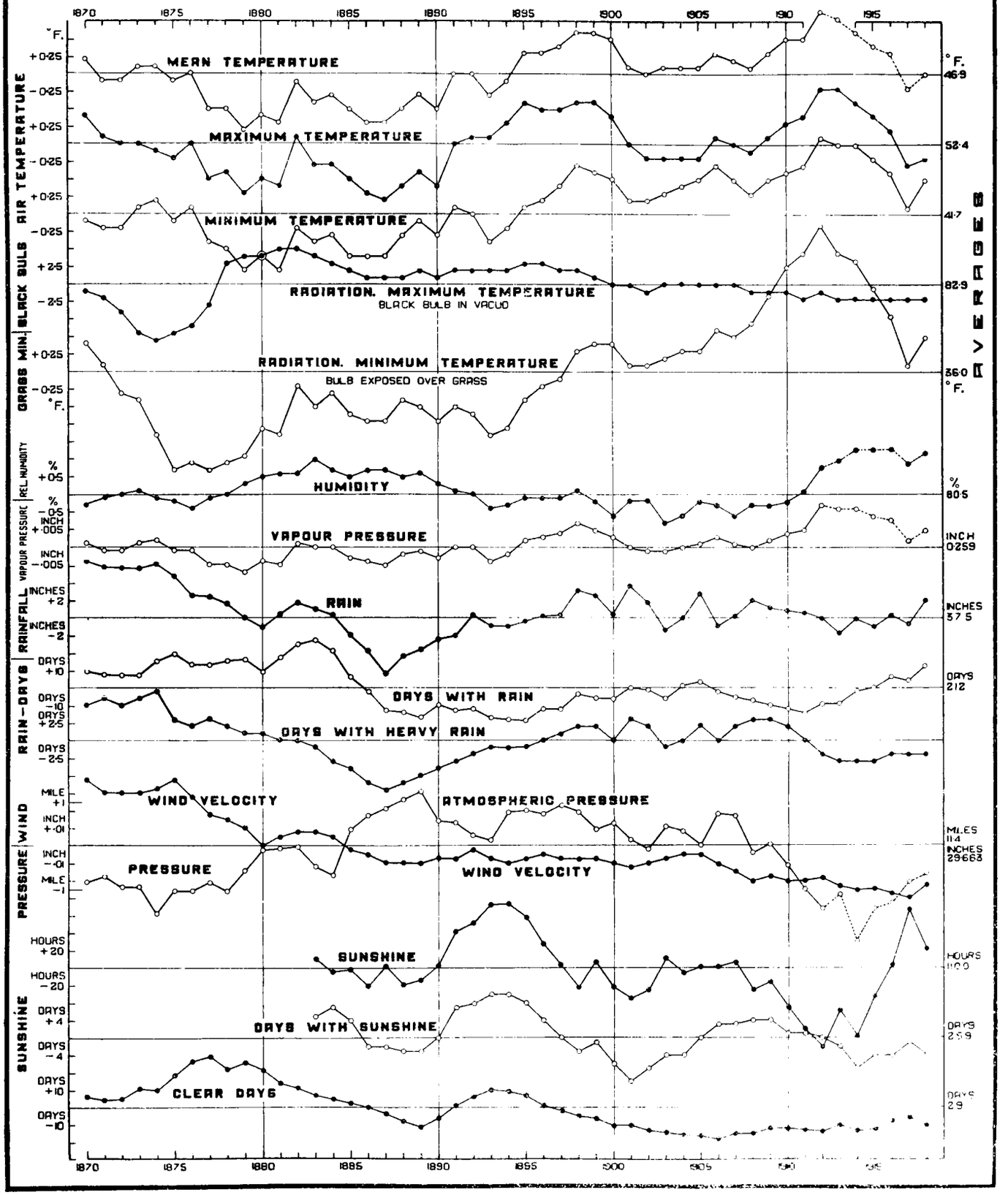
SECULAR VARIATIONS.



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THE CLIMATOLOGY OF GLASGOW

Atmospheric Pressure

1. *Instruments.**—The atmospheric pressure was photographically registered by the following method. Immediately behind the top of the mercury barometer a narrow slit was fixed parallel to the tube of the barometer, and a beam of light was sent through this slit with the result that the length of the illuminated portion of the slit depended on the height of the mercury. This luminous line was photographed on paper stretched on a drum rotating once round in 48 hours. A zero mark, compensated for temperature, and placed immediately behind the slit, constantly shut off the light from a short piece of the slit. Every second hour the light from the barometer was automatically shut off during four minutes, 58 m. to 2 m. Greenwich mean time. The developed photograph shows a black band, whose breadth depends on the height of the barometer. The band is crossed lengthwise by the white zero line and crosswise by the equi-distant two-hour lines. The scale of the photograph is about double that of the barometer. The cistern of the standard barometer is 184 feet above sea-level. Readings were taken five times a day—at 10 a.m., noon, 2, 6, and 10 p.m. Greenwich mean time, and also at 9 a.m. and 9 p.m. local mean time. After the dismounting of the barograph in 1913 the standard barometer has been read only at 9 a.m. and 9 p.m. local mean time.

2. *Tabulation.*—The photographic trace was measured by means of a measuring apparatus. This apparatus had a pointer which was moved by means of rack and pinion in the direction of the hour-lines, and whose position was read by a scale and vernier to 0·001 inch. The scale gave very nearly the barometer reading in inches. The eye-observations of the standard barometer determine the corrections of the measurements. The corrected measurements made for each hour were tabulated and will be referred to here as the " hourly pressure." 329 traces, 2·0 per cent. of the total number, are incomplete, and of these two-thirds belong to the six years 1868–73. There are no missing traces in the last six years. In some cases, not included in this number, the trace is defective at hours for which standard readings are available, and it can, therefore, be utilised as if it were complete ; and in a few cases where one to three readings are missing, the curve can be interpolated with all desirable accuracy. The 329 incomplete traces are all rejected in the calculation of the average hourly pressure in the 45 years. The mean of the 24 hourly pressures gives the " mean daily pressure." The mean daily pressure on days for which an incomplete or no trace is available is obtained either from two readings of the standard barometer at 10 a.m. and 10 p.m. Greenwich mean time, or from these and two additional ones at 4 a.m. and 4 p.m., all duly reduced for daily variation. There is not a day for which the mean daily pressure is not available.

3. *Mean values for each month, year, and five-year period, 1868–1912.*—Table 1 gives for each month the arithmetic mean of the mean daily pressures (§ 2) on the 31, . . . days, or the mean monthly pressure reduced to 32° F. but not to sea-level nor to latitude 45°. For example, the mean pressure for January 1868 is 29·663 − 0·113 = 29·550. The reduction to sea-level is +0·203 + 0·003 = 0·206. The mean pressure at sea-level in the latitude of the station is, therefore, 29·756 inches.

* A fuller description of the recording instruments, viz., the photographic barograph, the photographic thermograph, the Robinson anemograph and the Beckley raingauge, together with an account of the method of tabulation of the records is published in the *Annual Report of the Meteorological Committee* for 1867, '68 and '69. The sunshine recorder is described in the *Observer's Handbook* M.O. 191 where a description of the method of measuring the records is also given.

Table 1 also gives the mean yearly values in the column "year." Thus the mean pressure for 1868 is 29·663 — 0·027, and the reduction to sea-level is + 0·203.

Secular variation, 1868–1920.—Five-yearly means of the departures given in in Table 1, column "year," are compiled in Table 75.

The figures from 1913 to 1920 are based on only two observations per day and corrected for daily variation.

A graph of the figures is drawn on Plate III.

4. *Average values for 45 years, 1868–1912.*—Daily curves, Table 2. The average was calculated of all hourly pressures (see § 2) belonging to hour 1 in January 1868, and the same was done for all the other hours. Incomplete traces were bodily rejected. Similar calculations were effected for all the months in the 45 years, 1868–1912. The results for January were then compiled and averages over the 45 years taken for each hour. A similar calculation was made for each of the other 11 months. 16,107 curves were utilised: these constitute 98·0 per cent. of the possible total. The last column in the table contains the number, in percentage, of the rejected curves, *e.g.*, in January 3·5 per cent. of 1,395, or 49. Example: The average pressure at station level at hour 1 in January is 29·668 + 0·001 inches.

The mean values for the several months given in Table 2 differ from those given in Table 1, the former containing only days with complete traces (96·5 per cent. in January), the latter all the days.

The yearly curve is based on the mean pressures for each day. Table 1 gives on line "1868–1912" the departures from 29·663 of the averages over 45 years of the mean monthly pressures. The departure for January, reduced to sea-level, is — 0·003 + 0·003 inch.

5. *Extremes.*—Table 1 gives in the last two columns the highest and lowest records in each year, and at the foot of the table those in the several months, and also the range of the individual readings of the traces. It is remarkable that both the lowest and highest pressures occur in autumn and winter. Both extremes belong to January. The reduction to sea-level is obtained as indicated in § 3. The highest pressure, reduced to sea-level, is 31·10 and the lowest 27·43 inches.

TEMPERATURE

6. *Instrument.*—The temperature was photographically recorded. The bulb of the registering thermometer was placed in a large wooden screen, consisting of louvres and fixed to the north wall of a detached building (see Fig. 4). The ground below the screen is covered with turf, and the bulb was seven feet above the ground and not sheltered from radiation from the ground. The standard thermometer was fixed near it and at the same height. Two thermometers with wet bulbs were similarly placed for the determination of humidity. The thermograph thermometers were dismounted in 1913, while the dry and wet bulb standard thermometers have remained in position. Maximum and minimum thermometers also hang in the screen, the bulbs being 12 inches above the other bulbs.

The stems of the dry and wet registering thermometers passed into the building, where for each thermometer the height of the mercury and also that of a fixed mark were continuously photographed on paper stretched on a revolving drum by a device similar to that described in § 1. Eye readings of the standard dry and wet thermometers were taken five times each week-day—two minutes before 10 a.m., noon, 2, 6, 10 p.m. Greenwich mean time, and twice on Sundays. They were also read at 9 a.m. and 9 p.m. local mean time, together with the maximum and minimum thermometers.

In Tables 12 to 16 and 75A the temperatures read in 1845 to 1867 have been included. There is no record as to the thermometer exposure during that period, nor about the thermometers used. They were certainly not kept in the screen

described above, as the building, to whose north front it is fixed, was built in 1863. There is, however, a tradition that a small screen, three feet square, with the thermometers about four feet from the ground, stood on the ground at some distance from the main building of the Observatory, and to the north of it, and about 50 yards due west of the present screen.

7. *Tabulation.*—The photographic trace was placed under a glass scale and the temperature at each hour read off to a tenth of a degree Fahrenheit. The corrections of these readings were obtained from the eye-observations of the standard thermometers, reduced to the Kew Standard. The mean of the 24-hourly temperatures on a day is the mean daily temperature. The mean of the 31, . . . mean daily temperatures for a month is called here the mean monthly temperature, and similarly for the year. The maximum and minimum temperatures were obtained from the highest and lowest points of the daily trace, and they are not the highest and lowest of the tabulated hourly temperatures.

There are 269 days, half of which belong to the first six years, on which the trace for the dry bulb thermometer is incomplete owing to insufficient illumination or to faults in the photographic paper; and during six complete months, 1885 June to October and 1892 April, the thermograph was not in use as the thermometers were broken. On these 452 days for which there are incomplete or no photographic records the mean daily temperature was obtained from the mean of the eye-observations of the maximum and minimum thermometers by applying to it a correction derived from the daily temperature curve.

In deriving the mean daily temperature of the wet bulb thermometer on days which have incomplete traces the same rules were observed as for atmospheric pressure. (§ 2.)

There is not a day on which the mean temperatures of the dry and wet bulb thermometers are not available. The temperatures are given in Fahrenheit degrees.

8. *Mean values for each month, year, and five-year period, 1868–1912.*—The mean monthly temperature is given in Table 3; *e.g.*, each figure for January is the arithmetic mean of 31 mean daily temperatures (see § 7). *Example:* The warmest January belongs to 1898, with a mean temperature of 44°·4, which is 5°·7 above the average, 38°·7, for 45 years.

In the same way Tables 5 and 6 were constructed from the daily maximum and minimum temperatures (see § 7). *Example:* In January 1868 the daily maximum temperature was on an average 42°·1 + 1°·4 = 43°·5. Tables 5 and 6 also supply the highest and lowest temperatures which have occurred in each month and year. Thus the temperature has never exceeded 62°·0 during any March from 1868 to 1912, nor has it fallen below 19°·0. Again, 77°·6 is the highest recorded temperature for the year 1880 and 15°·2 the lowest.

Secular variations, 1868–1920.—Plate III. The mean temperature in each five successive years appears in Table 75, each figure being the mean of five successive quantities in column " year " of Table 3. Similar means are given for maximum and minimum temperatures as calculated from Tables 5 and 6, column "year." The figures from 1913 to 1920 are based on the observations taken twice daily. (See § 7.) They are reduced with due regard to the daily curves. (§ 9.)

9. *Average values for 45 years, 1868–1912.*—Curves. For each month the temperatures at the same hour of the day were combined to a mean value, all those being excluded which belong to an incomplete daily trace. The latter, together with the missing traces, amount to 2·7 per cent. of the complete number. The averages over 45 years of these hourly mean values are given in Table 7. The last column shows the number of the rejected and missing curves expressed in percentage of the possible total. Thus the mean temperature for the year belongs to 97·3 per cent. of the days.

I have shown elsewhere* that the daily curves may be calculated on the basis of physical considerations.

At the foot of Tables 3, 5, and 6 the average values of the mean, maximum, and minimum temperatures in the period 1868–1912 are given for each of the 12 months.

The result of a similar calculation for each five-day period appears in Table 8 in columns 1, 4, and 7. The table gives further, under the heading " Extremes " in column 2, the highest, and in column 3, the lowest, of the maximum temperatures observed on one day in the 45 years, and also corresponding quantities for the minimum and mean temperatures. All these quantities are shown on Plate I by circles, squares, and triangles.

Example : In the period January 1 to 5, 1868 to 1912, the mean temperature was 38°·9 (column 7), and the daily maximum and minimum temperatures were on an average 42°·2 and 35°·5 (columns 1 and 4). Of the maximum temperatures observed in this period the highest on a certain day was 53°·9 and the lowest 27°·6, while the extreme limits of the daily minimum temperature were 48°·8 and 17°·0. For every day the mean temperature was within the limits 51°·7 and 23°·3 (columns 8 and 9).

10. *Formulae.*—In each column of Table 8 the means of each two figures which belong to two periods equally distant from the solstices constitute a sequence of figures which increase from the winter solstice to the summer solstice. The quantities in each column are well represented by the formula :—

$$a + b \sin \lambda + c \cos 2\lambda - 9°{\cdot}55 \cos (\phi - \delta) \cos \lambda$$

where a, b, and c are constants, λ the longitude of the sun, δ its declination, ϕ the latitude of Glasgow, 55°·88, and thus $(\phi - \delta)$ is the meridian zenith-distance of the sun. It is remarkable that the last term is the same for all the columns, and that c is small. The curves defined by the formula (see Plate I) agree with the observations as well as a smoothed curve representing the observations.

The values of the constants given below were calculated from the yearly curves 1868 to 1907, which are practically identical with the yearly curves 1868 to 1912. Plate I also belongs to the period 1868·0 to 1907.

Plate I. Curve			*a* °F	*b* °F	*c* °F
M	1	Average maximum temperature ..	52·23	10·60	− 0·40
m	2	Highest do. ..	66·2	13·8	− 0·5
m	3	Lowest do. ..	39·6	12·6	+ 1·7
L	4	Average minimum temperature ..	41·55	6·95	− 0·50
l	5	Highest do. ..	53·3	4·3	− 0·2
l	6	Lowest do. ..	27·0	13·0	+ 0·3
T	7	Average mean temperature	46·73	8·37	− 0·50
t	8	Highest do.	58·1	7·8	− 0·9
t	9	Lowest do.	34·7	13·8	+ 0·8
P	10	Probable highest temperature	71·3	16·5	0
P	11	Probable lowest temperature	19·2	16·5	0
	12	Average maximum temperature in sun..	82·9	32·6	+ 3·0
	13	Highest do. ..	115·6	30·3	+ 7·3
	14	Lowest do. ..	44·4	17·8	+ 1·2
	15	Average minimum temperature on grass	35·6	7·0	− 0·8
	16	Highest do. ..	51·0	4·1	− 0·5
	17	Lowest do. ..	17·0	11·8	+ 0·1

The curves Nos. 13 and 17 belong to a transparent atmosphere, and Nos. 14 and 16 to an overcast day. In calculating the probable highest temperature, No. 10, the assumption has been made that these temperatures are also represented by a

* *Proc. R. Soc., Edin.*, Vol. XL, Part I, No. 11.

curve of the above type. The curve passes through two observed points, 82°·1 in period August 29 to September 2, and 56°·1 in period December 26 to 30, which have been so chosen that all the other observed temperatures fall below the curve temperatures. The probable lowest temperature, No. 11, is similarly defined, the exceptionally low temperatures being 6°·6 in period February 10 to 14, and 29°·0 in period May 16 to 20. As temperatures so much above (or below) curve No. 2 (or No. 6) have occurred only twice in 40 years, it is most unlikely that these curves will be reached again in these five-day periods, or that higher (or lower) temperatures than shown by the curves No. 10 (or No. 11) will occur in the other five-day periods.

The following results are found by subtraction :—

No. 2 *minus* No. 3, the range of maximum temperature is .. .. $26°\cdot6 + 1°\cdot2 \sin\lambda - 2°\cdot2 \cos 2\lambda$

No. 5 *minus* No. 6, the range of minimum temperature is .. .. $26°\cdot3 - 8°\cdot7 \sin\lambda - 0°\cdot5 \cos 2\lambda$

No. 8 *minus* No. 9, the range of mean temperature is .. .. .. $23°\cdot4 - 6°\cdot0 \sin\lambda - 1°\cdot7 \cos 2\lambda$

No. 1 *minus* No. 4, the average daily range is .. .. $10°\cdot68 + 3°\cdot65 \sin\lambda + 0°\cdot10 \cos 2\lambda$

and, in view of the smallness of the third term, has its maximum and minimum at the solstices.

No. 2 *minus* No. 6, the greatest range on the average is .. .. .. $39°\cdot2 + 0°\cdot8 \sin\lambda - 0°\cdot8 \cos 2\lambda$

and therefore has almost a constant value throughout the year.

No. 10 *minus* No. 11, the greatest possible range, is .. .. .. $52°\cdot1$

and is a constant throughout the year.

No. 7 *minus* mean of Nos. 1 and 4 becomes .. .. $0°\cdot16 - 0°\cdot41 \sin\lambda - 0°\cdot05 \cos 2\lambda$

and is the correction to be applied to the arithmetic mean of the maximum and minimum temperatures to reduce it to the mean temperature.

No. 13 *minus* No. 2 has the value .. $49°\cdot4 + 16°\cdot5 \sin\lambda + 7°\cdot8 \cos 2\lambda$

and is the excess of the temperature in the sun over the maximum temperature of the air on clear days.

The night temperatures in the screen and on the ground differ on an average by $6°\cdot0 + 0°\cdot3 \cos 2\lambda$ (No. 4 *minus* No. 15).

The night temperatures on cold nights with a transparent atmosphere differ in the screen and on the ground by $10°\cdot0 + 1°\cdot2 \sin\lambda + 0°\cdot2 \cos 2\lambda$ (No. 6 *minus* No. 17).

The maximum value belonging to curve No. 17 is 29°, and accordingly frost may occur on the ground at night at any time of the year.

According to curve No. 6 the temperature of the air will generally be above freezing point at night from May 11 to September 26, and according to curve No. 11 night frost will certainly not occur between June 2 and August 31.

In a paper published elsewhere* I have shown that the values of the maximum temperatures observed are grouped round its mean or rather its middle value in accordance with the law of errors. I have also pointed out that this scattering of the individual values can be expressed by a figure representing the probable scattering, which is defined analogously to the probable error and calculated by the same rules. The probable scattering is $\pm$ 3°·3 F. in the case under consideration.

11. *Statistics of unseasonable weather.*—In this section a period will be called " warm " or " cold " if its mean temperature is above or below the average for the period.

* *Proc. R. Soc., Edin.*, Vol. XXXVII, Part III, No. 13.

Table 9 contains the result of countings of the number of consecutive warm and cold months. *For example :* Once in 50 years there are 13 (15) consecutive warm (cold) months, and there are 62 warm months out of 600 months which are followed and preceded by a cold month.

According to the statistics in Table 11, after a warm or cold January a change occurred in February 29 times out of 50, and 21 times there was no change. With the exception of January and April there is a greater probability that the weather continues in the next month than that there is a change in point of temperature. For February and August the chances are two to one. Every year brings a modification of this table and the results cannot be considered as final.

Similar statistics are given in Tables 10 and 11 for a quarter of a year. Twenty-three cold quarters out of 200 were followed and preceded by a warm quarter, and it happened once that there were eight consecutive cold quarters. By Table 11 the probability that warm or cold weather in the first quarter of the year continues in the second quarter is greater in the proportion 31 : 19 than that of a change, and the corresponding proportion is still greater for the second quarter.

By Table 11 there are about even chances that the excess or deficiency of warmth in a period of half a year continues in the next period and that it does not.

12. *Frequency of high and low temperatures.*—The highest and lowest temperatures ever observed in a month or five-day period appear in Tables 5, 6 and 8 (see §§ 8 and 9).

Table 12 gives the number of warm days. *Example :* There were 158 days in 1868·0–1918·0, or about three days per year on an average, on which the temperature in the shade reached 75°, *viz.*, 2 in May, 59 in June, 58 in July, 32 in August, and 7 in September. The table also gives the number of days for temperatures higher than 75°.

Similar statistics are given for high minimum temperatures in Table 13—" Warm Nights " ; for low maximum temperatures in Table 14—" Cold Days " ; and for low minimum temperatures in Table 15—" Cold Nights."

Table 16 exhibits the distribution of such days in each year. In the columns " cold days " and " cold nights " the consecutive months, November to April, are treated together and the figures are entered to the year to which January to April belongs. The cold days and nights thus belong to the winter which precedes the summer whose warm days and nights are entered on the same line.

The tables give the statistics also for the years 1845 to 1867 with the exception of 1858–9, for which the records are missing. The results are not comparable with those of the next 50 years because the observations were taken under other conditions. It seems that before 1868 the thermometers were housed in a louvred screen standing to the north of a low observing building (Transit Room) and exposed to the sun's radiation almost all day in summer. On the other hand, the present screen is not exposed to solar radiation except in May, June, and July, between 5 and 7 a.m. and after 5 p.m.

13. *Periods of warm weather.*—In the statistics given in Tables 17 and 18 all those periods are taken into account in which during at least seven days the maximum temperature in the shade exceeded 65° on each day and reached 70° on at least one day.

Example, from Table 18 : In 1868 there were three such periods comprising together 28 days, of which two periods lasted from 7 to 10 days and one from 11 to 14 days. In the three years 1868–70 there were six such periods containing together 81 days, the maximum number in any three successive years. Also refer to Tables 12 to 16, " Warm Days."

A monthly arrangement of the warm periods is presented in Table 17, the period being entered to the month in which it begins. The periods lie between May 6 and September 5.

During all these periods the atmospheric pressure was high and at first steady, falling towards the end of the period.

14. *Periods of frosty weather.*—Similar statistics are given in Tables 19 and 20 for frosty weather. For example, in winter 1895, *i.e.*, November 1894 to March 1895, there was one period of from 3 to 5 days in which on each day the mean daily temperature was below freezing point, one period lasting 6 to 8 such days, and two periods lasting each from 9 to 11 such days. The total number of these frosty days is 29.

Water Vapour

15. *Instrument.*—The records utilised below were, with a few exceptions, obtained photographically from the dry and wet bulb thermometers. (See § 6.)

16. *Tabulation.*—The traces of the wet bulb thermometer are measured and reduced as explained in § 7. All those traces were neglected which were incomplete or had no corresponding trace of the other thermometer. When the temperature of the air is slightly below freezing-point it often happens that the wet bulb thermometer indicates a higher temperature than the dry bulb thermometer ; traces showing such an anomaly are treated as incomplete. The rejected and missing traces constitute 5·8 per cent. of the complete number. The monthly averages of the hourly values are thus based for both thermometers on an equal number of records appertaining to the same days. On account of the incomplete traces of the wet bulb thermometer the daily curves of temperature belonging to the dry bulb thermometer to be employed here (Table 22) differ from those in Table 7.

On the other hand, the daily mean values constitute an uninterrupted series of data. Those for the dry bulb thermometer are the identical values employed in section " Temperature." (Refer to § 7.)

The calculation of humidity, etc., is based on *Glaisher's Hygrometrical Tables*,* fifth edition, London, 1869, and in the case of humidity it was effected by means of a series of tables interpolated from Glaisher's Tables and printed by the Meteorological Council in 1882.

The humidity is not calculated from the individual hourly observations, but only for each day from the mean temperatures given by the dry and wet bulb thermometers, and for each month from the monthly averages of the temperatures at each of the 24 hours. To express this in symbols, let H (τ, τ^1) designate the relative humidity belonging to dry and wet bulb temperatures τ and τ^1, and let [ ] indicate mean values. Then H $([\tau], [\tau^1])$ was calculated instead of $[H(\tau, \tau^1)]$ for each day and also for each month at each of the 24 hours.

The vapour pressure, $P(\tau)$, in air saturated with water vapour at temperature, τ, as given by the dry bulb thermometer, is interpolated from Glaisher's Table III. The vapour pressure, P, at humidity H is given by $P = P(\tau)\, H$. This calculation was made for each of the twelve months and for each of the five-day periods from the average values of τ and H over 45 years, 1868 to 1912. It is, therefore, assumed that $P([\tau])\,[H]$ is a sufficient approximation to $[P(\tau)\, H]$.

17. *Mean values for each month, year, and five-year period, 1868–1912*—Tables 3 and 4 give corresponding values of the mean temperatures recorded by the two thermometers. (See § 8.)

Table 21 contains the mean monthly humidity, each figure being the arithmetic mean of the 31, etc., daily values. It is not calculated from the data in Tables 3 and 4.

The mean vapour pressure is not published here.

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* *See* F. J. W. Whipple " The Rationale of Glaisher's System of Hygrometry " *Proc. Phys. Soc.* Vol. XXXIV. Part II. 1922.

Secular variation, 1868–1920—Refer to § 8 for explanation. The figures in Table 75 and the graph on Plate III are based on the figures in column " year " of Table 21.

18. *Average values for 45 years, 1868–1912.*—Tables 22 and 23 contain for each month the hourly temperatures of dry and wet bulb thermometers, and in the last columns the number of traces which are missing or incomplete, in percentage of the complete number. The figures in Table 22 differ from those given in Table 7 because they are based on different numbers of curves.

Table 24 gives for each month and hour the average value of the 45 calculated values of humidity (see § 16). It is not based on the data of Tables 22 and 23, but on the data from which these tables were derived. On the other hand, Table 25, vapour pressure, is calculated from Tables 22 and 24.

The similarity of the daily curves of temperature, humidity, and vapour pressure is striking.

The mean monthly values of the temperatures and humidity are the quantities at the foot of Tables 3, 4, and 21. Analogous values were derived also for each five-day period. Each figure in Table 26 under the heading H is the average of 5×45 mean daily values of humidity. From this column and the mean temperature, in Table 8, the figures in the second column, " vapour pressure," are calculated.

19. *Formulae.*—Refer to § 10. The yearly curves representing the figures in Table 26 are of the same type as those for temperature. The formulae are :—
Humidity (in per cent.)

$$= 80{\cdot}57 - 5{\cdot}06 \sin \lambda - 0{\cdot}69 \cos 2\lambda - 3{\cdot}09 \cos (\phi - \delta) \cos \lambda.$$

Vapour Pressure

$$= 0{\cdot}263 + 0{\cdot}0670 \sin \lambda - 0{\cdot}0050 \cos 2\lambda - 0{\cdot}1066 \cos (\phi - \delta) \cos \lambda.$$

The calculated curves are drawn on Plate II. They intersect the observed curves in 28 and 32 points, respectively.

Rainfall

20. *The raingauges.*—From 1868 to 1873 an ordinary raingauge was employed, and its uncorrected measurements (see § 21) of the daily rainfall and the number of days with rain are included in Tables 27 ; 29, column 3 ; 34 ; 35 ; 36. About this raingauge nothing certain is known.

All the other figures are based on records obtained with a self-registering Beckley raingauge during the 44 years 1874 to 1917. In the Beckley raingauge the rain is collected in a funnel, slightly elliptical in form (major axis 289·0 mm. and minor axis 288·0 mm.), 653·7 square centimetres in area, and is conducted by a short pipe from the funnel to the receiving vessel. This vessel floats on mercury and sinks in accordance with the rainfall. A pencil, latterly an ink pen, attached to the floating vessel, marks the height of the vessel on a sheet of paper stretched on a drum which is turned by clockwork. When 316 cubic centimetres of water have accumulated in the floating vessel, it empties itself automatically by means of a syphon. This figure (316 cc.) was obtained from a series of measurements made from October 1922 to February 1923. For this experiment the rain which passed through the syphon was received in a bottle placed below it in a pit, and the collected fluid was measured at 10 a.m. on each day.

The self-registered daily rainfall has been checked since 1884 by direct measurement of the rain collected by a 5-inch gauge and, since 1895, also by the record of an 8-inch gauge.

The three raingauges stand 30 yards west of the main building of the Observatory, and the funnels are 24 inches above the ground. Between SE and SW they are sheltered to some extent by three old trees, at distances from 10 to 20 yards and rising to 18°

above the horizon of the funnels. None of the other obstructions of the horizon are so near nor rise to this altitude. The raingauges have always been in these positions.

21. *Tabulation.*—From 1868 to 1873 the quantity of water in the receiving vessel was measured at 9 a.m. and tabulated as the daily rainfall for the preceding day.

The Beckley rain-gauge was attended to at 10 a.m., when the water in the floating vessel was measured with a measuring-glass and the recording-paper was changed. On the recording paper there are printed, besides the vertical hour-lines, five horizontal lines indicating 0·00, 0·05, 0·10, 0·15, and 0·20 inch of rain, and it is supposed that each complete branch of the trace belongs to 0·200 inch of rain.* The record of the last branch of the daily trace was checked by the amount of rain in the floating vessel measured with the measuring-glass, and where the sum of the hourly readings of that branch of the trace did not agree with the measured quantity, the difference was apportioned to the hourly readings of that branch.

In some cases of exceptional falls the trace was also read at intervals of 15 minutes. The sum of the 24-hourly falls tabulated from 1 a.m. to midnight is the daily rainfall from midnight to midnight.

The figures thus tabulated were obtained on the assumption that 0·200 inch of rain has fallen when the syphon empties and that the area of the funnel is 100 square inches, this being the area to which the measuring glass applies. These values are not correct, the exact figures being 0·1903 inch and 101·33 square inches, respectively, as calculated from the above area (653·7 square centimetres) of the funnel, and the capacity of the floating vessel (316 cc.). The tabulated records of the Beckley gauge are thus too high.

If the floating vessel emptied a times in a day and the measuring-glass gave b inch, the tabulated daily rainfall would be $r = 0{\cdot}200\ a + b$, while the correct quantity would be $r - \frac{0{\cdot}2a}{21} - \frac{b}{76}$. The "Rain Frequency" Table, No. 31, furnishes the means for correcting the printed tables; in accordance with it, the aggregate in the course of 100 days of the daily falls of rain each of which is less than 0·20 inch is 3·3 inches while the aggregate in 100 days of the daily falls each of which exceeds 0·20 inch is 7·0 inches, of which 1·5 inches have been measured with the measuring-glass and 5·5 inches have passed through the syphon.

A tabulated total rainfall of 10·3 inches is changed into

$$3{\cdot}3\ (1 - \tfrac{1}{76}) + 1{\cdot}5\ (1 - \tfrac{1}{76}) + 5{\cdot}5\ (1 - \tfrac{1}{21}) = 10{\cdot}3\ (1 - 0{\cdot}03),$$

and, similarly, a mean rainfall tabulated as r ought to be $r\ (1 - 0{\cdot}03)$. Thus all the printed mean rainfalls are 3 per cent. too high. The only tables which are affected are No. 27 and second column of No. 29. The corrections of the hourly rainfalls are negligible.

In the case of snowfalls the snow collected in the funnel was melted at 10 a.m., measured, and attributed to the day on which it was measured. The measurement of the water in the check gauges was also made at 10 a.m. In the few cases in which the Beckley raingauge did not furnished a record, the rainfall given by the check gauges is assumed to be the daily rainfall. The measuring-glasses do not exactly correspond with the areas of the funnels, all records by the 8-inch gauge requiring to be increased by a twenty-eighth and those by the 5-inch gauge to be decreased by a fifty-fourth.

Comparison of the records of the raingauges.—It is not certain what raingauge was used from 1868 to 1873, but it seems to be the same gauge that was in operation from 1874 January to 1876 December. Its records during that period may be compared with those of the Beckley gauge. With two exceptions the monthly records exceed those of the Beckley gauge, the differences ranging from 1·77 to 0·90 inch.

* On the traces the rainfall was measured to a thousandth of an inch at intervals of an hour, the quantity tabulated for a particular hour being the fall during the preceding 60 minutes.

The yearly records for 1874–76 are 42·41, 44·27, 47·41 inches, as compared with those of the Beckley gauge 37·34, 36·51, 44·11 inches. The excesses are therefore 14, 21, and 7 per cent. of the Beckley figures.

The average differences of the daily rainfalls as recorded by the three rain-gauges in the period from June 1895 to December 1907 are tabulated below :—

Daily Rainfall.	Number of Days.	Uncorrected Differences.		Corrections to tabulations and Rain Measures.			Corrected. Differences.	
		B—8 in.	B—5 in.	Beckley.	8 in.	5 in.	B—8 in.	B—5 in.
0·10 to 0·25 inch..	655	+0·011	+0·023	−0·004	+·006	−·003	+·001	+·022
0·25 ,, 0·50 ,, ..	489	+0·024	+0·049	−0·013	+·012	−·007	−·001	+·043
0·50 ,, 1·00 ,, ..	187	+0·040	+0·086	−0·028	+·024	−·012	−·012	+·070
1·00 ,, 1·50 ,, ..	28	+0·076	+0·225	−0·051	+·040	−·021	−·016	+·195
1·50 ,, ..	3	+0·087	+0·305	−0·082	+·057	−·030	−·052	+·253

The small deficiency of the records for heavy rainfalls (see second last column) is well explained by the rain not being registered while the float is being emptied by the syphon.

The increasing differences of the 5-inch rain-gauge records from the others may be due to the rain-gauge standing about 6 feet nearer (28 feet as compared with 34 feet) to the nearest of the three trees mentioned above.

22. *Rainfall in each month, year, and five-year period, 1868–1917.*—The sums of the daily rainfalls in a month are contained in Table 27. All the figures are too high by 3 per cent. (see § 21). According to § 21 the records for 1868–73 cannot be combined with those of the following 44 years.

Secular variations, 1868–1920.—The yearly rainfalls in Table 27, last column, are grouped in periods of five years in Table 75. The curve is shown on Plate III.

23. *Average rainfall for 44 years, 1874–1917.*—All the observations utilised in this were registered with the Beckley recording rain-gauge. In calculating Table 28 all incomplete traces and traces at times of snowfall were set aside. The sum of the figures in the row "January" and columns "1" and "Mean Rainfall" is the arithmetic mean of all the tabulated hourly rainfalls, zero included, which fell between midnight and 1 a.m. in the 44 Januarys of the years 1874 to 1917. The row "year" contains the averages of the quantities belonging to the several months. The last column gives the average rainfall per 10,000 hours for each month and for the year. These figures, multiplied by $24 \times 31/10{,}000$, do not agree with the average rainfalls entered in the last line of Table 27 on account of the traces rejected in Table 28. (See § 21.)

The average monthly rainfall appears in Table 27 (foot) and the average rainfall in each five-day period in Table 29 and Plate II. The rainfall in a period of five days is the sum of the daily rainfalls on the five days. The arithmetic mean of the 44 records, zero included, is given for each period in Table 29. Deduct 3 per cent. from the figures in Table 27 and in the second and ninth columns of Table 29.

24. *Formula.*—Let r_1 and r_2 denote the rainfalls on days when the sun has the same declination before and after the solstice, then $r_1 + r_2$ is represented by $a + b \sin \lambda$ and $r_1 - r_2$ by $c \cos (\phi - \delta) \cos \lambda$. Thus the rainfall in a five-day period is found to be represented by a curve of the same type as the temperature and water-vapour curves (§§ 10, 19).

$$r = 0{\cdot}516 - 0{\cdot}078 \sin \lambda - 0{\cdot}216 \cos (\phi - \delta) \cos \lambda.$$

The differences of the observed and calculated rainfalls in five days amount on an average to 0·074 inch and they change signs 33 times. In groups of nine periods

(45 days) the average departures are − 0·02, + 0·01, − 0·01, + 0·02, 0·00, − 0·04, 0·00, + 0·01. The largest difference, − 0·04, arises from the small rainfall in the first four periods of September.

25. *Frequency of rainfalls.*—Tables 30, 31, 32 contain the result of counting the number of hours and days when there was a certain rainfall.

In Table 30 only the rainfalls automatically registered in the years 1874–1906 were used, the number of hourly records counted being 285,257. The figures in the table may be interpolated by means of the formula $\log n = 4{\cdot}2565 - 7{\cdot}344\, r^{0{\cdot}7}$. The departures are entered in the third column. In view of the regularity of the departures the figures, n, may be considered to be final. Nothing more would be learned by extending the counting over more years.

Rain occurs on 11·966 per cent. of all the hours, and on 1·2 per cent. of all the hours the rainfall equals or exceeds 0·075 inch ; a rainfall of 0·49 inch or more in one hour* occurs three times in 100,000 hours (11·4 years), and a rainfall of one inch in one hour occurs once in 30 years.

Table 31 is based on 44 years' records, 1874 to 1917. A similar table for 33 years agrees very closely with it, the greatest divergence being in the second line, where 57·04 stands instead of 56·82. Rain fell on 56·82 per cent. of all the days. The daily rainfall equals or exceeds 0·3 inch on 11 per cent. of the days. Only once in 1,000 days it exceeds 1·5 inch, and only twice in 10,000 days (27 years) it rises above 2·0 inches.

Table 32 is constructed from the same countings as the last table, but gives the results separately for the several months. November, December and January have the smallest number of rainless days, or days with less than 0·005 inch of rain. Heavy rainfalls are most numerous in the last five months of the year, while days with little rain (0·005 to 0·1 inch) are most frequent in the first four months of the year.

26. *Excessive rainfalls.*—Table 33 is interpolated from the counted number of occurrences when the rainfall within a given time, $\frac{1}{4}$-hour, $\frac{1}{2}$-hour, . . . 12 months, lay between 0·1 and 0·2, 0·2 and 0·3 inch, etc. The largest rainfalls are given in the second column ; 0·84 inch in 15 minutes, . . . 10·28 inches in 32 days, occur only once in 50 years. The figures in the sixth column give the falls which may be expected once in six months. According to the last column the heaviest rains lasting from 15 minutes to eight hours occur in August, July and May, while the heaviest rains in two or more days fall in June, February and January. Heavy rainfalls are fewest in April.

The figures in each of the columns are found to be represented by smooth curves of the same type. A curve of this type was drawn through three points which represent the most prominent excessive rainfalls (in one hour, one year, and 44 years), and the ordinates were read off. The figures are given in the seventh column and may be taken as the probable extreme rainfalls for Glasgow Observatory.

27. *Periods with small rainfalls, and periods of droughts.*—Table 34 contains the result of the countings of the number (p), of successive days during which the total rainfall was equal to or below a certain quantity (0·25, 0·5 inch, . . .) but above that quantity in (p + 1) days. All the observations of the 50 years, 18,262 days, are taken into account in each of the five columns. In many cases the same period is enumerated in each of the five columns, as the following example will show.

In 1892, 0·19 inch of rain fell in the 27 days, March 27 to April 22 ; 0·46 inch in the 37 days March 18 to April 23 ; 0·95 inch in the 63 days February 22 to April 24 ; 1·58 inch in the 85 days February 18 to May 12; and 2·95 inch in the 97 days February 5 to May 12.

* This means from 0h. to 1h. or from 1h. to 2h., etc. If $\frac{1}{2}$ inch fell between 0h. 30m. and 1h. 30m. it would not be counted.

In the 50 years there were 227 occasions when the rainfall on 10 to 14 successive days did not exceed 0·25 inch, and there was only one occasion when less than 0·25 inch was recorded in 40 to 44 days.

The two bottom lines of the table contain the values of $100\ \Sigma\ (pn)\ /\ 18262$ and $100 \times 0{\cdot}25\ \Sigma n\ /\ \Sigma\ (pn)$ divided by the average daily rainfall, 38·6 / 365·24.

The shortest periods taken into account in each of the columns of Table 34 occur too frequently to be called periods of drought: they are, therefore, excluded in Table 35, the object of which is to exhibit the distribution of the dry periods in the several months and years.

In the second column of Table 35, 69 per cent. for January indicates that the days belonging to the periods with 0·25 inch of rain constitute 69 per cent. of the number appertaining to equal distribution of dry periods at all seasons.

Most periods of drought occur in the four months March to June, and their number changes periodically in the course of years.

The distribution of the periods of severest drought, as exhibited in the last column, is in accord with that derived for all the shorter periods.

Days and Hours with Rain

28. A day is counted to have had rain if 0·005 inch or more has been registered. All the records from 1868 to 1917 are included in the statistics.

The statistics referring to hours with rain include only the records from 1874 to 1917, every hour being counted in which 0·001 inch of rain or more fell.

29. *Number of days with rain in each month, year, and five-year period.*—These numbers can be obtained from the departures compiled in Table 36. The secular curve is also entered in Table 75 and drawn on Plate III.

30. *Average number of days with rain, 1868–1917. Yearly Curve.*—The average number of rain-days in each month will be found in the bottom line of Table 36.

The average number in each five-day period is given (in percentage) in Table 29, third column, and on Plate II. Each figure is based on 5×44 records. In the period January 1 to 5, 66 per cent. of all the days have rain. The average rainfall on a rain-day is the ratio of corresponding numbers in columns 2 and 3 divided by 5, and is during the first period 0·18 inch.

31. *Formula.*—See §§ 10, 19, 24.

Number of rain-days (in per cent.)

$$= 59{\cdot}0 - 6{\cdot}4 \sin \lambda - 2{\cdot}0 \sin 2\lambda - 5{\cdot}5 \cos (\phi - \delta) \cos \lambda.$$

In groups of nine five-day periods, beginning with December 22, the average departures are − 1, + 1, − 1, + 1, + 2, − 2, 0, 0. The calculated curve is also drawn on Plate II.

32. *The average number of hours with rain, 1874–1917,* is shown in Table 29 in percentage. The average number of hours with rain on a rain-day in any five-day period may be derived from column 3 in conjunction with column 4. This figure for January 1–5 is $24 \times 21\ /\ 66 = 7{\cdot}6$ hours. The number of hours with rain thus calculated varies in the course of a year. It is a maximum, 8·8 hours, at the beginning of December; a minimum, 5·3 hours, in the period June 10–14; its mean value for the six months October to March is 7·4 hours, as compared with 6·3 hours in the other six months.

33. *Rainy weather.*—The rainy weather during the Glasgow Fair Holidays in 1906 raised the question whether the dates of the holidays should be changed. On behalf of the local authorities statistics were prepared and published in the *Glasgow Herald* for August 1, 1906. Similar statistics appear in the last three columns of Table 29 for all the 73 five-day periods of the year. The day was arbitrarily divided into three parts, forenoon from 8 a.m. to 2 p.m., afternoon from 2 p.m. to 8 p.m., and

night from 8 p.m. to 8 a.m., a division of the day which appeared best to meet the case. Any one of these parts was considered to have had rain when the average rainfall in an hour during the part of the day was at least 0·001 inch.

The three last columns give the statistics only for forenoon and afternoon. For example, in the 44 years 1874 to 1917, there were two years in which the five days January 1 to 5 contained either 10 or 9 or 8 forenoons or afternoons with rain out of the total of 10 forenoons and afternoons, and there were 29 years in which the five days had from 7 to 3 wet forenoons or afternoons.

Of the 73 periods there are 13 with zero in the first of these columns, and hence in these 13 periods each of the 44 years had more than two dry forenoons or afternoons out of 10, and there are 9 periods with 24 or more in the last column, *i.e.*, in 24 or more of the 44 years each of these periods had not more than two wet forenoons or afternoons out of 10. The most favourable period is June 5 to 9.

Number of forenoons, afternoons and nights with rain.—Other investigations which had the same object in view brought out the following results :—

Rain fell only at night, 8 p.m. to 8 a.m., on 14·0 ($= n$) per cent. of the total number :

Rain fell only in the daytime, 8 a.m. to 8 p.m., on 13·3 ($= d$) per cent. of the total number :

Rain fell in the forenoon but not in afternoon on 11·8 ($= f$) per cent. of the total number :

Rain fell in the afternoon but not in forenoon on 11·1 ($= a$) per cent. of the total number :

though possibly at night in the last two cases.

These quantities are almost constant during the year.

If the percentage number of days (24-hour periods) with rain be denoted by p, the value of p being given in Table 29, column 3 (average value of $p = 58·4$), then the number in percentage:—

Of nights with rain is $(p - d) = p - 13·3$; average value 45·1 per cent.

Of days with rain during daylight is $(p - n) = p - 14·0$; average value 44·4 per cent.

Of days with rain both in forenoon and afternoon is $(p - n - f - a) = p - 36·9$; average value 21·5 per cent.

Of forenoons with rain is $(p - n - a) = p - 25·1$; average value 33·3 per cent.

Of afternoons with rain is $(p - n - f) = p - 25·8$; average value 32·6 per cent.

For example, the period June 5 to 9 has $p = 45$ per cent., hence the numbers in percentage are :—

Wet nights, 32.
Days with rain during daylight, 31.
Days with rain both in forenoon and afternoon, 8.
Forenoons with rain, 20.
Forenoons wet but not afternoons, 12.
Afternoons wet, 19.
Afternoons wet but not forenoons, 11.

Duration of Sunshine

34. *Instrument.*—The data are automatically registered by a Campbell-Stokes* Sunshine Recorder. The essential parts are a solid glass sphere which brings the sun's rays to a focus about an inch from the surface of the sphere, and a metal

* For descriptions of the sunshine recorder see G. G. Stokes " Description of the Card Supporter for Sunshine Recorders adopted at the Meteorological Office," *Q. J. R. Meteor. Soc.*, Vol. VI., 1879–80, pp. 83–93. *The Observer's Handbook*, M.O. 191, 1925 Edition. *Dictionary of Applied Physics*, Vol. III., p. 510.

bowl which holds the recording-paper in the focal sphere. The sun burns on this paper a record which intersects the hour and half-hour lines ruled on the paper. The instrument was installed by the Meteorological Office in April 1880, and has been in constant use since then. It is placed on a buttress at the south-west corner of the Observatory, standing slightly above the level of the Observatory roof [see Fig. 2]. It commands a practically unobstructed horizon. From the north-west to the south there are no obstructions, while towards the north-east and south-east buildings cut off up to 3° of the horizon. These latter obstructions are of no importance since the instrument is incapable of recording at altitudes lower than 3° even in the clearest weather (see § 35).

It should also be mentioned that the Observatory is situated about half a mile within the north-western outskirts of this large manufacturing city and that there is almost always haze and smoke hovering over the city, especially between south and east : this fact is bound to have an effect on the morning records.

35. *Tabulation.*—The length of the burnt trace on the sunshine card is measured from each half-hour line to the next and is tabulated as the hourly duration of sunshine at the hour of apparent solar time lying between the two half-hour lines. The entries give the duration to the nearest tenth of an hour. At hours for which there is no sunshine zero is entered, and this record is taken into account in the calculation of the average values. The duration of sunshine in a day is the sum of the quantities tabulated for the several hours of the day.

Possible duration of sunshine in a day.—Owing to absorption of the sun's rays in the atmosphere the trace burnt into the card stops some time before the sun has set behind the range of hills even on the very sunniest of days. On such days the transparency of the atmosphere is so great that mountains more than 60 miles distant are distinctly seen. In the 40 years during which the recorder has been in use the smallest altitude of the sun at which an impression on the sunshine card has been made, is a fraction below 3°, and this limit was reached only twice in that period. It may be assumed that on those occasions the atmosphere was perfectly clear and that at smaller altitudes of the sun the apparatus fails to act. Hence the possible amount of a daily sunshine record is the time ($2T$) the sun is more than 3° above the horizon. From the known coefficient of transmission of a pure atmosphere (see No. 46), it is calculated that at an altitude of 3° only 0·07 of the quantity Q of the radiation outside the atmosphere reaches the surface of the earth ; hence the paper is scorched by the sun at any altitude when the state of the atmosphere allows at least a sixteenth of Q to reach the surface.

36. *Duration of sunshine in each month, year and five-year period, 1881–1920.*—The bottom line in Table 37 contains the means of the duration in the several months and years. The figures in the columns give the departures for each month and year.

Secular variation.—The departures from the mean value, 1099·5 hours, are combined for each five successive years and shown in Table 75 and on Plate III.

37. *Average values, 1881–1920.*—Table 39A is obtained from the tabulated hourly records, each figure for January, . . . being the arithmetical mean of all the 31×40 tabulated hourly records, zero included, for the particular hour. Thus in January at 9 a.m., *i.e.*, between 8 h. 30 m. and 9 h. 30 m., local apparent solar time, there is, on an average, 0·015 hour of sunshine.

In all the months the average duration of sunshine per hour is a maximum near noon and falls off towards sunrise and sunset. In the afternoon there is more sunshine than in the forenoon, which is principally due to the position of the Observatory (see No. 34).

38. *Formula for daily curves.*—The apparent zenith-distance of the sun at every hour of apparent solar time for every fifth day of the year was calculated. The sunshine registered in an hour may then be ascribed to one of these zenith-distances

without interpolation. Twelve graphs, one for each month, drawn with the amount of "sunshine per hour" as ordinate and the zenith-distance as abscissa, all show the same trend, and differ less from the mean curve than an afternoon curve differs from the corresponding forenoon curve. The mean curve has the equation:

$$\log f = a - b\, s_z \qquad .. \quad .. \quad .. \quad .. \quad .. \quad (1)$$

f is the fraction of time that has sunshine; s_z designates the ratio of the mass of atmosphere in a bent tube of unit section whose axis coincides with the curved path of a ray of light at zenith-distance, z, to the mass of atmosphere in a similar tube directed towards the zenith. Its value can be calculated by the well-known formula, due to Laplace:

$$s_z = \alpha_z \,/\, \alpha_0 \cos z \qquad .. \quad .. \quad .. \quad .. \quad .. \quad (2)$$

where α_0 is the factor of tan z in the series expressing the atmospheric refraction and α_z is the value of that series divided by tan z. $\alpha_z \,/\, \alpha_0$ may be obtained from the following table of $N = 10^4 \log (\alpha_z \,/\, \alpha_0)$.

z	30°	35°	40°	45°	50°	55°	60°	65°	70°	72°	74°	76°	78°	80°	81°	82°	83°	84°	85°	86°	87°
N	2	3	4	5	7	11	15	24	38	48	61	80	108	153	187	231	293	380	510	750	1240

It will be seen below that all the sunshine curves have the same equation (1). In the case of the mean curve as derived from the daily curves, f is the sunshine per hour expressed in unit of hour, and $a = -0{\cdot}220$, $b = 0{\cdot}116$. The departures of the observed curves from the curves calculated from formula (1) are given in Table 39B. The departures demonstrate at what hours and in what months the atmospheric conditions are better or worse than the average conditions. For example, there is an excess of sunshine in May after 10 a.m., and in July between 4 and 7 p.m., while in November, December and January there is a deficiency at all hours of the day. In May, with the exception of the early forenoon, the state of the atmosphere is most favourable for sunshine.

39. *Average values, 1881–1920*—continued. *Yearly Curve.*—In each five-day period the average duration, h, of daily sunshine was calculated, days with no sunshine being included. The result is given in Table 40, second column, each figure resting on 5 × 40 daily sunshine records. The fourth column gives 100 times the ratio of the observed to the possible sunshine, $2T$, as defined in No. 35. Though these percentages increase from winter to summer, it cannot be inferred that the atmospheric conditions in winter are inferior to those in summer, because, as demonstrated by the daily curves the average duration of sunshine decreases with increasing zenith-distance of the sun, and in winter the time during which the sun remains at low altitudes is a larger percentage of the possible duration of sunshine than it is in summer.

40. *Formula for yearly curve.*—The observed duration, h, may be compared with the calculated sunshine obtained by mechanical quadrature of the mean curve as given by formula (1) in No. 38. The calculated daily amounts depend on the limits of integration. With the limit T, which belongs to zenith-distance 87°, the amounts are too large, while the limit T', corresponding to zenith-distance 83°, gives a perfect agreement with the yearly sunshine curve. The calculated total yearly sunshine is on this assumption exactly the same as the observed mean value.

The observed curve may also be represented in the same manner as the daily curve. A graph drawn with "f" as ordinate, where $f = h \,/\, 2\,T'$, and the sun's meridian zenith-distance $z = \zeta - \delta$ as abscissa, is a curve of the same type as that defined by equation (1) in No. 38. (For notation refer to No. 10.) The values of the constants are $a = -0{\cdot}313$, and $b = 0{\cdot}116$. As all the observed quantities contribute

to the values of the two constants, the formula may be taken to belong to average conditions of the atmosphere. The departures of the observed values from the curve are given in the third column of Table 40. They show in what seasons haze or clouds are more or less prevalent than would on an average be expected. The excess of sunshine during the greater part of May is especially noteworthy.

41. *Highest Records.*—The highest records in each five-day period, 1881–1920, appear in Table 40, column 5. These highest records all lie below the possible duration 2 T (see § 35), and they range between 99 per cent. of the possible duration in the period March 7–11, and 69 per cent. in the period December 22–26. The percentages are respectively for the several months 85, 86, 91, 92, 93, 90, 90, 94, 87, 87, 84, 84.

Days with Sunshine

42. *Tabulation.*—A day is counted to have sunshine when at any time of the day an impression is made on the sunshine card. Thus, each day is counted as one, no matter whether the sunshine lasted a few minutes or continued during the whole day. On the days not counted the sky was either overcast all day or there was sufficient haze during the day to reduce the proportion of direct radiation reaching the surface to a value less than 7%.

43. *Number of days with sunshine in each month, year and five-year period, 1881–1920.*—The figures are given in Tables 38 and 75, and the secular variation is shown on Plate III.

44. *Average number of days with sunshine, 1881–1920. Yearly curve.*—Table 38 contains in its last line the average number for each of the 12 months. Table 40, column 6, gives for each five-day period the total number of days with sunshine expressed in percentage of the total number of days in the 40 years (200).

45. *Formula for yearly curve.*—A graph was drawn with the percentages divided by 100 as ordinates and the sun's meridian zenith-distance as abscissa. (See §§ 10 and 40.) This curve has the equation (1), § 38, the factor b having again the same numerical value as in the two other cases and the other constant being $a = -0{\cdot}096$.

The smooth and calculated curves depart from each other at none of the zenith-distances by more than 3 per cent. The departures of the observed values from the calculated curve indicate, like those belonging to the amount of sunshine, in what seasons haze or clouds occur more or less frequently than belong to the average Glasgow atmosphere.

46. *Deductions from the sunshine records. Frequency of coefficient of transmission.*—Let Q denote the quantity of heat falling on unit area outside the atmosphere, and Q_z the heat transmitted at zenith-distance, z, through an atmosphere whose coefficient of transmission is p, then:

$$\log (Q_z / Q) = s_z \log p \qquad .. \quad .. \quad .. \quad .. \quad (3)$$

The coefficient for a pure atmosphere, P, has been determined as 0·835,* and the mass of the atmosphere in a tube bent along the path of a ray at 87° zenith-distance has the value $s_{87} = 14{\cdot}4$ (see § 38); hence by formula (3) $Q_{87} = 0{\cdot}07\,Q$. Sunshine is registered when the transmitted quantity of heat exceeds $0{\cdot}07\,Q$, and this occurs at zenith-distance, z, when the coefficient of transmission exceeds the limiting value, p_z, as calculated from:

$$\log 0{\cdot}07 = s_z \log p_z \quad .. \quad .. \quad .. \quad .. \quad .. \quad (4)$$

* G. Müller, *Die Photometrie der Gestirne*, 8°, 556 pp., Leipzig, 1897.

Substituting the value of s_z from (4) in (1) of No. 38, f is obtained as a function of p_z ; p_z may, henceforth, be considered the independent variable and z the dependent variable, calculated for an arbitrary value of p_z by means of formulae (4), which gives s_z, and (2). The suffix may therefore be omitted:

$$\log f = a - b \log 0{\cdot}07 \,/\, \log p \qquad .. \qquad .. \qquad .. \qquad (5)$$

Thus, in a period, t_0, the coefficient of transmission lies between an arbitrary value p and $0{\cdot}835$ during a time, $t = t_0 f$, where f is given by formula (5). And since formula (1) holds good for all the daily curves throughout the year, this statement is correct at every point of the sky which the sun may occupy during any day of the year, *i.e.*, for about half the sky. There is no reason why there should be such a limitation and it is legitimate to assume that the formula holds good all over the sky. Such an assumption would be realised if the haze were arranged in layers parallel to the surface of the earth. t is the frequency with which a coefficient of transmission, p, occurs in time t_0.

Quantity of sun's transmitted heat.—Consider the sunshine at a fixed zenith-distance, z, to which the mass s_z belongs. If the sun stands in that direction during t_0, the sunshine lasts $t_z = t_0 f$. The coefficient, p, varies during t_0, and during t_z the values lie between $0{\cdot}835$ and p_z as calculated from (4). Suppose that the coefficients are arranged in order of magnitude. A coefficient which lies between p and $p + dp$ lasts a time dt, where dt is found from equation (5) after substituting $t \,/\, t_0$ in place of f. For a certain value of p the quantity Q_p is transmitted and can be calculated from (3), the notation Q_z being replaced by Q_p. The average quantity of heat transmitted per unit time at zenith-distance, z, during the time of sunshine is xQ, where $x = t_z^{-1} \int (Q_p/Q)\ dt$, and the integration extends for p from p_z to $0{\cdot}835$. Introduce a new variable $\xi = (\log\ 0{\cdot}07) \,/\, (s_z \log p)$ and $Z = b\, s_z$ and find $x = \dfrac{Z\ 10^z}{\text{Mod.}} \int 0{\cdot}07^{1/\xi} 10^{-z\xi} d\xi$, and the limits of integration are 1 and $b\, s_{87}/Z$.

I calculated the values of x by mechanical quadrature for $z = 32°{\cdot}5$, and repeated this for a series of values of the zenith-distance. The result is entered in column (1) below. For a pure atmosphere the average quantity of transmitted heat would be $x_0 Q$ during the time of sunshine, where $\log x_0 = s_z \log 0{\cdot}835$; x_0 occupies column (2) of the table. The values of x_0 are about twice those of x, *i.e.*, during the time when the sun actually shines at Glasgow the solar radiation is only a half of what would be transmitted if the atmosphere were pure.

Average coefficient of transmission.—I further calculated the average quantity of heat transmitted in unit of time, which equals the above xQ multiplied by t_z/t_0. The result is given in column (3). According to these figures the soil received by direct radiation at the minimum zenith-distance only 24 per cent. of the possible radiation which would be transmitted by a cloudless pure atmosphere ($0{\cdot}24 = 0{\cdot}189/0{\cdot}802$).

This column (3) is represented by $\log Q_G/Q = -0{\cdot}459 - 0{\cdot}23\, s_z$. In words, the average heat, Q_G, transmitted through the Glasgow atmosphere is the same as that of an atmosphere which has a constant coefficient of transmission, $p = 0{\cdot}59$ (from $\log p = -0{\cdot}23$), and which is clouded over during $0{\cdot}65$ of the time ($\log 1 - 0{\cdot}65 = -0{\cdot}459$). This value of the coefficient compares with the value, $0{\cdot}69$, derived from the theoretical representation of the mean daily temperature curves for the several months.*

z	(1)	(2)	(3)
$32{\cdot}5$	$0{\cdot}432$	$0{\cdot}802$	$0{\cdot}189$
40	$0{\cdot}413$	$0{\cdot}784$	$0{\cdot}176$
50	$0{\cdot}381$	$0{\cdot}749$	$0{\cdot}151$
60	$0{\cdot}336$	$0{\cdot}690$	$0{\cdot}119$
70	$0{\cdot}274$	$0{\cdot}583$	$0{\cdot}076$
80	$0{\cdot}185$	$0{\cdot}355$	$0{\cdot}025$
85	$0{\cdot}116$	$0{\cdot}150$	$0{\cdot}005$

* *Proc. R. Soc., Edin.*, Vol. XL, Part I, No. 11, p. 95.

47. *Frequency of sunshine.*—For the 40 years, 1881 to 1920, the number of days in each five-day period was counted on which the sun shone from 4 to 8 hours, from 8 to 12 hours, and from 12 to 16 hours, respectively. These numbers, expressed in percentage of the total number of days occurring in the periods, are entered in columns 8, 9, and 10 of Table 40.

In all the periods from March 27 to September 17 more than 40 per cent. of the days had more than four hours' sunshine. The sunniest period is May 26–30, when 64 per cent. of the days had more than four hours' sunshine, of which 15 per cent. had more than 12 hours.

CLOUDINESS

48. The observations are estimates of the fraction of the sky covered by clouds, and the grades adopted in the statistics are the decimal fractions multiplied by ten. The observations were made at fixed hours of the day between 9 a.m. and 10 p.m. The observations made on Sundays were excluded, since they were made only in the morning and evening, and after 1873.

49. *Statistics, 1868–1917. Daily variation.*—According to Table 41A an overcast sky occurred most often (51 per cent.) at 9 a.m., and was least frequent (46 per cent.) at 2 p.m., while the sky was clear at 9 a.m. on 10 per cent. of the days, at 2 p.m. on 9 per cent., and at 9 p.m. on 20 per cent. of the days. The daily variations are given also separately for each month.

Tables 40 and 41A also contains the yearly variation; *e.g.*, December and January are the cloudiest months of the year, 79 per cent. of the days having more than 0·7 of the sky covered with clouds, as compared with 69 per cent. in June.

Table 41B, giving the secular variation, shows that there has been a steady decrease in the number of occasions with a clear sky when the cloudiness was less than 3.

50. *Clear days.*—The statistics, Table 42, refer to those days on which the average cloudiness between 9 a.m. and 10 p.m. was less than 3. It shows the yearly and secular variations. The rapid decrease in the first and fourth quarters of the year is especially remarkable.

RADIATION

51. *Instruments.*—The solar radiation thermometer is a maximum thermometer which has its spherical bulb coated with dull lamp black. It is suspended in a wide glass tube ending in a sphere in whose centre the bulb is placed. The tube is exhausted of air.

The radiation minimum thermometer is a spirit minimum thermometer with an elongated bulb. Both instruments are placed in the grounds near the rain-gauges (see § 20), about two inches above the ground, which is covered with short grass. The temperatures were read at 9 p.m. local mean time. The sun's rays can strike the instruments all the year round, except in midwinter before 11 a.m. and after 2 p.m. when trees intercept them.

52. *Mean results for each month, year and five-year period, 1868–1917.*—Tables 43 and 44 give the arithmetic means of all the readings obtained in each month and year. The secular variations are entered in Table 75B under the heading "Radiation" and are drawn on Plate III.

53. *Average results, 1868–1917. Yearly variation.*—Average values for each month are given in Tables 43 and 44, and for each five-day period in Table 45. For formula see § 10.

54. *Extremes and statistics, 1868–1917.*—The highest and lowest records in the several periods are contained in Tables 43, 44, 45. The frequency of certain minimum temperatures on grass is set forth in Table 46.

55. The differences of the *maximum temperatures* registered by the solar radiation and shade maximum thermometers are discussed in §§ 56, 57. Formulae are given in § 10.

Difference of the daily minimum temperature in the screen and on grass.—The average difference is 6°·0, and is independent of the season and the air temperature (see § 10). The difference depends on the transparency and cloudiness of the atmosphere, large differences indicating a transparent atmosphere and almost cloudless sky. Statistics of the occurrence of the differences exceeding 10° are given in Tables 47A, B, C. Of the 18,158 days on which both thermometers were observed, 2,186 days (or 12·0 per cent.) show differences exceeding 10°. If the number of the differences be plotted against the minimum temperature in the shade the curve is symmetrical and the maximum frequency belongs to 41°·5 which is the mean value of the minimum shade temperature. 1,121 differences are associated with temperatures lower than 41°·5, and 1,065 with higher temperatures. The differences exceeding 10° thus also lead to the result that they are independent of the air temperature.

The radiation minimum thermometer cannot be used for the determination of the transparency of the atmosphere unless the sky be cloudless.

Table 47A gives the average percentage of the days on which the differences lie within the limits 10°·0 to 10°·9, . . . , and Tables 46B and C contain similar statistics for January to December and for each five-year period.

According to Table 46A the frequency of occurrence rapidly decreases with the difference, those above 15° having been observed on only 0·47 per cent. of the days. From Table 47B it appears that large differences are most frequent in autumn, and least in winter. By Table 47C the number of large differences has decreased since 1878, though not steadily, *i.e.*, either the number of clear nights or the transparency of the atmosphere has decreased since then.

Transparency of the Atmosphere

56. *Reduction of observations.*—The record of the solar black bulb maximum thermometer depends on the transparency of the atmosphere, and it may be utilised in comparing the maximum transparency on different days.

The black bulb of the solar thermometer receives per unit of time a quantity of heat which is proportional to p^s (see §§ 38 and 46), while it loses by radiation a quantity nearly proportional to the difference of the temperatures of the black bulb and of the outer glass vessel (see § 51). As glass is almost opaque to radiation of long wave-length, all the other gains or losses of heat may be neglected. Hence, at the time when the maximum temperature, B, of the black bulb is registered, the following relation holds good with sufficient approximation:

$$B - G = a\, p^s.$$

The time of occurrence not being known, the mass, s, of the atmosphere can be only approximately calculated. According to observations made specially for this purpose the maximum, B, occurs in winter soon after noon, and in summer from one to two hours after noon provided that the sun was shining near noon. I, therefore, substitute $a = s_0 + \Delta s$, where s_0 is the mass of air which the rays traverse at noon and Δs a small correction.

The temperature, G, of the glass at time of maximum depends on the temperature, τ_0 of the air in the shade at noon and on the solar radiation, provided that the sun shone since noon. Hence G may be replaced by τ_0 plus a power series in p^s.

$$B - \tau_0 = c\, p^s + c'\, p^{2s} + \ldots$$

The constants, c, c', must be determined from observations on different days on which the air has the same degree of transparency. I select observations for which p approaches as near as possible the constant maximum value, P, *i.e.*, for which $B - \tau_0$ has the largest of all values which occur in the course of years at a certain

zenith-distance of the sun. The selected highest values of $B - \tau_0$ are 54°·4, 67°·4, 72°·6, 80°·6, 82°·8, 90°·0 belonging respectively to the zenith-distances of the sun, 76°·1, 67°·1, 60°·3, 52°·4, 41°·0, 35°·9.

A preliminary solution of the equations gave a value of p in very close agreement with the value for a pure atmosphere (0·835 in § 46), and thus proved that the first term of the power series preponderated. Numerical calculation also showed that Δs could be neglected. It was therefore assumed finally that

$$B - \tau_0 = c\, p^s.$$

p as calculated from this formula agrees nearly enough with the coefficient of transmission to be considered an adequate quantity for measuring the transparency of the atmosphere. The constant, c, is found from the above observations on the assumption that p has the value 0·835.

$$\log c = 2{\cdot}035.$$

I applied the above theory to the observations made in the 33 years, 1880·3 to1913·3, during which both the thermograph and sunshine records were available. By means of a table which gave p with the argument $B - \tau_0$, p was interpolated for each difference, $B - \tau_0$, as observed on 7,036 days on which the sun shone at noon during the 33 years (= 12,052 days), and from this material are derived the statistics in Tables 48A and B. During the same period there were 8,587 days with sunshine.

It would have been preferable under the circumstances if the maximum temperature in the shade had been chosen instead of τ_0, for, while the latter was no longer available after the dismantling of the thermograph in 1913, the recording of the maximum temperature in the shade has been continued.

57. *Statistics.*—In Table 48A the statistics are arranged according to months. For example, in January, during 33 years, the maximum coefficient of transmission near midday, p, exceeded 0·80 on $0{\cdot}2 \times 10^{-2} \times 33 \times 31 = 2$ days. There was sunshine on $0{\cdot}2 + 10 + 16 + 6 + 11 = 43$ per cent. of the days, and on 32 per cent. of the days the sun shone at noon and p exceeded the value 0·5. According to the figures in the second and third line days with a transparent atmosphere at midday are almost equally numerous in the several months ; and according to the last two lines a moderately transparent atmosphere (p between 0·5 and 0·7) occurs at midday on a number of days proportional (63 per cent. $=41 + 22$) to the number of days with sunshine.

Table 48B exhibits the changes in the course of 33 years for the four seasons and the whole year. They all indicate that the transparency has been continuously declining.

The coefficient of transmission discussed in this section belongs to a time at midday when the solar radiation and the transparency had their maxima. The frequency shown in the tables is therefore not comparable with the frequency derived from formula (5) in § 46.

VISIBILITY

58. Since August 1899 note has been taken of the most distant objects visible from the Observatory roof, which is 200 feet above sea-level.

The objects employed are : (1) Ben More, a mountain 3,800 feet high, 36 miles distant ; (2) Ben Venue, a range of hills rising to 2,400 feet, 24 miles distant ; (3) Dumgoyne, height 1,400 feet, distant 9 miles ; (4) high ground in front of Dumgoyne, height 500 feet, distance 6 miles ; (5) the tower of the University, altitude 3° above the horizon, distant 0·6 mile towards the south-east, or prominent houses at the same distance towards the north ; (6) houses at a distance of 0·2 mile ; (7) house at distance of 100 yards ; (8) objects in the Observatory grounds.

The first four objects lie almost in the same direction towards the north. The numerals, (1) to (8), constitute the visibility scale, *i.e.*, the visibility is designated by (3) if object No. (3) is visible and Nos. (1) and (2) are invisible. From the observations made towards the north no inference can be drawn as to the conditions prevailing in other directions on account of the eccentric position of the Observatory. (See § 34.)

The observations are also not comparable with the records of the solar maximum temperature in § 56, because the sun's rays may have to traverse smoke, haze, and clouds at midday, though the atmosphere may be transparent towards the north horizon, or a bank of smoke may lie low and affect the transparency along the horizon, but not the intensity of solar radiation. A comparison of the two determinations of transparency was, however, effected for Grade (5) (University tower visible), which was observed on 198 days with sunshine at midday. On these days the coefficient of transmission of the atmosphere exceeds 0·7 on 4 per cent. of the number of days ; it lies between 0·7 and 0·65 on 6 per cent. of the days; between 0·65 and 0·6 on 28 per cent.; between 0·65 and 0·55 on 28 per cent.; between 0·55 and 0·5 on 20 per cent.; and it is lower than 0·5 on 14 per cent. of the number of days.

The observations are made three times a day, Sundays excepted, at 9 a.m., 2 p.m., and near sunset, and there are 18,063 observations, made in the 20 years, 1899 to 1919, used for the statistics.

The diurnal variation is tabulated in Table 49A for the two halves of the year, October to March and April to September. The first columns give the percentages of the occasions when the several grades were observed, and the other columns contain the departures at 9 a.m., 2 p.m., and at sunset. For example, from October to March a visibility of Grade (3) occurred at 9 a.m. on 15 per cent. (18–3) of all the days.

At all seasons the atmosphere is more transparent at 2 p.m. than it is at 9 a.m. and at sunset.

Yearly variation.—By Table 49B the Grades (1), (2), (3) occurred most frequently in summer. In July Grade (1) occurred on 4 per cent. of the occasions, Grade 2 on 22 per cent., Grade (3) on 31 per cent.—total 57 per cent.; while the corresponding percentage in January is 22 per cent.

Secular variation.—By Table 49C the visibility towards the open country does not appear to have changed in the 20 years.

59. *Days with fog.*—The loose definition of fog is probably the cause of the large divergence in the number of days marked in the course of years. The observed numbers of days with fog and dense fog are respectively 235 and 23 during 1868–77, 158 and 85 during 1878–87, 125 and 62 during 1888–97, 55 and 44 during 1898–1907, 40 and 15 during 1908–17.

The figures for the months are more trustworthy since the error mentioned affects all the months equally. The percentages of the days with fog and dense fog are respectively in January 6·1 and 2·5, in February 3·7 and 2·1, in March 2·9 and 0·5, in April 1·0 and 0·1, in August 0·3 and 0·1, in September 3·2 and 0·5, in October 5·7 and 1·9, in November 9·2 and 3·2, in December 8·3 and 4·3 per cent. (Also see Table 49.)

WIND

60. *Instruments.*—There are three anemometers at the Observatory : the Osler pressure anemometer installed about 1840, the Robinson cup anemometer erected in 1868, and the Dines pressure-tube anemometer introduced in 1902.

The Osler anemometer may be described as a spring balance which bears a plate, 1 foot square, instead of the receptacle for the article to be weighed. The plate lies in a vertical plane and always faces the wind. Its motion is recorded on paper by a pencil, which, connected to the plate by a steel wire, follows its motion. Since 1894 the instrument has been standardised at intervals with the aid of an ordinary

suspension spring balance which was attached to the plate during the experiment and pulled successively with forces of 5, 10, . . . 40 pounds, the position of the pencil being marked on the recording paper. The several determinations agreed within a range of 3 pounds. The instrument is unreliable for pressures less than 5 pounds, but is most effective in recording the pressure of strong gusts.

The cups of the Robinson anemometer* have a diameter of 9 inches, and their centres are 24 inches away from the axis of rotation. The rotation of the cups is communicated to the recording apparatus in the Observatory by means of a long shaft, the gearing being so arranged that the shaft performs one revolution when the cups have moved 50/3 miles. The revolutions of the shaft are automatically recorded on paper, and in drawing the scale for the wind velocities it is supposed that the cups travel with a third of the velocity of the wind ; 3 is called the " factor " of the anemometer.

The records of the Dines anemometer have not been included in these statistics.

Positions of the anemometers.—The Osler anemometer stands on the Observatory roof due south of the hemispherical telescope dome and 10 metres distant from its centre. The vane and the pressure plate are about level with the top of the dome. During the first 25 years the Robinson anemometer stood on the top of this dome, and in April 1894 was removed to a standard 10 metres east of the centre of the dome. On the same standard the Dines instrument is mounted ; the vane is 1·4 metres above the plane of the cups and 1 metre from the centre of their axis of rotation towards the NE. The cups are 15 metres above the ground, 3 metres higher than the top of the dome, and 7 metres above the roof of the main building, in the middle of which it stands (see Fig. 3).

The eastern horizon from north to south is obstructed by buildings which lie almost in a circle round the dome at a distance of 100 metres and reach to about the same height. In the other directions trees and detached houses are at least 10 metres below the level of the cups.

61. *Tabulation.*—The curves recorded by the Robinson anemograph are read half-way between the hour lines to the nearest mile and the difference of two neighbouring readings is the uncorrected velocity per hour. These are corrected for friction† in accordance with the Code of Regulations of the Meteorological Office, *viz.*, 1·5 is added to the reading 0 ; 1·0 is added to the readings 1, 2, 3 ; and 0·5 to the readings 4 to 10. In the register the fraction 0·5 is indicated by a dot, so that the tabulated velocities are successively 1., 2, 3, 4, 4., 5., . . . 10., 11, 12, . . . The tabulated velocities are thus expressed in " Robinson miles " per hour.

The direction of the wind is also recorded by the Robinson anemograph, and it is tabulated to the nearest point of the compass. The direction may be represented by a line whose length is 1·00, drawn in the direction from which the wind is blowing. The rectangular components of this line, cos θ and sin θ, are also tabulated, the angle θ being the azimuth of the wind direction measured from the north, *e.g.*, point 10 on the compass, or ESE. is equivalent to cos $\theta = -0{\cdot}4$, sin $\theta = +0{\cdot}9$.

Average value of direction.—If the wind blew from each of the eight directions during 12·5 per cent. of the time there would be no prevalent direction ; while if it blew from the same direction, say SW., during the whole time, this direction would be the prevalent one. Again, if the wind blew during 50 per cent of the time equally often from all quarters, and throughout the remaining time from the SW., the SW. direction would be prevalent, but its degree of prevalence would be smaller than in the previous case. The conditions in the first case might be represented by a point

* *Loc. cit.*, p. 57.

† Since 1900 no allowance has been made for friction in tabulating wind records from the observatories controlled by the Meteorological Office.

coinciding with the origin, those in the second and third by lines drawn from the origin towards the SW. of respective lengths 1·0 and 0·50. These considerations suggested the mode of representing the directions by means of rectangular co-ordinates as specified above. Let square brackets, [ ], indicate average values, and let the azimuth, counted from the north, of the prevalent direction be designated by A, and the degree of prevalence in percentage by p, then

$$0{\cdot}01\ p\cos A\ =\ [\cos\theta],\ 0{\cdot}01\ p\sin A\ =\ [\sin\theta].$$

The point D of the compass of the prevalent direction is calculated from

$$D = +\ 32\ A\ /\ 360,\ A \text{ being expressed in degrees.}$$

In No. 65 the average daily movement of the air will be derived. Let the observed velocity at any instant be v and the direction be θ, and let the velocity ν at azimuth δ define the diurnal inequality of v and θ, and let square brackets, [ ], indicate 50-year averages for a particular hour during a definite period (10-day or month) of the year ; and let round brackets, ( ), stand for the mean of 24-hourly values, then, if the correlation between v and θ be neglected,

$$\nu\cos\delta = [v]\,[\cos\theta] - (\,[v]\,[\cos\theta]\,).$$

62. *Comparison of Robinson and Dines anemographs.*—The Robinson anemograph records average velocities, the Dines instrument shows velocities at each instant. The Dines record looks like a broad band beyond which project lines representing stronger gusts. A line, drawn midway through the band, may be considered representative of an average velocity, and thus comparable with the velocity given by the Robinson instrument. The average hourly velocity was measured on both records, each with its adopted scale, for each hour in July and August, 1902, and also for all those hours in the period September 1902 to November 1904 in which the velocity exceeded 15 miles. All the records between 0 and 5 miles were combined to a mean with due regard to the number of entries coming under each mile, and in the case of the Robinson velocities with regard to a continuous correction for friction. This was repeated for readings between 5 and 10 miles, etc. The following table contains these mean values :—

Number of Readings.		Hourly Velocity in Miles.		Robinson, *O–C.*
		Dines, *D.*	Robinson, *R.*	
1902 July and August	422	2·1	4·4	− 0·1
	519	5·6	8·4	0·0
	377	9·6	12·9	+ 0·1
	157	13·3	17·5	+ 0·5
	12	16·8	22·6	+ 1·7
1902 Sept. 3 to 1904 Nov. 19	95	17·6	21·3	− 0·4
	125	21·7	25·9	− 0·3
	163	25·0	29·9	0·0
	90	27·8	33·3	+ 0·3
	48	32·0	37·5	− 0·1

The solution is $D + 2{\cdot}0 = 0{\cdot}9\ R$. The positive correction of two miles to be applied to the Dines record appears to be real, as there are quite a number of records which give zero for the Dines and a few miles for the Robinson anemograph. Hence the " Robinson mile," by which is designated the unit of the Robinson records, equals 0·9 of a " Dines mile." The constant of the anemometer would become 2·7 (= 3 × 0·9) instead of the value 3 printed on the recording-sheets, if the " Dines mile " were the true mile.

Comparison of the Dines and Osler anemographs.—The quantities used for the determination of the relative scale of these instruments are (1) the highest records in each hour of the period September 3 1902 to November 19 1904 in which the hourly velocity exceeded 25 miles ; (2) the highest record at each gale during 1904 to 1907 in which the hourly velocity exceeded 40 miles. The observations are tabulated below, those relating to (2) being distinguished by asterisks ; n denotes the number of observations, D the average Dines record in " Dines miles " per hour, O the average Osler record in pounds per square foot.

n	Velocity, D.	Pressure, O.	Pressure, obs.–calc.
23	28·4	2·2	− 0·2
84	32·9	3·6	− 0·4
127	38·3	5·7	− 0·3
8*	38·6	6·5	+ 0·3
125	42·8	8·1	+ 0·1
12*	43·1	7·6	− 0·5
15*	47·0	10·9	+ 0·9
110	47·6	10·5	+ 0·2
36	52·2	12·5	− 0·3
12*	52·3	13·1	+ 0·3
8*	57·5	16·8	+ 0·9
15	57·6	15·6	− 0·3
3*	65·3	19·0	− 1·9
2*	73·0	28·0	+ 1·4

These and the former observations are represented by the formula :

$$O + 2{\cdot}3 = 0{\cdot}0051\ (D + 2{\cdot}0)^2 = 0{\cdot}0042\ R^2.$$

The pressure scale of the Dines anemograph as printed on the recording-sheets is calculated with the factor 0·003, pressure in pounds per square foot being $0{\cdot}003\ D^2$. Thus, with the Dines pressures of 1, 5, 10, 20 pounds correspond, according to the above formulae, the Osler pressures of 0, 7, 16, 33 pounds. The discordance is remarkable.

Comparison of Osler and Robinson anemograph records.—The records of 20 gales during the period 1894-8 were compared, the range of the average pressure, O, being only 4 pounds, 7 to 11. This preliminary comparison gave $O = 0{\cdot}0042\ R^2$.

63. *Mean values of velocity and direction for each month, year, and five-year period, 1868–1917.*—The compilation of velocity is given in Table 50. Each figure under January is derived from 31 × 24 recorded hourly velocities.

Corresponding tables for the direction of the wind are not published here. In their stead Table 51 gives this information in statistical form. Light winds with velocities under three miles were separately counted and tabulated under calms. The secular variation is exhibited in Table 52 by the method explained in § 61. In the 50 years the wind has veered from SW. to WSW., the degree of prevalence being 18 per cent. (Also see Table 75B.)

64. *Average values of velocity and direction, 1868–1917.*—Table 53 contains the average velocities at intervals of an hour for the several months and the year, and Table 54 gives the values of [cos θ] and [sin θ] (see § 61) at intervals of two hours for the several periods of a third of a month and year. Each figure in this table rests on 10 (or 11 or 8) times 50 observations.

65. *Average daily movement of the air, 1868–1917.*—Refer to § 61. The means, [cos θ] and [sin θ], are given in Table 54 for each second hour and 36 periods of the year, and [v] for the same periods can be interpolated from Table 53. $\nu \cos \delta$ and $\nu \sin \delta$ were calculated for each hour for each of the 36 periods. These values were found to be represented by $\nu \cos \delta = \alpha\,\sigma$ and $\nu \sin \delta = \beta\,\sigma$ where α and β, belonging to a certain hour, have nearly the same values for all periods, and thus the curves representing the daily movement of the air are identical at all seasons and differ only

in scale. The values of α, β, σ are contained in Tables 55A and B. The figures are given at intervals of three hours. To obtain at a certain hour the velocity of the daily current from the diagram below, draw a line from the origin to the corresponding hour point, the direction of the line is the direction from which the current comes, and the length of the line is the velocity. The scale of the velocity is obtained from Table 55B, σ being the distance of the 15-hour point. From about midday to 6 p.m. the daily current blows from almost due west, with a maximum velocity of two miles in July, and of half a mile in December and January. From midnight to 9 a.m. the current comes from the east with about half the afternoon velocity. In November the daily current is least pronounced.

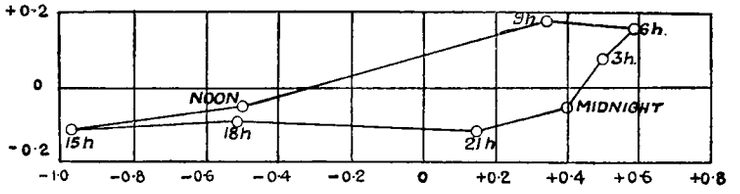

Fig. 5. Diurnal Variation of Air Flow.

66. *Average values of velocity and direction, 1868–1917. Yearly curves.*— Average monthly values of velocity are to be found in Tables 50 and 53, below the line. Statistics of the direction are given for each month in Table 51 and average monthly values of the rectangular components of direction are entered in the last two columns of Table 54.

67. *Average values of velocity and direction, 1868–1917. Yearly curves.*— In this section the quantities are given for each period of five days. Table 56 contains the hourly velocity in miles, the average point of compass (see § 61) and degree of prevalence in percentage. Each is calculated from $50 \times 5 \times 24$ recorded quantities. The direction and degree of prevalence is illustrated on the annexed diagram for each of the 73 periods. Note the high degree for period 38.

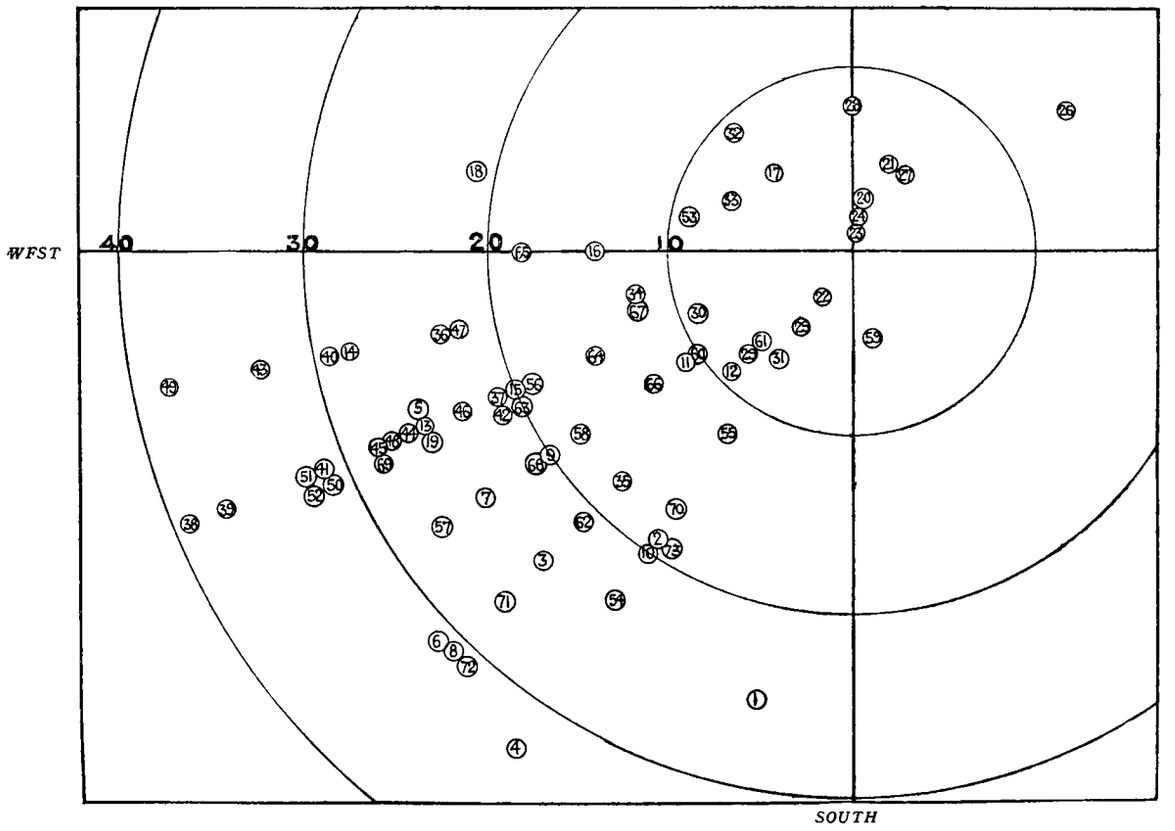

Fig. 6. Annual Variation of Wind Direction.

68. *Formula.*—Refer to §§ 10, 19, 24, 31. A smoothed yearly curve of velocity is well represented by the formula :

$$\text{Velocity} = 11{\cdot}68 - 0{\cdot}83 \sin \lambda - 0{\cdot}34 \sin 2\lambda + 1{\cdot}94 \cos (\phi - \delta) \cos \lambda.$$

In groups of 9 to 10 five-day periods the average departures are $-0{\cdot}1$, $+0{\cdot}1$, $+0{\cdot}2$, $-0{\cdot}1$, $+0{\cdot}1$, $-0{\cdot}1$, $+0{\cdot}2$, $-0{\cdot}1$. The observations and the calculated curve are shown on Plate II.

69. *Frequency of hourly velocity.*—The number of hours were counted in the 40 years, 1868 to 1907, during which the wind blew with a velocity of 1, 2, 3, . . . miles per hour ; 348,225 hourly velocities have been classified, the results being embodied in Tables 57 to 62.

The corrections for friction, mentioned in § 61, are discontinuous, and cannot be employed in this inquiry. In Table 57 the first column gives the recorded velocities, and the second column, under heading " Real Velocities," contains the velocities corrected for friction. According to this table the velocity lies between 2·6 and 5·2 miles per hour during 16·61 per cent. of all the hours.

From the figures in the last column another series of figures was obtained by successive addition, giving the hours, n, during which the velocities, V, are smaller than 2·6, 5·2, 7·0, . . . A graph with the co-ordinates, n and V, represents the observations very closely, and this good agreement proves that a period of 40 years is sufficiently long to bring all probabilities into operation.

Table 58 is obtained by interpolation from Table 57. It is of special importance to engineers. Refer to § 62 for definition of the " Robinson mile," which is the unit used in all the tables.

Tables 59 and 60 give statistics for the several months, and Tables 61 and 62 for the five-year periods.

For example, winds of low velocity show a preference for the months May to October, while calms ($V < 5$) are most numerous in the months August to December. Further, strong winds are more numerous from November to April than during the other half year. Gales are most numerous in January and they seldom occur in the summer. Most remarkable are the high velocities in the decade 1868–77, which coincide with the occurrence of a low barometer (see Table 75B and Plate III).

70. *Frequency of daily velocity, 1868–1917.*—Table 56 shows the distribution of average daily velocities for each five-day period, and gives the percentages of the days on which the daily averages of the velocities per hour lie within the limits given in the heading. For example, in the period January 1 to 5 the wind blew on 11 per cent. of all the days in the years 1868 to 1917, with an average daily velocity of less than five miles per hour, and on 34 per cent. of the days with an average velocity of more than 15 miles per hour. Calms occur rarely from the beginning of April to the beginning of July, *i.e.*, during the period of low average velocities. A comparison with the average velocity curve shows that a low average velocity is due to the absence of high winds and not to the prevalence of calms ; indeed calms during a day are most frequent in the seasons in which high winds prevail. (Refer to § 69.)

GALES

71. *Statistics of records of cup anemograph.*—All the velocities are expressed in " Robinson miles " (§ 61).

In the tabulations all those gales are included whose maximum velocity during 60 minutes is 40 miles. The beginning and the end of a gale are fixed by the arbitrary condition that for the whole duration of the gale the average velocity in every three consecutive hours is at least 30 miles per hour. For instance, let the average velocities in 13 consecutive hours be 20, 30, 35, 41, 24, 27, 40, 45, 48, 42, 30, 25, 22. The first hour is not counted in the duration of the gale, because the average of 20, 30, 35 is less than 30, while the second hour is obviously counted. Thus, the duration of such a gale would be given as 11 hours.

Again, if two maxima above 40 miles are separated by velocities below 30 miles, lasting more than four hours, the disturbance is counted as two gales. Some such arrangement had to be introduced, as disturbances prevailing during several days with several maxima ought to obtain a greater weight than those lasting only a few hours.

In one case the rule has not been satisfactory. For 57 hours during the disturbance of January 30 to February 1, 1868, the mean velocity in each three consecutive hours was above 30 miles and there were several maxima above 40 miles, yet this disturbance had to be counted as one gale, though, had the minima been less, it would have been counted as two. The case, however, is unique.

Fourteen of the 260 gales treated in the tables are tabulated as two gales, eight of which belonging to the period 1868–1873. Two disturbances, of dates January 14 to 18 1868, and February 20 to 27 1868, are counted as four gales each ; the four maxima being separated by three minima below 30 miles, lasting in the first case 5, 30, 34 hours, respectively, and in the second case 63, 20, 19 hours.

Table 63 contains statistics of the 50 strongest gales. The table gives the maximum velocity in 15 minutes in addition to that in 60 minutes, although the former one is difficult to measure and not so accurate as the velocity during a whole hour. Direction, duration and atmospheric pressure are included in the table. Δb is the fall of the pressure from the time when the gale began to the time when the minimum pressure was reached. The last column contains the number of hours occupied by this fall.

According to this evidence neither the atmospheric pressure nor its rate of fall at the beginning of a gale give any indication of its strength. The memorable gale which wrecked the Tay Bridge is No. 6 of the list. Of the first 10 gales, nine occurred in the first 15 years, 1868–1882, and there are only four gales after 1896. Except Nos. 9 and 24, all the gales have a south to west direction.

Table 64 contains the number of gales in each year. The gales are classified with reference to local atmospheric pressure and maximum velocity. In most years the greatest number of gales belong to a pressure between 29·0 and 29·5 inches. The decline in the number of gales in the course of years is shown by the figures 71, 45, 31, 27, 16, 25, 17, 13, 8, 7, which are the numbers in the ten successive five-year periods.

The large falling-off in numbers of gales after 1870, and the steady decrease after 1894, when the anemograph was always in the same position and the obstructions in and around the Observatory grounds remained unchanged, is remarkable. If owing to local causes (*e.g.*, increase in number of buildings) all the velocities above 40 miles recorded since 1893 required the correction of + 5 miles the number of gales in the 15 years 1893–1907 would be about as numerous and severe as those in the preceding 15 years. In the period 1893–1907 there would be 35 with velocities of 45–49 miles, 13 with velocities of 50–54 miles, and 6 with velocities of more than 55 miles, as compared with 20, 13, 5, respectively, for the period 1873–87. On the other hand, the similarity of the secular curves of wind velocity and atmospheric pressure is in favour of the actual decrease in the numbers and severity of the gales.*

* The records from Aberdeen and Valencia do not show any marked decrease in the average wind velocity. The following table gives the average wind velocities in mi/hr for the two stations, for the years examined.

	Aberdeen	Valenc a		Aberdeen	Valencia
1871	8·6	13·1	1901	8·1	11·4
1876	10·3	13·1	1902	8·9	12·0
1881	9·5	13·3	1903	8·9	13·3
1882	9·5	13·0	1904	8·3	11·7
1886	9·6	13·3	1905	8·8	11·8
1887	8·4	11·6	1906	8·5	12·5
1891	9·0	12·5	1907	8·3	11·8
1892	8·9	11·7	1908	8·2	12·3
1896	7·9	11·6	1909	8·3	11·6
1897	8·9	11·9	1910	8·5	12·1

[Ed.]

In Table 65 the gales are classified according to the several months and the velocity, for two periods of 20 years and one period of 10 years.

Tables 66 and 67 classify the directions of the gales at the time of maximum velocity. The diminution of gales in the course of 50 years is least shown by gales coming from points 20 to 25, which are the principal points for gales.

Tables 68 and 69 refer to the veering. They indicate a tendency of the gales to cease near the same point of the compass or of southerly gales veering more than westerly gales.

72. *Greatest wind pressures.*—During the gale of December 28 1879, No. 6, the extraordinary pressure of 70 pounds per square foot was registered with the Osler anemograph. This record is open to doubt, and it was measured with a scale about the correctness of which nothing is known. Immediately after this pressure was recorded the pressure spring broke. It was replaced by a new one in the course of the following month and it is believed that the area of the pressure plate was reduced from fifteen inches square to its present size of one square foot. Obviously the scale determined after 1893 cannot be applied before 1880. In an indirect way the correctness of this record may be tested.

Calculate R_0 from the maximum pressure, O, recorded during a gale, using the formula in § 62. This calculated R_0 may be compared with the greatest hourly velocities observed during 15 minutes and 60 minutes on the Robinson anemograph during the same gale. Then it is found that R_{15} / R_{60} and R_0 / R_{60} have, on an average, the same values in each period of five years since 1887, during which time no important changes were made to the anemographs. The ratios are also found to be independent of the velocity. In the following table all gales are included for which records are available and for which R_{60} exceeds 40 miles.

Periods.	Number of Gales.	Average R_0 / R_{60}.	Number of Gales.	Average R_{15} / R_{60}.
1868, 1869, 1870 ..	54	1·56	57	1·18
1871, 1872, 1873 ..	19	1·30	20	1·21
1874, 1875, 1876 ..	—	—	29	1·19
1877, 1878, 1879 ..	16	2·00	20	1·23
1880 to 1887	41	1·83	44	1·19
1888 to 1907	69	1·53	73	1·15

While R_{15} / R_{60} is practically constant during the 40 years, R_0 / R_{60} in the first 20 years differs from the value which appertains on an average to the last 20 years. The value derived for 1871–73 is certainly too small, since R_0, which is calculated with the strongest pressure and ought to be in excess of any velocity registered with the cup anemometer, is for 8 out of 19 gales smaller than R_{15}.

It appears to me reasonable to assume that with equal average values of R_{15} / R_{60} there correspond equal average values of R_0 / R_{60}. On this assumption R_0 / R_{60} has the same value in the first and second half of the 40 years, and therefore the pressures recorded in 1877–79 require to be multiplied by $(1{\cdot}53/2{\cdot}00)^2 = 0{\cdot}59$. The maximum pressure during the Tay Bridge storm would thus be $70 \times 0{\cdot}59 =$ 41 pounds per square foot.

Table 70 shows the maximum pressures recorded for 138 gales in 1868–1887 but corrected, and for 85 gales in the period 1888–1917.

Miscellaneous Observations.

73. *Snow.*—The days were noted when snow fell, and their number, independently of the duration, is compiled in Tables 71, 72. There are, on an average, 13 falls of snow in a year. In 50 years, 12 Januarys have no snowfall ; 15 Januarys have one or two days on which snow fell ; 11 Januarys have three or four such days, etc. The five-year period, 1913·0–1918·0, had 23·4 falls per year and one year of this period had 41 days with snowfalls.

Similar statistics are contained in Tables 73 and 74 for the days on which snow lay on the grass-covered ground round the Observatory. A year has on an average 11 days when the ground is white with snow, while one year in the five-year period 1902·5–1907·5 had as many as 33 such days.

74. *Thunderstorms.*—Since 1886 the occurrences of thunderstorms has been noted. The total number in 35 years is 164, *viz.*, 9 in January, 7 in February, 8 in March, 6 in April, 21 in May, 25 in June, 31 in July, 27 in August, 7 in September, 6 in October, 5 in November, and 12 in December. The greatest number in a year was nine (in 1893), the smallest, one (in 1904 and 1909).

TABLE 1.—SERIAL VALUES OF THE MEAN ATMOSPHERIC PRESSURE AT STATION LEVEL, b, FOR EACH MONTH AND YEAR, 1868 TO 1912.

$b = 29{\cdot}663 + \mathrm{B}\ 10^{-3}$ inches of mercury under local gravity.

B.

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Pressure. Highest.	Pressure. Lowest.
1868 ..	−113	− 15	− 96	− 10	+ 15	+188	+200	− 42	+ 33	− 64	+120	**−535**	−27	30·51	28·14
69 ..	− 63	−143	+ 55	+ 93	+ 41	+194	+119	+247	−260	+130	− 90	−143	+15	48	15
70 ..	− 2	− 6	+206	+173	+ 69	+193	+100	+152	+ 83	−256	−127	+ 77	+55	48	18
71 ..	−144	− 29	+ 35	−103	+197	+ 93	−162	+ 61	+ 65	− 34	+137	+ 73	+16	40	20
72 ..	−484	−208	−148	+ 21	− 7	− 86	+ 57	+ 76	−167	−270	−336	−407	**−164**	21	09
73 ..	−402	+260	− 65	+181	+ 48	+ 35	− 70	− 86	− 22	−174	− 30	+169	−13	47	03
74 ..	− 77	+ 10	+157	−122	+132	+214	+ 28	− 71	−142	−190	− 10	− 85	−13	67	28
75 ..	−187	+220	+277	+156	+ 23	− 67	+110	+101	+108	−129	− 42	+109	+56	50	46
76 ..	+266	−208	−462	− 60	+288	+ 43	+ 94	− 10	−132	− 28	− 36	−498	−62	42	09
77 ..	−235	−133	−184	− 72	− 20	+ 24	−103	− 67	+170	− 55	−474	− 20	−98	42	27·98
78 ..	+148	+254	+137	− 30	−167	+ 28	+144	−136	− 36	−255	− 52	−193	−13	46	28·54
79 ..	+160	−369	+ 30	−148	+116	−180	−176	−174	− 48	+198	+369	+282	+ 5	46	58
80 ..	+369	−296	+161	− 60	+218	+ 40	− 50	+160	+ 30	+ 98	− 81	−106	+40	44	34
81 ..	+ 49	− 73	− 88	+135	+159	+ 1	− 21	−141	+106	+159	−230	− 78	− 2	56	27·92
82 ..	+266	+165	− 74	−109	+137	− 56	−167	− 52	− 48	− 56	−319	−253	−47	67	28·55
83 ..	−143	− 27	+103	+124	+ 58	+ 78	− 93	+ 8	− 89	− 28	−247	+168	− 7	53	39
84 ..	− 57	−121	− 63	− 6	+ 4	+152	− 5	+ 66	+ 47	+ 90	+215	−181	+12	53	27·22
85 ..	− 67	−416	+162	− 80	−145	+144	+248	+114	−132	−173	− 29	+189	−15	45	28·14
86 ..	−305	+221	+ 26	+ 14	+ 24	+ 76	− 50	+ 24	+ 80	− 78	− 65	−288	−27	48	27·46
87 ..	− 46	+318	+170	+126	+170	+318	+ 66	+ 54	− 3	+185	−208	−149	**+83**	52	28·25
88 ..	+258	+193	−229	+ 12	+ 73	+ 90	−141	+ 28	+271	+ 73	−199	− 69	+30	49	65
89 ..	+185	− 12	+ 50	−132	− 64	+187	+ 29	−114	+137	−202	+222	+139	+35	50	45
90 ..	−257	+363	−177	− 44	− 31	+ 23	− 59	− 59	+143	+104	−120	+203	+ 7	53	42
91 ..	+112	**+464**	−102	+146	− 89	+188	0	−197	− 43	−254	−106	−145	− 2	60	05
92 ..	−125	−111	+169	+134	+ 41	+ 59	+112	− 74	− 77	−167	+ 37	+ 20	+ 1	43	48
93 ..	+140	−327	+137	+299	+171	+112	− 13	+ 52	−123	−136	+126	−130	+26	45	33
94 ..	−230	−119	− 65	− 16	+ 76	+100	− 38	− 35	+347	+ 44	− 93	− 11	− 3	54	27·98
95 ..	−121	+284	−248	− 33	+236	+175	− 87	−112	+179	− 69	−100	−189	− 7	55	28·12
96 ..	+345	+320	−235	+196	+395	+ 34	+ 98	+114	−208	−169	+247	−191	+79	89	15
97 ..	+ 56	+ 66	−393	− 50	+ 66	+124	+ 83	−183	+ 31	+216	+230	−162	+ 7	43	48
1898 ..	+231	−109	+ 34	− 69	− 42	+ 60	+198	+ 29	+120	− 74	−110	− 94	+14	34	43
1999 ..	−203	−103	+ 90	−133	+139	+184	+157	+202	−141	+ 88	+ 70	− 61	+24	52	25
00 ..	− 75	−335	+202	− 3	+ 50	+ 7	+ 66	+ 77	+144	− 50	−184	−224	−27	49	24
01 ..	+ 25	+187	−115	−129	+241	+104	+150	+ 75	− 20	− 50	+225	−368	+27	43	42
02 ..	+120	− 15	−184	+ 40	+ 79	+ 56	+ 83	+ 5	+140	+ 54	− 77	+ 40	+28	86	27
03 ..	−100	− 74	−327	− 23	+ 3	+219	− 12	+321	+ 83	−426	+ 69	−193	−38	42	08
04 ..	−134	−392	+ 86	−121	+ 1	+133	+ 99	+ 46	+144	+138	+ 94	− 80	+ 1	48	31
05 ..	+201	+138	−324	− 69	+225	+104	+102	− 58	+ 54	+118	−240	+170	+35	69	11
06 ..	−148	−225	+ 91	+169	− 73	+228	+ 65	+ 2	+293	−171	− 83	− 8	+12	51	35
07 ..	+310	+ 67	+121	−125	− 47	−181	+111	− 50	+196	−281	+ 27	−244	− 8	83	26
08 ..	+140	+ 62	−119	+112	+ 32	+173	+ 77	+ 44	− 33	+206	+ 37	−114	+51	47	34
09 ..	+ 89	+227	−325	− 8	+178	+117	− 71	+ 50	+166	−248	+ 88	−299	− 3	43	15
10 ..	−224	−490	+179	−121	+ 4	+ 5	− 40	−109	+345	+173	−300	−309	−74	48	14
11 ..	+330	+ 99	+ 94	+ 53	+ 87	+ 49	+217	+ 53	+112	+ 34	−282	−385	+38	61	36
1912 ..	0	−318	−379	+232	+ 53	−140	+ 46	−212	+277	− 76	− 12	−288	−68	37	24
1868–1912	− 3	− 17	− 36	+ 12	+ 70	+ 81	+ 33	+ 4	+ 48	− 46	− 44	−108	0	30·89	27·22
Δb ..	+ 3	+ 4	+ 2	+ 1	− 1	− 3	− 4	− 4	− 2	− 1	+ 1	+ 3	0		
Highest	30·89	30·82	30·67	30·51	30·56	30·46	30·39	30·33	30·43	30·55	30·52	30·69			
Lowest	27·22	28·08	28·09	27·95	28·50	28·80	28·76	28·52	28·50	28·06	27·92	27·46			
Range ..	3·7	2·7	2·6	2·6	2·1	1·7	1·6	1·8	1·9	2·5	2·6	3·2			

Gravity Correction ..	27·5	28·0	28·5	29·0	29·5	30·0	30·5
	+·027	+·027	+·028	+·028	+·029	+·029	+·030

Reduction to Sea Level = 203 + Δb in unit of 10^{-3} inch.

TABLE 2.—DIURNAL AND ANNUAL VARIATION OF ATMOSPHERIC PRESSURE, 1868–1912.

Departures from 45-year Normals.

(Unit 0·001 inch.)

Hour	1	2	3	4	5	6	7	8	9	10	11	noon	13	14	15	16	17	18	19	20	21	22	23	mgt.	Mean (unit 1 in.)	r%
Jan. ..	+ 1	− 1	− 3	− 7	−11	−11	−10	− 3	+ 3	+ 9	**+11**	+ 6	− 2	− 6	− 7	− 4	− 1	+ 3	+ 5	+ 8	+ 9	+ 9	+ 7	+ 6	29·668	3·5
Feb. ..	+ 3	0	− 5	− 9	−10	−10	− 8	− 1	+ 3	+ 7	+10	+ 7	+ 1	− 5	− 9	− 8	− 6	+ 2	+ 5	+ 7	+ 7	+ 8	+ 6	+ 6	29·646	2·7
Mar. ..	+ 2	− 4	− 7	−11	−11	− 8	− 3	+ 2	+ 5	+ 7	+ 7	+ 5	+ 1	− 4	− 9	−10	− 9	− 3	+ 3	+ 8	+ 9	**+11**	+10	+ 9	29·630	1·6
Apr. ..	+ 3	− 1	− 5	− 7	− 7	− 2	+ 3	+ 6	+ 7	+ 7	+ 5	+ 3	− 1	− 5	−11	−13	−14	−10	− 5	+ 4	+ 7	+ 9	+ 9	+ 8	29·677	2·0
May ..	+ 6	+ 3	− 1	− 2	− 1	+ 2	+ 5	+ 8	+ 7	+ 5	+ 3	0	− 4	− 7	−12	−14	**−16**	−13	− 9	0	+ 6	+10	**+11**	+10	29·733	1·7
June ..	+ 5	+ 2	− 2	− 2	− 1	+ 3	+ 5	+ 7	+ 6	+ 5	+ 3	+ 1	− 3	− 6	− 9	−12	−14	−12	− 8	− 3	+ 4	+ 9	+ 9	+ 9	**29·745**	1·6
July ..	+ 5	+ 1	− 3	− 5	− 4	− 1	+ 1	+ 4	+ 4	+ 4	+ 3	+ 2	0	− 2	− 5	− 8	−10	− 9	− 7	− 1	+ 4	+ 8	+ 9	+ 9	29·696	2·3
Aug. ..	+ 3	0	− 5	− 8	− 8	− 4	0	+ 4	+ 5	+ 5	+ 4	+ 2	+ 1	− 2	− 5	− 8	− 9	− 8	− 4	+ 3	+ 6	+ 8	+ 7	+ 6	29·661	2·3
Sept. ..	+ 4	+ 1	− 4	− 8	− 9	− 5	0	+ 5	+ 7	+ 8	+ 6	+ 4	+ 1	− 3	− 8	−11	−10	− 7	− 1	+ 6	+ 7	+ 8	+ 6	+ 5	29·713	1·6
Oct. ..	0	− 4	−10	−12	−13	−10	− 5	+ 2	+ 6	+ 9	+ 8	+ 5	0	− 4	− 8	− 9	− 5	+ 2	+ 5	+ 8	+ 9	+ 9	+ 7	+ 6	29·617	0·7
Nov. ..	+ 1	− 1	− 5	− 8	− 8	− 7	− 4	+ 3	+ 7	**+11**	+10	+ 5	− 2	− 7	− 9	− 8	− 5	+ 1	+ 3	+ 5	+ 5	+ 6	+ 5	+ 5	29·620	1·8
Dec. ..	+ 1	+ 1	− 1	− 5	− 9	−10	− 8	− 2	+ 4	+10	+10	+ 4	− 3	− 7	− 9	− 6	− 4	0	+ 2	+ 5	+ 6	+ 7	+ 6	+ 5	**29·556**	2·5
Year ..	+ 2	− 1	− 5	− 7	− 8	− 6	− 2	+ 2	+ 5	+ 7	+ 6	+ 3	− 1	− 5	− 9	**−10**	− 9	− 5	− 1	+ 4	+ 6	**+ 8**	+ 7	+ 7	29·664	2·0

r = number of rejected curves in per cent of complete number.

TABLE 3.—SERIAL VALUES OF THE MEAN TEMPERATURE IN THE SHADE FOR EACH MONTH AND YEAR, 1868–1912.

Departures from 45-year Normals (given in the bottom line).

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1868	− 1	+ 32	+ 30	+ 13	+ 21	+ 6	+ 31	+ 22	+ 4	− 20	− 29	+ 27	+ 11
69	+ 31	+ 38	− 20	+ 26	− 40	− 10	+ 20	− 5	+ 13	+ 12	− 12	− 35	+ 1
70	− 17	− 27	− 7	+ 23	+ 13	+ 4	+ 20	+ 16	+ 6	− 4	− 28	− 53	− 5
71	− 44	+ 27	+ 26	− 15	+ 23	− 4	− 2	+ 20	− 6	+ 8	− 28	+ 1	0
72	+ 18	+ 31	+ 19	+ 8	− 19	− 4	+ 19	− 1	− 16	− 10	− 1	0	+ 4
73	+ 13	− 36	− 10	+ 9	− 21	+ 10	+ 8	− 10	− 16	− 24	− 5	+ 47	− 3
74	+ 29	+ 9	+ 33	+ 23	− 21	+ 4	+ 17	− 9	− 1	− 2	− 5	− 82	0
75	+ 26	− 22	0	+ 20	+ 17	− 12	0	+ 13	+ 14	+ 1	− 23	+ 9	+ 3
76	+ 19	− 16	− 23	− 4	+ 2	+ 4	+ 3	+ 11	− 9	+ 33	− 16	+ 19	+ 2
77	− 5	+ 16	− 18	− 31	− 31	+ 1	− 19	− 18	− 20	+ 5	+ 12	+ 17	− 8
78	+ 3	+ 32	+ 6	+ 17	+ 14	+ 16	+ 21	+ 22	+ 12	+ 27	− 35	− 78	+ 5
79	− 74	− 40	− 26	− 34	− 25	− 16	− 26	− 9	− 12	− 12	− 11	− 28	**− 26**
80	− 7	+ 39	+ 8	+ 8	+ 2	+ 5	− 4	+ 31	+ 23	− 41	− 26	− 6	+ 3
81	**− 95**	− 34	− 21	− 19	+ 20	− 18	− 14	− 29	+ 1	− 20	+ 43	+ 4	− 15
82	+ 39	+ 43	+ 31	− 5	+ 12	− 9	− 1	+ 4	− 12	+ 15	− 22	− 39	+ 5
83	+ 8	+ 24	− 37	+ 3	− 10	− 12	− 12	− 7	− 1	+ 4	− 11	+ 20	− 3
84	+ 30	+ 12	+ 16	+ 1	− 4	− 3	0	+ 17	+ 13	+ 9	− 8	− 10	+ 6
85	− 14	+ 12	− 8	+ 4	− 36	− 7	+ 1	− 26	− 23	− 38	− 8	+ 2	− 12
86	− 34	− 36	− 23	− 9	− 21	− 17	− 6	− 7	− 4	+ 28	+ 16	− 45	− 13
87	− 1	+ 11	− 18	− 23	0	+ 27	+ 16	− 1	− 16	− 25	− 14	− 21	− 5
88	+ 10	− 24	− 37	− 20	− 2	− 23	− 34	− 20	− 16	+ 5	+ 16	+ 27	− 10
89	+ 14	− 15	− 3	− 13	+ 34	+ 22	− 11	− 10	− 7	− 11	+ 23	+ 12	+ 3
90	+ 34	− 15	+ 23	− 3	+ 18	− 13	− 26	− 15	+ 34	+ 17	0	− 28	+ 2
91	− 11	+ 28	− 29	− 22	− 19	+ 9	+ 3	− 6	+ 14	− 4	− 7	+ 9	− 3
92	− 18	− 12	− 32	− 14	+ 10	− 16	− 18	− 4	− 24	− 37	+ 14	− 36	− 16
93	− 9	+ 7	+ 25	+ 32	+ 32	+ 31	+ 5	+ 28	− 11	+ 3	− 18	+ 29	+ 13
94	− 8	+ 6	+ 24	+ 28	− 30	− 10	+ 6	− 17	− 15	− 14	+ 36	+ 23	+ 2
95	− 70	− 90	+ 2	+ 12	+ 33	+ 14	− 16	+ 11	+ 36	− 39	+ 11	− 8	− 9
96	+ 22	+ 31	+ 11	+ 24	+ 44	+ 16	− 7	− 10	− 2	− 44	+ 3	− 2	+ 7
97	− 35	+ 14	+ 6	− 23	− 16	− 5	+ 6	+ 21	− 18	+ 9	+ 40	+ 10	+ 1
98	+ 57	+ 2	− 4	+ 23	− 14	− 2	− 4	+ 7	+ 29	+ 32	+ 6	+ 54	**+ 15**
1899	− 12	+ 1	+ 3	− 9	− 23	+ 30	+ 14	+ 38	− 9	+ 10	+ 55	− 30	+ 6
1900	+ 9	− 50	− 26	+ 10	+ 4	+ 12	+ 12	− 6	+ 8	− 8	+ 11	+ 51	+ 2
01	+ 2	− 18	− 12	+ 6	+ 29	− 8	**+ 40**	+ 5	+ 24	+ 1	− 1	− 13	+ 5
02	+ 1	− 36	+ 20	0	− 36	− 16	− 26	− 23	+ 5	+ 7	+ 28	+ 11	− 5
03	− 14	+ 45	+ 11	− 24	0	− 5	− 13	− 20	− 2	+ 10	+ 9	− 12	− 1
04	+ 16	− 18	− 15	+ 6	− 7	− 4	− 4	− 3	+ 2	+ 17	+ 2	+ 10	0
05	+ 22	+ 13	+ 22	− 15	+ 11	+ 18	+ 18	− 8	− 3	− 27	− 10	+ 44	+ 7
06	+ 25	− 24	− 6	− 7	− 15	+ 19	− 10	+ 13	+ 14	+ 23	+ 35	− 5	+ 5
07	+ 9	− 14	+ 21	− 1	− 16	− 39	− 14	− 26	+ 11	+ 10	+ 7	+ 6	− 4
08	− 1	+ 24	− 10	− 24	+ 20	+ 1	+ 3	− 4	+ 12	+ 61	+ 30	+ 11	+ 10
09	+ 14	+ 8	− 29	+ 8	+ 7	− 14	− 20	+ 2	− 16	+ 8	− 31	− 19	− 7
10	− 14	+ 5	+ 28	− 17	+ 1	+ 6	− 10	+ 4	+ 8	+ 29	− 53	+ 39	+ 2
11	+ 21	+ 9	+ 1	+ 4	+ 37	+ 10	+ 23	+ 34	+ 1	− 7	− 2	+ 35	+ 14
1912	− 6	+ 11	+ 27	+ 29	+ 12	− 8	+ 6	− 35	− 23	− 4	+ 8	+ 33	+ 4
1868–1912 (Unit 1° F.).	**38·7**	39·0	40·4	44·6	49·5	55·1	**57·5**	56·6	53·0	47·1	42·1	39·1	46·9

TABLE 4.—SERIAL VALUES OF THE MEAN TEMPERATURE INDICATED BY THE WET BULB THERMOMETER FOR EACH MONTH AND YEAR, 1868–1912.

Departures from 45-year Normals (given in the bottom line).

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1868	0	+ 30	+ 31	+ 17	+ 24	0	+ 17	+ 16	+ 2	− 18	− 29	+ 27	+ 10
69	+ 32	+ 37	− 27	+ 24	− 42	− 13	+ 16	− 11	+ 12	+ 11	− 12	− 35	− 1
70	− 16	− 29	− 8	+ 20	+ 14	+ 8	+ 20	+ 5	+ 5	− 4	− 27	− 55	− 5
71	− 41	+ 29	+ 23	− 8	+ 16	− 10	− 1	+ 19	− 9	+ 10	− 31	− 1	0
72	+ 19	+ 31	+ 18	+ 6	− 13	+ 5	+ 19	+ 5	− 10	− 11	− 2	+ 2	+ 6
73	+ 13	− 38	− 5	+ 3	− 20	+ 12	+ 11	− 4	− 20	− 20	− 6	+ 45	− 2
74	+ 26	+ 7	+ 32	+ 24	− 20	− 7	+ 13	− 8	0	− 1	− 3	− 80	0
75	+ 28	− 21	− 4	+ 14	+ 19	− 6	− 7	+ 14	+ 16	+ 1	− 25	+ 6	+ 3
76	+ 15	− 18	− 22	0	− 7	0	0	+ 6	− 9	+ 32	− 11	+ 20	+ 1
77	− 3	+ 13	− 14	− 29	− 34	+ 1	− 10	− 11	− 23	+ 7	+ 13	+ 17	− 6
78	+ 4	+ 35	+ 1	+ 20	+ 16	+ 11	+ 15	+ 20	+ 11	+ 24	− 37	− 76	+ 4
79	− 72	− 33	− 22	− 27	− 25	− 8	− 22	− 5	− 12	− 6	− 15	− 25	**− 22**
80	− 5	+ 37	+ 10	+ 10	− 3	0	− 2	+ 28	+ 24	− 46	− 24	− 6	+ 2
81	**− 87**	− 31	− 17	− 17	+ 18	− 15	− 6	− 26	+ 5	− 21	+ 43	+ 4	− 12
82	+ 38	+ 43	+ 31	− 4	+ 10	− 3	+ 6	+ 7	− 8	+ 18	− 21	− 37	+ 7
83	+ 7	+ 22	− 40	+ 3	− 12	− 6	− 11	− 2	+ 3	+ 3	− 9	+ 17	− 2
84	+ 30	+ 9	+ 14	− 1	+ 1	+ 2	+ 7	+ 20	+ 20	+ 8	− 10	− 10	+ 8
85	− 14	+ 19	− 6	+ 4	− 29	− 9	+ 10	− 22	− 19	− 35	− 4	+ 3	− 8
86	− 35	− 34	− 19	− 12	− 14	− 17	− 11	− 4	− 9	+ 30	+ 17	− 46	− 13
87	+ 3	+ 13	− 11	− 18	0	+ 22	+ 12	− 5	− 13	− 27	− 13	− 20	− 5
88	+ 13	− 25	− 33	− 14	0	− 21	− 26	− 16	− 13	+ 6	+ 14	+ 27	− 7
89	+ 17	− 20	0	− 10	+ 39	+ 20	− 12	− 6	− 7	− 10	+ 25	+ 12	+ 4
90	+ 32	− 14	+ 21	− 10	+ 21	− 1	− 22	− 13	+ 36	+ 18	+ 4	− 29	+ 4
91	− 10	+ 28	− 31	− 26	− 21	+ 10	− 2	− 5	+ 17	− 4	− 3	+ 10	− 3
92	− 18	− 11	− 35	− 20	+ 10	− 10	− 17	− 2	− 21	− 39	+ 17	− 35	− 15
93	− 10	+ 6	+ 25	+ 30	+ 37	+ 26	+ 4	+ 26	− 11	+ 6	− 23	+ 27	+ 12
94	− 10	+ 8	+ 22	+ 29	− 31	− 5	+ 9	− 14	− 23	− 13	+ 37	+ 20	+ 3
95	− 68	− 86	+ 5	+ 14	+ 26	+ 5	− 16	+ 15	+ 35	− 41	+ 12	− 11	− 9
96	+ 24	+ 30	+ 11	+ 23	+ 30	+ 23	− 5	− 15	+ 2	− 48	+ 2	+ 1	+ 7
97	− 35	+ 18	+ 7	− 24	− 21	+ 5	+ 1	+ 20	− 18	+ 11	+ 41	+ 10	+ 1
98	+ 56	− 5	− 6	+ 24	− 16	+ 1	− 12	+ 6	+ 29	+ 34	+ 8	+ 48	**+ 14**
1899	− 11	+ 1	+ 3	− 7	− 21	+ 26	+ 19	+ 33	− 10	+ 9	+ 53	− 27	+ 6
1900	+ 9	− 46	− 28	+ 10	0	+ 15	+ 16	− 4	+ 9	− 5	+ 17	+ 49	+ 4
01	− 1	− 20	− 13	+ 2	+ 21	− 12	**+ 38**	+ 2	+ 20	+ 1	0	− 15	+ 2
02	− 1	− 37	+ 22	− 4	− 39	− 10	− 28	− 24	+ 7	+ 5	+ 25	+ 7	− 6
03	− 13	+ 43	+ 14	− 24	+ 1	− 9	− 9	− 18	− 2	+ 12	+ 9	− 8	0
04	+ 16	− 17	− 12	+ 8	− 4	− 6	− 1	− 3	− 3	+ 15	+ 2	+ 10	+ 1
05	+ 16	+ 7	+ 20	− 14	+ 9	+ 9	+ 15	− 9	− 8	− 31	− 8	+ 41	+ 4
06	+ 23	− 27	− 11	− 16	− 7	+ 18	− 10	+ 16	+ 11	+ 24	+ 32	− 7	+ 4
07	+ 7	− 15	+ 19	− 2	− 13	− 26	− 14	− 22	+ 11	+ 13	+ 8	+ 9	− 2
08	− 4	+ 28	− 8	− 26	+ 24	+ 2	0	− 10	+ 16	+ 61	+ 29	+ 13	+ 11
09	+ 11	+ 1	− 28	+ 4	− 4	− 16	− 19	0	− 15	+ 6	− 30	− 17	− 9
10	− 14	+ 5	+ 24	− 13	+ 4	+ 2	− 13	+ 8	+ 5	+ 27	− 52	+ 35	+ 2
11	+ 18	+ 10	− 3	+ 5	+ 33	+ 2	+ 16	+ 29	− 2	− 6	− 4	+ 36	+ 11
1912	− 3	+ 15	+ 31	+ 24	+ 12	+ 6	+ 4	− 30	− 25	− 4	+ 8	+ 32	+ 6
1868–1912 (Unit 1° F.).	**37·0**	37·1	37·9	41·2	45·6	51·0	**53·8**	53·3	50·2	**44·7**	40·1	37·5	44·1

TABLE 5.—SERIAL VALUES OF THE MEAN MAXIMUM TEMPERATURE IN THE SHADE FOR EACH MONTH AND YEAR, 1868–1912.

Departures from 45-year Normals (given in the bottom line).

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Highest.
1868	+14	+32	+32	+ 8	+13	+ 6	**+50**	+20	0	−11	−26	+29	+14	84·3
69	+29	+42	−16	+33	−48	− 5	+28	+ 6	+ 8	+10	− 2	−27	+ 5	79·0
70	−24	−27	0	+30	+10	− 2	+25	+43	+21	+ 1	−20	−46	+ 1	84·5
71	−49	+18	+35	−14	+35	0	− 3	+28	− 9	+ 9	−25	+ 8	+ 2	74·5
72	+20	+27	+14	+ 3	−32	−14	+21	− 4	−25	−10	− 2	− 2	− 1	76·4
73	+12	−31	−14	+14	−27	+ 8	+ 6	−15	−13	−23	− 5	+45	− 4	84·4
74	+35	+11	+33	+24	−30	+12	+15	− 8	− 9	0	− 7	−71	0	78·1
75	+29	−28	− 3	+35	+10	−20	+ 6	+10	+11	− 7	−25	+10	+ 2	72·9
76	+17	−15	−27	−14	+ 7	+ 9	+ 2	+19	− 5	+20	−18	+11	0	81·3
77	+ 3	+21	−15	−43	−34	+ 4	−31	−24	−11	+ 7	+16	+18	− 8	72·7
78	+11	+26	+ 9	+24	+10	+18	+35	+22	+ 6	+17	−28	−68	+ 7	84·9
79	−68	−48	−29	−43	−23	−23	−38	−12	−18	0	−10	−21	**−28**	71·5
80	−10	+38	+25	+ 9	+ 5	+14	− 1	+36	+26	−27	−19	− 5	+ 7	77·6
81	**−83**	−39	−24	− 5	+33	−21	−23	−35	− 4	−19	+44	+ 7	−14	75·5
82	+36	+40	+30	− 9	+22	−10	− 4	+ 8	−11	+11	−13	−38	+ 5	74·1
83	+11	+22	−33	+ 5	−12	−12	−10	− 8	+ 1	+ 9	− 6	+21	− 1	71·7
84	+29	+10	+14	0	− 2	− 5	− 3	+20	+17	+10	− 3	− 6	+ 6	81·1
85	−14	+14	− 2	+ 2	−43	− 8	+13	−14	−14	−41	−14	+ 3	−10	79·0
86	−32	−41	−29	− 6	−30	−15	− 7	−12	− 7	+22	+14	−43	−16	77·0
87	− 6	+11	−21	−20	+ 7	+39	+15	+ 5	−13	−21	−23	−20	− 4	82.0
88	+ 4	−29	−44	−28	0	+17	−42	−24	−14	+ 5	+10	+24	−13	73·4
89	+14	−12	− 8	−28	+36	+33	− 7	−20	− 8	−13	+19	+14	+ 1	77·2
90	+40	−20	+21	0	+16	−28	−25	−15	+32	+13	+ 6	−36	0	70·0
91	−12	+36	−26	−27	−17	+13	+ 6	−11	+10	− 2	−12	+11	− 3	77·5
92	−21	−13	−25	+ 3	+18	−14	−17	− 7	−31	−40	+11	−37	− 5	76·7
93	− 9	+ 4	+42	+53	+31	+43	+ 9	+33	− 8	+ 5	− 8	+28	**+18**	79·7
94	− 1	+11	+47	+33	−35	−10	+10	−20	− 6	− 6	+36	+24	+ 7	81·2
95	−66	−76	0	+16	+51	+31	−21	+ 6	+50	−32	+12	−10	− 3	77·4
96	+25	+29	+14	+20	+69	+14	−11	− 8	− 7	−39	0	− 4	+ 8	79·1
97	−37	+ 6	+ 2	−23	−12	−12	+16	+22	−16	+14	+32	+14	0	81·2
98	+51	+ 3	− 5	+16	−14	+ 1	+ 6	+ 7	+30	+24	+ 6	+57	+15	77·4
1899	− 4	+ 8	+ 3	−16	−28	+39	+ 6	+54	− 8	+16	+52	−31	+ 7	80·1
1900	+ 4	−48	−24	+11	0	+20	+ 2	−16	+13	− 8	+ 6	+44	0	77·7
01	+ 3	−14	−13	+14	+50	−13	+48	+ 6	+20	+ 2	+ 3	−14	+ 7	76·8
02	+ 2	−41	+15	0	−48	−21	−34	−23	+ 2	+ 4	+24	+ 7	−10	81·9
03	−17	+47	+ 7	−26	− 7	− 8	−19	−25	0	0	+ 6	−17	− 5	75·1
04	+16	−21	−20	− 2	−16	− 4	−12	− 8	+ 5	+ 9	− 2	+ 9	− 4	75·7
05	+19	+10	+20	−23	+ 7	+27	+20	−16	−13	−18	−13	+34	+ 4	79·2
06	+21	−19	− 6	+ 4	−36	+25	−11	+ 7	+27	+20	+29	− 7	+ 4	83·5
07	+ 9	−13	+26	− 6	−31	−57	−11	−36	+11	+ 1	+ 3	+ 4	− 9	82·3
08	+ 1	+23	−16	−32	+14	− 4	+ 2	+ 3	− 1	+62	+30	+13	+ 8	83·2
09	+11	+ 3	−35	+15	+12	−14	−29	− 1	−16	+ 5	−21	−22	− 8	73·0
10	− 7	+ 3	+31	−25	+ 1	+13	− 7	− 6	+ 8	+23	−50	+34	+ 1	77·0
11	+22	+10	−10	− 5	+50	+10	+29	+38	+ 6	− 3	− 3	+27	+14	84·0
1912	− 9	+ 9	+21	+36	+ 8	−27	+ 8	−43	−23	− 3	+ 6	+38	+ 2	73·1
1868–1912	**42·1**	43·0	45·4	51·1	56·9	62·7	**64·6**	63·3	58·9	52·0	45·9	42·6	52·4	84·9
Highest in a day (unit 1° F.)	55·1	55·6	62·0	70·4	77·0	84·9	84·5	84·3	83·5	71·1	59·8	56·0		

TABLE 6.—SERIAL VALUES OF THE MEAN MINIMUM TEMPERATURE IN THE SHADE FOR EACH MONTH AND YEAR, 1868–1912.

Departures from the 45-year Normals (given in the bottom line).

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Lowest in a day.
1868	−21	+27	+25	+ 9	+22	− 4	+ 6	+21	+ 3	−31	−37	+22	+ 4	22·5
69	+34	+35	−26	+16	−40	−19	+ 7	−20	+15	+18	−22	−39	− 3	13·0
70	−12	−31	−15	+15	+13	+ 4	+15	− 9	− 8	−11	−35	−63	−11	7·9
71	−39	+34	+18	−13	+ 1	− 5	+ 2	+ 7	− 2	+ 2	−31	− 9	− 3	23·1
72	+21	+32	+27	+15	−12	+ 5	+14	+ 4	− 6	− 8	− 5	+ 5	+ 8	25·5
73	+13	−41	− 1	+ 5	−18	+13	+ 5	− 7	−15	−28	− 7	+48	− 3	22·4
74	+28	+ 6	+32	+21	−16	− 9	+15	− 5	+ 7	−10	0	−93	− 2	12·7
75	+27	−15	+ 3	+ 6	+25	− 1	− 9	+15	+17	+ 9	−20	+ 2	+ 5	19·9
76	+22	−13	−21	+ 4	− 5	− 6	− 7	+ 8	−11	+50	−13	+29	+ 3	22·2
77	− 7	+ 7	−19	−23	−30	+ 1	− 3	− 6	−28	+ 1	+17	+13	− 6	22·0
78	+ 4	+38	+ 3	+19	+19	+ 9	+21	+19	+16	+34	−40	−92	+ 4	11·9
79	−86	−34	−22	−22	−29	− 4	− 9	− 6	−13	−22	− 9	−31	**−24**	13·5
80	− 2	+45	+ 1	+10	0	− 2	− 3	+28	+18	−50	−38	−10	0	15·2
81	**−107**	−30	−28	−26	+12	−16	− 7	−30	+10	−20	+41	0	−17	8·4
82	+49	+48	+30	+ 1	0	− 7	+ 4	+ 2	−15	+19	−25	−39	+ 6	14·3
83	+14	+24	−38	− 2	− 9	−11	−15	− 7	+ 4	− 1	−10	+17	− 3	24·5
84	+34	+14	+24	+ 6	− 7	− 9	+ 7	+13	+15	+ 7	−14	−13	+ 6	24·6
85	− 9	+14	−14	+ 4	−32	− 7	−12	−40	−33	−34	0	+ 1	−13	19·7
86	−33	−30	−13	− 9	− 8	−17	− 9	− 8	− 3	+37	+19	−48	−10	13·0
87	+ 6	+12	−16	−27	− 3	+12	+13	−12	−17	−32	− 6	−23	− 8	20·6
88	+15	−16	−32	−16	− 5	−22	−24	−16	−13	+ 7	+21	+29	− 6	20·3
89	+13	−19	− 1	+ 2	+42	+12	−14	0	− 7	− 7	+25	+13	+ 5	25·0
90	+31	− 9	+22	− 6	+26	− 1	−20	−16	+35	+18	− 5	−19	+ 5	23·4
91	−11	+21	−31	−20	−19	+11	+ 4	0	+22	+ 2	− 4	+ 8	− 1	20·0
92	−15	− 9	−36	−25	+ 3	−16	−16	− 3	−20	−35	+16	−36	−16	14·8
93	− 8	+10	+18	+16	+41	+23	+ 6	+26	−12	0	−25	+30	+11	17·0
94	−15	+ 6	+ 9	+31	−28	−14	+ 3	−13	−24	−23	+36	+20	− 1	15·0
95	−74	−102	+ 8	+14	+16	+ 3	−16	+21	+27	−39	+15	− 4	−11	6·6
96	+24	+31	+ 7	+24	+25	+25	− 9	−15	+ 7	−45	+ 4	− 3	+ 6	24·6
97	−31	+19	+13	−21	−17	+ 3	− 1	+22	−21	+ 4	+49	+ 3	+ 2	23·8
98	+59	− 2	− 3	+34	−14	+ 1	−14	+ 4	+27	+42	+ 5	+54	**+16**	24·3
1899	−12	− 2	+ 5	− 4	−18	+16	+25	+28	−11	+ 4	+60	−31	+ 5	18·2
1900	+14	−55	−27	+ 9	+ 9	+17	+26	+ 1	+ 3	− 8	+19	+61	+ 6	14·8
01	+ 4	−23	− 5	− 3	+12	− 5	**+36**	+ 3	+29	− 3	− 6	−12	+ 2	22·0
02	0	−34	+23	− 3	−32	− 7	−24	−23	+ 8	+ 6	+33	+15	− 3	14·4
03	−10	+42	+15	−26	+ 4	− 1	− 9	−13	− 1	+19	+10	− 8	+ 2	17·8
04	+22	−11	−10	+12	+ 1	+ 3	+ 8	+ 1	− 3	+22	+ 4	+14	+ 5	21·9
05	+21	+13	+22	−11	+13	+14	+22	− 1	+ 4	−32	− 1	+55	+10	24·3
06	+31	−27	− 9	−20	− 2	+18	−14	+17	+ 4	+24	+41	− 5	+ 5	19·6
07	+12	−23	+17	+ 4	0	−20	− 9	−19	+10	+20	+ 5	+12	+ 1	21·2
08	− 3	+24	− 4	−23	+28	+ 5	+ 5	− 4	+24	+63	+27	+10	+13	20·6
09	+16	+11	−21	+ 7	+ 3	−10	−14	+ 2	−19	+11	−42	−16	− 6	19·8
10	−24	+ 8	+26	−11	+ 8	+ 3	− 9	+14	+13	+32	−54	+45	+ 4	12·0
11	+24	+ 4	+11	+12	+28	+ 8	+20	+32	− 4	− 7	− 3	+41	+14	24·0
1912	0	+ 9	+36	+26	+14	+17	+ 7	−27	−29	− 8	+10	+28	+ 7	16·0
1868–1912	**34·8**	35·0	35·6	38·7	43·0	48·4	**51·4**	50·9	47·5	42·1	37·9	35·2	41·7	6·6
Lowest (unit 1° F.)	8·4	6·6	19·0	22·3	29·0	36·0	41·2	35·0	30·6	24·1	15·2	7·9		

TABLE 7.—DIURNAL AND ANNUAL VARIATION OF THE MEAN TEMPERATURE IN THE SHADE, 1868–1912.

Departures from 45-year Normals.

(Unit 0·001 degree Fahr.).

Hour.	1	2	3	4	5	6	7	8	9	10	11	noon	13	14	15	16	17	18	19	20	21	22	23	mdt.	Mean (unit 1°F.).	r % (see Table 2).
Jan. ..	− 6	− 6	− 7	− 8	− 8	− 9	− 8	− 8	− 7	− 4	+ 3	+ 9	+13	+15	+14	+11	+ 7	+ 4	+ 2	0	− 2	− 3	− 4	− 5	**38·7**	2·2
Feb. ..	− 9	−11	−12	−14	−15	**−16**	−15	−14	−10	− 3	+ 7	+16	+22	+25	+25	+22	+15	+ 9	+ 5	+ 1	− 1	− 4	− 6	− 8	39·0	1·7
Mar. ..	−18	−21	−23	−25	−27	−28	−27	−20	− 9	+ 3	+16	+26	+32	+36	+37	+34	+28	+19	+ 9	+ 2	− 4	− 8	−12	−15	40·3	1·1
Apr. ..	−30	−34	−38	−41	−43	−43	−33	−19	− 2	+12	+25	+35	+43	+47	+49	+48	+43	+32	+16	+ 3	− 7	−14	−20	−24	44·6	3·5
May ..	−39	−44	−48	−52	−52	−45	−29	−13	+ 2	+15	+28	+38	+46	+51	+55	+54	+50	+40	+24	+ 6	− 9	−19	−26	−33	49·5	1·4
June ..	−42	−47	−51	−54	−51	−42	−28	−12	+ 4	+18	+29	+39	+47	+52	+55	+55	+51	+42	+27	+ 8	− 8	−20	−29	−36	55·0	3·5
July ..	−37	−41	−45	−47	−47	−40	−26	−12	+ 4	+15	+26	+34	+42	+47	**+50**	**+50**	+45	+39	+22	+ 6	− 9	−19	−27	−32	**57·5**	3·8
Aug. ..	−31	−34	−37	−40	−42	−40	−29	−14	+ 2	+15	+27	+36	+43	+47	+48	+46	+40	+31	+16	0	−10	−18	−23	−28	56·6	5·7
Sept. ..	−24	−27	−30	−33	−35	−37	−32	−20	− 4	+10	+23	+33	+40	+44	+44	+41	+33	+22	+ 8	− 1	− 8	−14	−18	−22	53·1	3·0
Oct. ..	−15	−18	−20	−21	−22	−24	−23	−19	− 8	+ 4	+17	+26	+33	+35	+34	+28	+19	+10	+ 3	− 2	− 5	− 8	−11	−14	47·2	3·1
Nov. ..	− 7	− 9	−10	−11	−12	−13	−13	−12	− 9	− 2	+ 7	+14	+19	+21	+19	+14	+ 9	+ 5	+ 2	0	− 3	− 5	− 6	− 8	42·1	1·4
Dec. ..	− 5	− 6	− 7	− 8	− 8	− 9	− 8	− 8	− 7	− 3	+ 2	+ 8	+12	+14	+12	+ 9	+ 6	+ 4	+ 2	+ 1	0	− 2	− 3	− 4	39·2	2·5
Year ..	−22	−25	−27	−29	**−30**	−29	−23	−14	− 4	+ 7	+18	+26	+33	+36	**+37**	+34	+29	+21	+11	+ 2	− 5	−11	−15	−19	46·9	2·7

TABLE 8.—FIVE-DAY NORMALS OF THE TEMPERATURE IN SHADE, 1868–1912, IN DEGREES FAHRENHEIT.

No. of Period.		Maximum Temperature.			Minimum Temperature.			Mean Temperature.		
		Normal.	Extremes.		Normal.	Extremes.		Normal.	Extremes.	
1	Jan. 1– 5 ..	42·2	53·9	27·6	35·5	48·8	17·0	38·9	51·7	23·3
2	6–10 ..	**41·5**	52·0	21·7	34·6	46·3	14·9	38·4	48·4	18·7
3	11–15 ..	42·2	54·1	24·4	34·7	47·9	13·1	38·7	49·2	19·5
4	16–20 ..	42·7	53·6	22·6	35·4	47·4	8·4	39·2	50·2	14·3
5	21–25 ..	**41·5**	55·1	26·2	33·7	46·7	12·8	37·9	48·5	21·8
6	26–30 ..	42·6	52·8	23·9	34·9	48·9	12·0	38·8	50·1	18·0
7	31– 4 ..	42·0	53·1	28·1	35·0	47·3	14·4	38·6	50·1	22·1
8	Feb. 5– 9 ..	42·8	55·6	22·7	35·2	50·5	9·6	39·0	52·4	16·1
9	10–14 ..	42·5	51·4	26·0	34·4	47·4	**6·6**	38·5	49·7	17·6
10	15–19 ..	43·6	53·0	30·4	35·6	46·5	14·8	39·6	49·7	22·7
11	20–24 ..	43·6	55·6	32·5	35·3	47·2	21·1	39·5	49·3	27·6
12	25– 1 ..	43·2	55·3	30·3	34·9	48·1	16·0	38·9	50·1	26·6
13	Mar. 2– 6 ..	44·5	60·6	32·7	35·6	47·1	19·0	39·9	51·4	25·9
14	7–11 ..	44·8	58·6	33·2	35·3	47·9	20·0	39·9	50·3	28·0
15	12–16 ..	44·5	62·0	31·7	35·0	48·2	19·6	39·7	53·9	26·7
16	17–21 ..	45·7	58·8	32·2	36·0	47·4	22·4	40·8	51·7	30·0
17	22–26 ..	46·4	61·0	34·9	36·0	49·4	23·8	40·9	54·1	30·2
18	27–31 ..	47·0	61·3	35·1	35·9	46·7	23·2	41·1	50·7	30·6
19	Apr. 1– 5 ..	49·1	64·4	38·2	37·2	49·5	26·9	43·0	51·8	34·2
20	6–10 ..	50·1	63·1	38·9	37·5	49·8	28·2	43·4	53·3	34·4
21	11–15 ..	50·4	69·6	39·3	38·3	49·4	25·9	44·0	55·4	32·4
22	16–20 ..	52·2	69·7	39·0	39·4	49·3	25·4	45·4	57·7	33·1
23	21–25 ..	52·3	70·4	37·9	40·0	51·6	22·3	45·7	56·7	30·4
24	26–30 ..	52·6	69·0	43·1	40·0	50·3	32·0	46·1	58·6	37·9
25	May 1– 5 ..	53·6	67·9	44·4	40·2	51·0	30·6	46·7	55·6	39·1
26	6–10 ..	55·6	72·7	42·3	41·8	50·0	30·4	48·3	58·5	39·6
27	11–15 ..	56·3	74·0	44·9	42·8	51·9	30·7	49·1	58·9	40·7
28	16–20 ..	56·7	70·1	40·1	42·6	55·7	29·0	49·2	60·0	37·3
29	21–25 ..	58·3	74·0	45·2	**44·4**	55·6	32·1	51·0	62·0	**40·8**
30	26–30 ..	60·1	77·0	45·2	45·6	54·1	33·0	52·4	64·2	43·3
31	31– 4 ..	60·6	77·0	45·0	46·7	56·1	36·0	53·2	65·1	41·8
32	June 5– 9 ..	61·3	77·4	48·5	47·2	56·0	36·3	53·7	65·3	45·2
33	10–14 ..	62·2	77·8	51·1	47·4	57·2	38·8	54·2	65·0	45·9
34	15–19 ..	62·9	79·1	46·1	48·4	57·3	38·8	55·2	67·9	43·6
35	20–24 ..	63·3	81·3	51·1	49·7	57·4	40·0	55·9	68·4	48·6
36	25–29 ..	65·0	**84·9**	54·4	50·3	60·5	41·2	57·2	72·2	50·5
37	30– 4 ..	64·7	83·2	51·6	51·1	60·0	42·0	57·2	68·3	49·3
38	July 5– 9 ..	63·9	77·9	53·9	50·9	59·7	42·0	57·0	67·9	49·6
39	10–14 ..	64·9	84·0	54·2	51·2	58·5	43·0	57·6	69·1	49·0
40	15–19 ..	64·9	82·3	55·4	51·7	63·7	43·9	57·8	68·5	50·6
41	20–24 ..	**65·2**	84·5	54·4	**52·0**	61·9	43·0	**58·1**	**72·3**	50·8
42	25–29 ..	64·3	78·2	52·1	51·4	60·2	41·2	57·4	68·5	50·1
43	30– 3 ..	64·3	82·6	50·3	51·3	61·7	40·3	57·4	70·1	47·3
44	Aug. 4– 8 ..	63·9	84·3	53·0	52·0	**62·0**	37·9	57·4	71·4	50·8
45	9–13 ..	64·3	79·7	53·1	51·6	61·1	42·0	57·5	67·5	49·5

TABLE 8.—FIVE-DAY NORMALS OF THE TEMPERATURE IN SHADE, 1868–1912, IN DEGREES FAHRENHEIT—*continued.*

No. of Period.		Maximum Temperature.			Minimum Temperature.			Mean Temperature.		
		Normal.	Extremes.		Normal.	Extremes.		Normal.	Extremes.	
46	14–18 ..	64·3	80·8	52·8	51·4	60·4	39·3	57·3	68·1	49·2
47	19–23 ..	62·8	79·5	52·0	50·4	60·0	41·2	56·1	66·2	49·4
48	24–28 ..	61·7	80·1	53·6	50·1	57·8	39·0	55·4	68·5	48·6
49	29– 2 ..	61·2	83·5	51·0	48·8	59·8	35·0	54·7	69·1	47·4
50	Sept. 3– 7 ..	61·0	77·6	51·3	49·4	**62·0**	35·4	54·9	68·3	44·5
51	8–12 ..	60·1	74·6	51·6	47·7	60·7	35·9	53·7	63·2	45·9
52	13–17 ..	59·4	72·3	50·3	47·2	58·6	34·9	53·1	63·7	44·7
53	18–22 ..	57·6	66·3	48·0	46·5	56·4	34·0	51·9	59·9	42·2
54	23–27 ..	57·3	72·9	48·7	46·8	58·6	30·6	51·8	62·9	41·5
55	28– 2 ..	56·2	71·1	46·0	45·7	60·6	34·6	50·7	62·9	40·3
56	Oct. 3– 7 ..	54·4	71·1	43·9	44·3	57·1	28·2	49·4	60·0	36·0
57	8–12 ..	53·7	66·9	43·5	42·7	57·5	28·1	48·3	59·6	36·8
58	13–17 ..	51·8	62·0	42·3	42·2	55·3	28·0	47·0	57·2	35·6
59	18–22 ..	51·3	61·8	39·8	41·9	53·4	24·1	46·7	57·2	32·6
60	23–27 ..	49·3	61·0	36·8	40·0	57·3	24·3	44·7	59·1	29·8
61	28– 1 ..	49·1	60·3	35·2	40·0	54·1	24·7	44·6	56·3	30·1
62	Nov. 2– 6 ..	48·8	59·8	36·9	40·9	50·7	21·3	45·0	54·1	30·4
63	7–11 ..	46·6	56·1	31·2	38·4	52·0	23·9	42·7	53·9	28·3
64	12–16 ..	46·1	59·0	25·0	37·5	51·5	19·8	42·0	54·8	22·0
65	17–21 ..	45·1	55·9	24·7	36·6	51·9	15·2	41·1	53·8	20·4
66	22–26 ..	44·4	56·8	31·5	37·2	53·8	18·3	41·0	56·0	25·0
67	27– 1 ..	43·4	55·9	29·9	36·0	51·4	19·3	39·9	53·5	25·8
68	Dec. 2– 6 ..	43·8	56·0	26·0	36·2	50·3	13·5	40·1	53·8	19·1
69	7–11 ..	42·4	55·0	24·1	34·9	50·0	19·7	38·9	51·7	22·7
70	12–16 ..	42·8	55·8	25·2	35·4	48·7	14·3	39·3	51·7	22·3
71	17–21 ..	43·1	54·3	26·3	35·9	48·9	11·9	39·7	50·7	22·3
72	22–26 ..	41·9	53·7	26·7	34·4	49·0	13·8	38·4	51·8	20·7
73	27–31 ..	41·6	53·3	**20·3**	**34·1**	48·0	7·9	**38·1**	51·3	**14·1**

TABLES 9, 10, AND 11.—EXCESSES AND DEFICIENCIES IN MEAN TEMPERATURE RELATIVE TO THE AVERAGE.

9. *Number of Times in 600 Months* (= 50 years) *that the Mean Temperature in each of m Consecutive Months was Above or Below the Monthly Normal.*

Number of Consecutive Months. *m*	Above.	Below.	Total Number of Months.
15	—	1	15
13	1	—	13
10	1	—	10
9	1	1	18
8	1	1	16
7	2	1	21
6	4	—	24
5	7	7	70
4	11	12	92
3	12	15	81
2	28	27	110
1	62	68	130
			600

10. *Number of Times in 200 Quarters of a Year* (= 50 years) *that the Mean Temperature in each of m Consecutive Quarters was Above or Below the Quarterly Normal.*

Number of Consecutive Quarters. *m*	Above.	Below.	Total Number of Quarters.
8	2	1	24
6	1	1	12
5	2	2	20
4	2	6	32
3	8	2	30
2	12	9	42
1	17	23	40
			200

11. *Number of Times in 50 Years* (1) *that the Mean Temperature in a Period of One, Three, or Six Months continues Above or Below the Average in the Next Period,* (2) *that it does not do so.*

	1	2		1	2		1	2
Jan.	21	29						
Feb.	35	15	Jan. to Mar.	31	19			
Mar.	28	22				Jan. to June	25	25
Apr.	23	27						
May	29	21	Apr. to June	33	17			
June	30	20						
July	25	25						
Aug.	34	16	July to Sept.	21	29			
Sept.	28	22				July to Dec.	19	31
Oct.	28	22						
Nov.	26	24	Oct. to Dec.	29	21			
Dec.	29	21						

TABLE 12.—NUMBER OF WARM DAYS, 1845–1917. ANNUAL VARIATION. MAXIMUM TEMPERATURE IN SHADE ABOVE 75°.

Maximum Temperature.	23 years, 1845–1867.						50 years, 1868–1917.					
	May.	June.	July.	Aug.	Sept.	Total.	May.	June.	July.	Aug.	Sept.	Total.
75·0–75·9	1	8	12	8	—	29	1	16	15	7	1	40
76·0–76·9	4	5	8	4	1	22	1	15	11	9	2	38
77·0–77·9	—	6	5	3	—	14	—	12	8	4	2	26
78·0–78·9	1	5	1	2	1	10	—	4	9	3	—	16
79·0–79·9	—	5	1	—	—	6		5	3	4	—	12
80·0–80·9	—	4	—	1	—	5	—	—	3	2	—	5
81·0–81·9	—	2	1	—	—	3	—	5	4	1	—	10
82·0–82·9	—	2	—	—	—	2	—	1	1	1	1	4
83·0–83·9	—	1	—	1	—	2	—	—	1	—	1	2
84·0–84·9	—	1	—	1	—	2	—	1	3	1	—	5
85·0–85·9	—	2	—	—	—	2	—	—	—	—	—	0
Total	6	41	28	20	2	97	2	59	58	32	7	158

TABLE 13.—NUMBER OF WARM NIGHTS, 1845–1917. ANNUAL VARIATION. MINIMUM TEMPERATURE IN SHADE ABOVE 57°.

Minimum Temperature.	23 years, 1845–1867.						50 years, 1868–1917.						
	May.	June.	July.	Aug.	Sept.	Total.	May.	June.	July.	Aug.	Sept.	Oct.	Total.
57·0–57·9	1	5	11	9	9	35	—	10	56	38	12	5	121
58·0–58·9	—	2	7	5	6	20	—	2	21	16	8	—	47
59·0–59·9	—	1	6	1	2	10	—	1	20	16	7	—	44
60·0–60·9	—	—	6	4	1	11	—	1	9	11	3	—	24
61·0–61·9	—	—	1	—	—	1	—	—	5	4	—	—	9
62·0–62·9	—	—	—	—	—	0	—	—	—	1	1	—	2
63·7	—	—	—	—	—	0	—	—	1	—	—	—	1
Total	1	8	31	19	18	77	0	14	112	86	31	5	248

TABLE 14.—NUMBER OF COLD DAYS, 1845–1917. ANNUAL VARIATION. MAXIMUM TEMPERATURE IN SHADE BELOW 32°.

Maximum Temperature.	23 years, 1845–1867.						50 years, 1868–1917.					
	Nov.	Dec.	Jan.	Feb.	Mar.	Total.	Nov.	Dec.	Jan.	Feb.	Mar.	Total.
7·5	—	1	—	—	—	1	—	—	—	—	—	—
8·5	—	1	—	—	—	1	—	—	—	—	—	—
18·5	—	—	—	1	—	1	—	—	—	—	—	—
19·7	—	—	1	—	—	1	—	—	—	—	—	—
20·0–20·9	—	—	1	—	—	1	—	1	—	—	—	1
21·0–21·9	—	—	—	—	—	—	—	—	1	—	—	1
22·0–22·9	—	—	—	—	—	—	—	—	1	1	—	2
23·0–23·9	—	—	—	1	—	1	—	1	1	1	—	3
24·0–24·9	—	—	1	1	—	2	1	1	2	1	—	5
25·0–25·9	1	—	1	—	—	2	2	2	—	—	—	4
26·0–26·9	—	2	4	2	—	8	—	8	2	1	—	11
27·0–27·9	—	3	2	2	—	7	—	3	7	—	—	10
28·0–28·9	1	4	5	4	1	15	1	6	7	3	—	17
29·0–29·9	1	8	4	2	—	15	—	8	7	2	—	17
30·0–30·9	1	5	13	4	—	23	2	16	10	6	1	35
31·0–31·9	7	4	16	10	2	39	7	17	18	8	2	52
Total	11	28	48	27	3	117	13	63	56	23	3	158

TABLE 15.—NUMBER OF COLD NIGHTS 1845–1917. ANNUAL VARIATION. MINIMUM TEMPERATURE IN SHADE BELOW 23°.

Minimum Temperature.	23 years, 1845–1867.							50 years, 1868–1917.						
	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Total.
−3·0	—	1	—	—	—	—	1	—	—	—	—	—	—	—
2·6	—	1	—	—	—	—	1	—	—	—	—	—	—	—
4·0– 4·9	—	1	—	1	—	—	2	—	—	—	—	—	—	—
6·0– 6·9	—	—	1	1	—	—	2	—	—	—	1	—	—	1
7·0– 7·9	—	—	—	—	—	—	—	—	1	—	—	—	—	1
8·0– 8·9	—	—	—	2	—	—	2	—	—	2	—	—	—	2
9·0– 9·9	—	—	1	1	—	—	2	—	—	—	1	—	—	1
10·0–10·9	—	1	1	1	—	—	3	—	—	—	2	—	—	2
11·0–11·9	—	1	1	1	—	—	3	—	1	—	1	—	—	2
12·0–12·9	—	—	3	1	—	—	4	—	1	3	—	—	—	4
13·0–13·9	—	1	2	—	1	—	4	—	3	3	1	—	—	7
14·0–14·9	—	2	2	—	1	—	5	—	3	4	2	—	—	9
15·0–15·9	—	—	2	1	2	—	5	1	5	4	1	—	—	11
16·0–16·9	2	1	5	2	—	—	10	1	4	1	2	—	—	8
17·0–17·9	1	—	4	4	—	—	9	—	1	5	2	—	—	8
18·0–18·9	2	3	6	4	1	—	16	3	5	4	1	—	—	13
19·0–19·9	2	4	8	4	2	—	20	2	4	6	1	2	—	15
20·0–20·9	4	5	7	7	8	—	31	3	13	6	6	3	1	32
21·0–21·9	5	10	9	11	2	1	38	4	12	7	3	3	—	29
22·0–22·9	4	5	10	12	4	1	36	3	8	15	7	3	1	37
Total ..	20	36	62	53	21	2	194	17	61	60	31	11	2	182

TABLE 16.—NUMBER OF WARM AND COLD DAYS AND NIGHTS. SECULAR VARIATION.

Year.	Warm Days. Max. Temp. above 75°.			Warm Nights. Min. Temp. above 57°.			Cold Days. Max. Temp. below 32°			Cold Nights. Min. Temp. below 23°.		
	75°–80°.	80°–86°.	Total.	57°–60°.	60°–64°.	Total.	32°–27°.	27°–7°.	Total.	23°–15°.	15°–3°.	Total.
1845	—	—	—	—	—	—	7	1	8	12	3	15
46	8	5	13	7	1	8	—	—	—	1	1	2
47	5	—	5	8	2	10	7	—	7	10	—	10
48	2	—	2	2	—	2	2	2	4	6	4	10
49	1	—	1	4	—	4	5	1	6	4	1	5
50	3	—	3	1	—	1	6	—	6	7	1	8
51	3	3	6	—	—	—	2	—	2	1	—	1
52	6	—	6	6	2	8	2	—	2	4	—	4
53	1	—	1	—	—	—	1	1	2	5	—	5
54	—	—	—	2	—	2	9	1	10	6	—	6
55	10	—	10	2	2	4	8	—	8	11	3	14
56	5	2	7	3	—	3	5	—	5	6	1	7
57	10	4	**14**	11	2	**13**	3	1	4	6	3	9
58	No records.			No records.			3	—	3	6	—	6
59	No records.			No records.			No records.			No records.		
60	—	—	—	—	—	—	1	2	3	10	2	12
61	2	—	2	2	—	2	4	2	6	8	6	14
62	—	—	—	—	—	—	3	1	4	14	—	14
63	—	—	—	—	1	1	3	1	4	10	—	10
64	4	—	4	4	—	4	5	1	6	14	—	14
65	8	1	9	10	—	10	10	3	**13**	7	2	9
66	8	1	9	2	1	3	2	—	2	6	—	6
1867	5	—	5	1	1	2	11	1	12	11	2	13
21 years ..	81	16	97	65	12	77	99	18	117	165	29	194
1868	8	4	12	7	2	9	—	—	—	2	—	2
69	3	—	3	2	—	2	—	—	—	—	—	—
70	5	2	7	6	1	7	4	—	4	4	1	5
71	—	—	—	2	1	3	5	2	7	5	2	7
72	3	—	3	10	2	12	—	—	—	—	—	—
73	1	1	2	—	3	3	—	—	—	2	—	2
74	2	—	2	3	—	3	1	—	1	—	—	—
75	—	—	—	6	—	6	8	1	9	11	1	12
76	7	3	**10**	4	—	4	2	—	2	2	—	2
77	—	—	—	1	—	1	2	—	2	1	—	1
78	5	2	7	15	—	**15**	1	—	1	1	—	1
79	—	—	—	1	1	2	15	1	16	15	3	18
80	3	—	3	5	1	6	2	1	3	2	1	3
81	1	—	1	1	—	1	15	5	**20**	17	7	**24**
82	—	—	—	3	—	3	1	—	1	—	—	—
83	—	—	—	1	—	1	2	3	5	3	1	4
84	2	1	3	7	2	9	—	—	—	—	—	—
85	7	—	7	1	1	2	2	—	2	—	—	—
86	2	—	2	4	—	4	5	—	5	9	1	10
1887	6	1	7	7	—	7	1	1	2	4	—	4

TABLE 16.—NUMBER OF WARM AND COLD DAYS AND NIGHTS. SECULAR VARIATION—*continued.*

Years.	Warm Days. Max. Temp. above 75°.			Warm Nights. Min. Temp. above 57°			Cold Days. Max. Temp. below 32°			Cold Nights. Min. Temp. below 23°.		
	75°–80°.	80°–86°.	Total.	57°–60°.	60°–64°.	Total.	32°–27°.	27°–7°.	Total.	23°–15°.	15°–3°.	Total.
1888	—	—	—	1	—	1	—	—	—	2	—	2
89	2	—	2	3	—	3	1	—	1	—	—	—
90	—	—	—	1	—	1	—	—	—	—	—	—
91	1	—	1	2	—	2	1	—	1	2	—	2
92	1	—	1	2	1	3	1	—	1	1	1	2
93	9	—	9	11	—	11	7	1	8	6	—	6
94	2	1	3	3	—	3	1	—	1	2	—	2
95	5	—	5	3	2	5	8	6	14	11	6	17
96	2	—	2	5	—	5	—	—	—	—	—	—
97	6	1	7	3	2	5	—	—	—	—	—	—
98	4	—	4	5	1	6	2	—	2	—	—	—
1899	10	1	11	7	—	7	1	—	1	2	—	2
1900	1	—	1	6	2	8	6	1	7	7	1	8
01	5	—	5	12	3	15	—	—	—	—	—	—
02	1	1	2	—	—	—	6	—	6	6	1	7
03	1	—	1	—	—	—	4	—	4	5	—	5
04	1	—	1	2	1	3	—	—	—	—	—	—
05	3	—	3	4	1	5	1	—	1	1	—	1
06	3	2	5	3	1	4	—	—	—	1	—	1
07	1	2	3	2	1	3	3	—	3	3	—	3
08	5	1	6	3	2	5	2	—	2	4	—	4
09	—	—	—	2	1	3	1	1	2	1	—	1
10	2	—	2	2	—	2	8	4	12	7	3	10
11	3	3	6	11	3	14	2	—	2	1	—	1
12	—	—	—	1	—	1	4	—	4	3	—	3
13	—	—	—	2	—	2	2	—	2	2	—	2
14	4	—	4	12	—	12	—	—	—	—	—	—
15	1	—	1	4	—	4	—	—	—	—	—	—
16	4	—	4	9	1	10	2	—	2	4	—	4
1917	—	—	—	5	—	5	1	—	1	4	—	4
50 years ..	132	26	158	212	36	248	130	27	157	153	29	182

TABLE 17.—NUMBER OF PERIODS, *p*, OF WARM WEATHER, 1868–1917. MONTHLY VALUES.

p	7 to 10 Days.	11 to 14 Days.	15 to 18 Days.	29 Days.	Total of Days.
May	3	1	—	—	33
June	8	5	—	—	129
July	13	6	1	—	197
August	11	5	1	1	198
50 years ..	35	17	2	1	557

TABLE 18.—NUMBER OF PERIODS, *p*, OF WARM WEATHER, 1868–1917. ANNUAL VALUES.

Maximum Temperature in Shade exceeds 65° each Day of Period and 70° on at least One Day.

p	7 to 10 Days.	11 to 14 Days.	15 to 18 Days.	29 Days.	Total of Days.	*p*	7 to 10 Days.	11 to 14 Days.	15 to 18 Days.	Total of Days.	*p*	7 to 10 Days.	11 to 14 Days.	Total of Days.	*p*	7 to 10 Days.	11 to 14 Days.	Total of Days.
1868 ..	2	1	—	—	28	1881	1	—	—	8	1894	1	—	7	1906	2	—	16
69 ..	—	2	—	—	24	82	1	—	—	8	95	1	—	7	07	1	—	7
70 ..	—	—	—	1	29	83	—	—	—	—	96	2	—	14	08	—	1	11
71 ..	1	—	—	—	10	84	1	—	1	25	97	1	1	22	09	1	—	8
72 ..	—	1	—	—	13	85	—	1	—	13	98	1	—	7	10	1	—	8
73 ..	—	—	—	—	—	86	1	—	—	7	1899	1	1	24	11	2	2	40
74 ..	1	—	—	—	9	87	1	1	—	22	1900	1	—	7	12	1	—	10
75 ..	1	—	—	—	8	88	—	—	—	—	01	1	—	7	13	—	—	—
76 ..	—	1	—	—	11	89	—	—	—	—	02	—	—	—	14	1	—	7
77 ..	1	—	—	—	9	90	—	—	—	—	03	—	—	—	15	—	—	—
78 ..	—	1	1	—	28	91	1	—	—	10	04	—	—	—	16	1	1	21
79 ..	—	—	—	—	—	92	—	—	—	—	1905	1	1	18	1917	1	1	20
1880 ..	1	—	—	—	10	1893	1	1	—	24								

TABLE 19.—NUMBER OF PERIODS, *p*, OF FROSTY WEATHER, 1867–1917. MONTHLY VALUES.

p	3 to 5 Days.	6 to 8 Days.	9 to 11 Days.	20 Days.	Total of Days.
November ..	4	1	—	—	25
December ..	13	3	3	—	101
January ..	12	6	1	1	112
February ..	12	1	1	—	61
March	8	—	—	—	25
50 years ..	49	11	5	1	324

TABLE 20.—NUMBER OF PERIODS, *p*, OF FROSTY WEATHER, 1867–1917. ANNUAL VALUES.

Mean Daily Temperature on all days below 32°.

p	3 to 5 Days.	6 to 8 Days.	9 to 11 Days.	Total of Days.	*p*	3 to 5 Days.	6 to 8 Days.	9 to 11 Days.	20 Days.	Total of Days.	*p*	3 to 5 Days.	6 to 8 Days.	9 to 11 Days.	Total of Days.	*p*	3 to 5 Days.	6 to 8 Days.	Total of Days.
1868	—	—	—	—	1881	2	—	—	1	28	1894	1	—	—	4	1906	1	—	3
69	—	—	—	—	82	—	—	—	—	—	95	1	1	2	29	07	—	—	—
70	3	—	—	11	83	—	—	1	—	11	96	—	—	—	—	08	1	—	4
71	—	1	1	15	84	—	—	—	—	—	97	—	—	—	—	09	1	—	4
72	—	—	—	—	85	—	—	—	—	—	98	—	—	—	—	10	5	—	20
73	1	—	—	3	86	4	—	—	—	12	1899	1	—	—	5	11	1	—	4
74	—	—	—	—	87	3	—	—	—	11	1900	2	1	—	16	12	1	—	5
75	1	—	1	14	88	1	—	—	—	3	01	1	—	—	3	13	1	—	5
76	1	—	—	3	89	2	—	—	—	6	02	1	1	—	11	14	—	—	—
77	—	—	—	—	90	—	—	—	—	—	03	—	1	—	7	15	—	—	—
78	—	—	—	—	91	1	—	—	—	4	04	—	—	—	—	16	—	1	7
79	4	3	—	37	92	2	—	—	—	6	1905	—	—	—	—	1917	2	—	6
1880	3	1	—	17	1893	1	1	—	—	10									

TABLE 21.—SERIAL VALUES OF THE MEAN RELATIVE HUMIDITY FOR EACH MONTH AND YEAR, 1868–1912.

Departures from 45-year Normals (in percentage).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1868	+2	+1	+2	+2	+2	−3	−6	−3	−1	+1	−2	+1	− ·3
69	+2	+2	−5	0	−2	−3	−2	−4	0	−1	−1	−2	−1·3
70	+1	−3	−2	−1	+1	+2	0	−6	0	0	−1	−5	−1·2
71	+1	+4	−1	+5	−2	−4	0	−1	−2	+2	−3	0	− ·1
72	+2	+3	0	−2	+4	+5	0	+3	+3	−1	−1	+1	+1·4
73	+1	−4	+4	−3	+1	+1	+2	+3	−5	+2	0	+1	+ ·3
74	−1	−1	0	+2	0	−5	−2	0	0	0	0	−3	− ·8
75	+2	0	−3	−3	+2	+2	−4	0	+1	0	−2	−2	− ·6
76	−3	−2	−1	+2	−5	−2	−2	−3	0	0	+3	+2	− ·9
77	+1	−2	+3	+1	−2	−1	+4	+3	−3	+2	+2	+1	+ ·7
78	+1	+5	−3	+3	+2	−1	−3	−1	−2	−2	−3	−2	− ·5
79	−5	+4	+1	+4	0	+3	+1	+1	0	+4	−4	+1	+ ·8
80	+1	+2	+2	+1	−3	−2	+1	−1	+1	−5	−1	0	− ·3
81	+1	+1	+1	−1	0	0	+4	+1	+2	−2	+2	+2	+ ·9
82	+1	+2	+1	+1	+1	+3	+3	+1	+2	+3	0	−1	+1·4
83	0	+1	−4	0	−1	+1	0	+2	+2	−1	+2	0	+ ·2
84	+2	0	−1	−2	+3	+2	+3	+2	+3	0	−3	0	+ ·7
85	0	+6	+2	0	+4	−2	+5	+2	+2	+2	+2	+1	**+2·0**
86	−3	−1	0	−2	+4	0	−3	+1	−4	+2	+1	−4	− ·7
87	+3	+2	+4	+3	0	−2	−2	−2	+1	−3	+1	+1	+ ·5
88	+2	−3	0	+3	+2	+1	+3	+1	+1	+1	−1	+1	+ ·9
89	+4	−5	+1	+1	+5	−2	−2	+2	−1	+1	+2	+1	+ ·6
90	+1	+1	0	−4	+3	+6	+1	+1	+2	+1	+2	−2	+1·0
91	0	+3	−5	−4	−1	0	−3	0	+1	+1	+3	**+3**	− ·2
92	−2	0	−5	−5	0	+2	0	+1	+1	−2	+2	−2	− ·8
93	−2	0	+1	0	+4	−2	−1	−1	0	+2	−3	+1	− ·1
94	−4	+3	0	+2	0	+2	+2	+1	−4	+1	+2	−1	+ ·3
95	−3	−4	+2	+1	−3	−5	0	+2	0	−3	+1	−1	−1·1
96	+3	+1	+1	0	**−6**	+5	+1	−4	+2	−4	−1	+2	·0
97	−2	+4	+1	−2	−2	+4	−2	0	−1	+2	+2	+2	+ ·5
98	+2	−4	−1	+2	−1	+2	−5	−1	+1	+2	+1	−2	− ·3
1899	0	+1	−1	+1	+1	−2	+3	−2	−1	0	+1	+2	+ ·2
1900	+1	0	−3	0	−2	+2	+2	+1	0	+1	+2	0	+ ·3
01	−2	−2	−2	−2	−2	−3	−1	−2	−2	0	+1	−1	**−1·5**
02	−4	−4	+2	−3	−3	+3	−2	−2	+1	−1	−2	−3	**−1·5**
03	−1	+2	+4	−1	+2	−3	+1	0	−1	+2	0	**+3**	+ ·7
04	+1	0	+1	+2	+2	−1	+1	−1	−3	−1	−1	0	·0
05	−3	−3	0	0	0	−5	−2	−1	−4	−4	+1	+1	**−1·5**
06	+2	−3	−5	−6	+5	0	−1	+2	−2	+1	−1	−3	− ·9
07	−2	−2	0	−1	+2	+5	−1	+2	0	+3	+2	+2	+ ·8
08	−2	0	+2	−2	+3	+1	−2	−4	+2	+2	0	+1	+ ·1
09	−1	−4	−1	−2	**−6**	−2	0	−1	0	−1	0	+1	−1·4
10	−2	+2	−1	+2	+3	−3	−2	+2	−2	−1	−1	−2	− ·4
11	−1	+3	−2	0	0	−5	−3	−2	−2	+1	−1	**+3**	− ·7
1912	+1	+3	+4	−2	+1	+8	−1	+1	−2	0	−1	+1	+1·1
1868–1912	84·9	83·2	79·8	75·8	**74·4**	75·5	77·7	79·8	81·7	83·2	84·6	**85·5**	80·5

TABLE 22.—DIURNAL AND ANNUAL VARIATION OF TEMPERATURE INDICATED BY THE DRY BULB THERMOMETER IN THE NORTH WALL SCREEN, 1868–1912.

Hour.	1	2	3	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20	21	22	23	Mdt.	Mean.	r%
Jan. ..	38·4	38·4	38·3	38·2	38·2	38·1	38·2	38·2	38·3	38·6	39·2	39·8	40·3	40·4	40·3	40·0	39·6	39·3	39·1	38·9	38·8	38·7	38·6	38·5	**38·9**	7·5
Feb. ..	38·3	38·1	37·9	37·9	37·8	**37·7**	**37·7**	37·8	38·2	38·9	39·9	40·8	41·4	41·6	41·7	41·3	40·7	40·1	39·6	39·3	39·0	38·8	38·5	38·3	39·2	5·7
Mar. ..	38·8	38·6	38·3	38·1	38·0	37·9	38·0	38·6	39·8	40·9	42·2	43·1	43·8	44·2	44·2	44·0	43·4	42·4	41·4	40·7	40·2	39·8	39·4	39·1	40·6	5·7
Apr. ..	41·7	41·3	40·9	40·6	40·4	40·4	41·4	42·8	44·4	45·9	47·2	48·1	48·9	49·4	49·6	49·4	48·9	47·8	46·3	45·0	44·0	43·3	42·7	42·2	44·7	5·6
May ..	45·6	45·1	44·7	44·4	44·4	45·0	46·6	48·2	49·7	51·0	52·3	53·3	54·1	54·6	55·0	55·0	54·5	53·5	51·9	50·1	48·6	47·6	46·9	46·3	49·5	2·3
June ..	50·8	50·3	49·9	49·7	49·9	50·8	52·2	53·8	55·5	56·8	58·0	58·9	59·7	60·2	60·5	60·5	60·1	59·2	57·7	55·9	54·2	53·0	52·1	51·5	55·1	5·3
July ..	53·8	53·4	53·1	52·8	52·9	53·5	54·9	56·3	57·9	59·0	60·1	60·9	61·7	62·2	**62·5**	**62·5**	62·0	61·2	59·7	58·1	56·6	55·6	54·9	54·3	**57·5**	6·1
Aug. ..	53·5	53·2	52·9	52·6	52·4	52·6	53·7	55·2	56·8	58·1	59·3	60·2	60·9	61·3	61·4	61·2	60·6	59·7	58·2	56·6	55·6	54·8	54·3	53·8	56·6	6·6
Sept. ..	50·7	50·4	50·1	49·8	49·6	49·4	49·9	51·1	52·7	54·1	55·4	56·4	57·1	57·5	57·5	57·2	56·4	55·3	53·9	53·0	52·3	51·7	51·3	50·9	53·1	3·7
Oct. ..	45·8	45·6	45·4	45·2	45·1	45·0	45·0	45·5	46·5	47·8	49·0	49·9	50·5	50·8	50·6	50·0	49·1	48·2	47·6	47·1	46·7	46·4	46·1	45·8	47·3	4·5
Nov. ..	41·8	41·7	41·6	41·4	41·4	41·3	41·4	41·4	41·8	42·4	43·3	44·0	44·5	44·6	44·4	43·9	43·4	43·1	42·8	42·5	42·3	42·1	41·9	41·7	42·5	6·4
Dec. ..	39·2	39·1	39·0	38·9	38·9	38·8	38·9	38·9	39·0	39·3	39·9	40·4	40·9	41·0	40·9	40·6	40·3	40·1	39·9	39·7	39·6	39·5	39·4	39·3	39·6	9·9
Year ..	44·9	44·6	44·3	**44·1**	**44·1**	44·2	44·8	45·7	46·7	47·7	48·8	49·7	50·3	**50·7**	**50·7**	50·5	49·9	49·2	48·2	47·2	46·5	45·9	45·5	45·1	47·1	5·8

TABLE 23.—DIURNAL AND ANNUAL VARIATION OF TEMPERATURE INDICATED BY THE WET BULB THERMOMETER IN THE NORTH WALL SCREEN, 1868–1912.

Hour.	1	2	3	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20	21	22	23	Mdt.	Mean.	r%
Jan. ..	36·9	36·8	36·8	36·7	36·7	36·6	36·7	36·7	36·8	37·1	37·5	37·9	38·2	38·3	38·3	38·1	37·8	37·6	37·4	37·2	37·1	37·0	36·9	36·9	**37·2**	7·5
Feb. ..	36·7	36·5	36·4	36·3	36·3	**36·2**	**36·2**	36·3	36·6	37·2	37·9	38·4	38·8	39·0	39·0	38·8	38·4	38·0	37·7	37·4	37·2	37·0	36·8	36·7	37·3	5·7
Mar. ..	37·0	36·8	36·6	36·4	36·4	**36·2**	36·3	36·8	37·6	38·4	39·2	39·7	40·1	40·3	40·4	40·3	39·9	39·4	38·8	38·3	38·0	37·7	37·4	37·2	38·1	5·7
Apr. ..	39·5	39·2	38·9	38·7	38·5	38·6	39·3	40·2	41·2	42·0	42·7	43·2	43·7	44·0	44·1	44·0	43·7	43·2	42·5	41·7	41·2	40·7	40·3	40·0	41·3	5·6
May ..	43·3	42·9	42·7	42·4	42·4	43·0	44·1	45·0	45·9	46·6	47·2	47·8	48·3	48·6	48·8	48·7	48·5	48·0	47·2	46·3	45·4	44·8	44·3	43·9	45·7	2·3
June ..	48·6	48·3	48·0	47·8	48·0	48·6	49·6	50·5	51·5	52·1	52·7	53·1	53·7	53·9	54·1	54·1	53·8	53·4	52·7	51·8	50·9	50·2	49·6	49·3	51·1	5·3
July ..	51·8	51·5	51·2	51·0	51·1	51·5	52·4	53·2	54·0	54·6	55·1	55·5	56·0	56·2	**56·4**	56·3	56·2	55·8	55·2	54·4	53·6	53·0	52·5	52·2	**53·8**	6·1
Aug. ..	51·7	51·4	51·2	51·0	50·8	51·0	51·7	52·6	53·6	54·2	54·8	55·2	55·6	55·8	55·9	55·8	55·6	55·2	54·5	53·7	53·1	52·6	52·2	51·9	53·4	6·6
Sept. ..	48·9	48·7	48·4	48·2	48·0	47·9	48·2	49·1	50·1	50·9	51·6	52·1	52·5	52·7	52·7	52·6	52·3	51·8	51·1	50·6	50·1	49·7	49·4	49·1	50·3	3·7
Oct. ..	44·0	43·8	43·6	43·5	43·4	43·3	43·3	43·6	44·4	45·2	46·0	46·5	46·9	47·0	47·0	46·7	46·2	45·7	45·3	44·9	44·6	44·4	44·2	44·0	44·9	4·5
Nov. ..	40·1	40·0	39·9	39·8	39·5	39·7	39·7	39·8	40·0	40·5	41·1	41·6	41·9	42·0	42·0	41·6	41·3	41·0	40·8	40·6	40·4	40·3	40·1	40·0	40·6	6·4
Dec. ..	37·6	37·5	37·4	37·4	37·4	37·3	37·4	37·4	37·6	37·8	38·2	38·6	38·9	39·0	39·0	38·8	38·6	38·4	38·3	38·1	38·1	38·0	37·9	37·7	38·0	9·9
Year ..	43·0	42·8	42·6	**42·4**	**42·4**	42·5	42·9	43·4	44·1	44·7	45·3	45·8	46·2	46·4	**46·5**	46·3	46·0	45·6	45·1	44·6	44·1	43·8	43·5	43·2	44·3	5·8

TABLE 24.—DIURNAL AND ANNUAL VARIATION OF RELATIVE HUMIDITY, 1868–1912.

Departure from the Mean of the Day over the 45-year Period (per Thousand).

Hour.	1	2	3	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20	21	22	23	Mdt.	Mean.	r%
Jan.	+ 7	+ 7	+ 9	+ 10	+ 11	+14	+15	+13	+11	+ 8	− 5	−13	−23	− 27	− 24	− 15	− 8	− 5	− 3	0	+ 1	+ 2	+ 1	+ 2	859	7·5
Feb.	+17	+ 17	+ 22	+ 19	+ 22	+27	+25	+23	+18	+10	−13	−31	−44	− 51	− 49	− 39	− 24	−11	− 3	+ 4	+ 6	+11	+13	+16	842	5·7
Mar.	+41	+ 44	+ 48	+ 47	+ 50	+50	+47	+38	+20	− 4	−35	−58	−73	− 81	− 80	− 74	− 57	−34	− 8	+ 5	+18	+25	+31	+38	810	5·7
Apr.	+69	+ 76	+ 83	+ 89	+ 89	+87	+71	+40	+ 5	−35	−62	−87	−97	−109	−109	−109	− 97	−71	−31	+ 5	+26	+44	+55	+55	765	5·6
May	+84	+ 90	+100	+107	+105	+97	+67	+30	− 7	−43	−68	−85	−98	−106	−113	**−115**	−106	−86	−49	− 6	+31	+53	+64	+77	**748**	2·3
June	+88	+101	+106	**+110**	+106	+91	+59	+23	−12	−43	−67	−87	−97	−108	−113	−116	−106	−88	−52	−11	+26	+53	+68	+83	762	5·3
July	+83	+ 93	+ 97	+ 98	+ 97	+85	+58	+24	−14	−41	−63	−84	−96	−108	−111	−112	−101	−80	−42	− 6	+32	+52	+64	+79	781	6·1
Aug.	+70	+ 77	+ 82	+ 85	+ 87	+82	+61	+32	− 3	−36	−66	−86	−97	−110	−108	−107	− 89	−65	−27	+11	+38	+52	+60	+67	803	6·6
Sept.	+57	+ 61	+ 64	+ 68	+ 70	+69	+62	+45	+ 6	−29	−59	−79	−94	−106	−102	− 95	− 74	−44	− 7	+13	+31	+43	+45	+51	822	3·7
Oct.	+34	+ 41	+ 42	+ 39	+ 41	+42	+40	+34	+12	−11	−38	−61	−75	− 82	− 74	− 59	− 30	− 8	+ 5	+15	+20	+23	+29	+31	833	4·5
Nov.	+14	+ 18	+ 16	+ 19	+ 21	+21	+19	+18	+13	+ 3	−14	−31	−39	− 40	− 32	− 23	− 10	− 5	− 2	+ 3	+ 3	+ 8	+10	+11	851	6·4
Dec.	+ 5	+ 6	+ 5	+ 8	+ 8	+10	+ 8	+ 9	**+10**	+ 6	− 2	−12	−19	− 23	− 15	− 10	− 3	− 1	0	+ 2	+ 2	+ 6	+ 6	+ 4	**864**	9·9
Year	+47	+ 53	+ 56	+ 58	**+ 59**	+56	+44	+27	+ 5	−18	−41	−59	−71	**− 79**	− 78	− 73	− 59	−41	−18	+ 3	+19	+31	+37	+43	812	5·8

TABLE 25.—DIURNAL AND ANNUAL VARIATION OF VAPOUR PRESSURE, 1868–1912.

Departure from the Mean of the Day over the 45-year Period.

(Unit 0·001 inch.)

Hour.	1	2	3	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20	21	22	23	Mdt.	Mean.
Jan.	− 3	− 3	− 3	−3	−3	− 3	− 2	− 3	− 3	− 1	0	+ 3	+ 5	+ 5	+ 5	+ 4	+ 3	+ 1	0	0	− 1	− 2	− 3	− 3	204
Feb.	− 3	− 3	− 4	− **5**	− **5**	− **5**	− **5**	− **5**	− 2	+ 1	+ 3	+ 6	+ 7	+ 7	+ 8	+ 8	+ 7	+ 5	+ 3	+ 2	+ 1	0	− 2	− 3	**201**
Mar.	− 4	− 5	− 7	− 8	− 8	− 9	− 9	− 7	− 2	+ 1	+ 3	+ 4	+ 6	+ 6	+ 7	+ 7	+ 7	+ 5	+ 4	+ 2	+ 1	0	− 2	− 3	205
Apr.	− 6	− 7	− 9	−10	−12	−12	− 8	− 5	0	0	+ 2	+ 2	+ 5	+ 6	+ 7	+ 6	+ 4	+ 5	+ 5	+ 4	+ 2	+ 1	− 1	− 5	226
May	−11	−14	−15	−15	−16	−13	− 7	− 3	− 1	− 2	+ 1	+ 4	+ 6	+ 8	+ 9	+ 8	+ 7	+ 5	+ 4	+ 3	+ 1	− 2	− 5	− 6	266
June	−16	−16	−19	−20	−19	−15	−10	− 5	0	+ 1	+ 4	+ 5	+ 9	+10	**+12**	+10	+10	+ 8	+ 8	+ 5	+ 1	− 3	− 8	− 9	331
July	−10	−12	−14	−17	−17	−14	− 7	− 4	− 1	+ 1	+ 4	+ 4	+ 8	+ 8	+10	+10	+ 9	+10	+ 9	+ 5	+ 4	0	− 5	− 6	**369**
Aug.	−11	−12	−14	−16	−18	−18	−12	− 5	+ 1	+ 1	+ 3	+ 5	+ 9	+ 7	+10	+ 8	+ 9	+ 9	+ 7	+ 5	+ 4	− 1	− 5	− 8	**369**
Sept.	− 7	− 9	−11	−13	−14	−17	−14	− 7	− 2	0	+ 3	+ 7	+ 8	+ 7	+ 9	+ 9	+ 9	+ 8	+ 7	+ 5	+ 3	0	− 4	− 6	332
Oct.	− 5	− 5	− 6	− 9	− 9	−10	−11	− 8	− 4	+ 2	+ 5	+ 6	+ 6	+ 7	+ 8	+ 7	+ 8	+ 7	+ 5	+ 3	0	− 2	− 3	− 6	272
Nov.	− 2	− 2	− 3	− 4	− 3	− 4	− 4	− 4	− 2	0	+ 3	+ 5	+ 8	+ 8	+ 9	+ 7	+ 5	+ 4	+ 2	+ 1	0	− 1	− 2	− 3	231
Dec.	− 2	− 3	− 3	− 3	− 3	− 4	− 3	− 3	− 2	− 1	+ 2	+ 4	+ 6	+ 6	+ 7	+ 6	+ 5	+ 4	+ 3	+ 1	0	+ 1	0	− 2	210
Year	− 7	− 8	−10	**−12**	−11	−11	− 9	− 5	− 2	0	+ 3	+ 6	+ 7	+ 8	+ **9**	+ 8	+ 8	+ 7	+ 5	+ 2	0	− 3	− 4	− 6	263

TABLE 26.—FIVE-DAY NORMALS OF RELATIVE HUMIDITY, H (PER 1.000), AND VAPOUR PRESSURE, T (IN UNIT OF 0·001 INCH), 1868–1912.

	Period.	H.	T.		Period.	H.	T.
Jan. 1– 5 ..	1	856	203	July 5– 9 ..	38	782	364
6–10 ..	2	846	196	10–14 ..	39	768	365
11–15 ..	3	846	199	15–19 ..	40	770	369
16–20 ..	4	853	204	20–24 ..	41	787	**380**
21–25 ..	5	852	**194**	25–29 ..	42	784	370
26–30 ..	6	835	197	30– 3 ..	43	775	366
31– 4 ..	7	841	197				
				Aug. 4– 8 ..	44	796	376
Feb. 5– 9 ..	8	842	200	9–13 ..	45	794	376
10–14 ..	9	833	**194**	14–18 ..	46	804	378
15–19 ..	10	836	203	19–23 ..	47	803	362
20–24 ..	11	819	198	24–28 ..	48	803	353
25– 1 ..	12	822	195	29– 2 ..	49	807	345
Mar. 2– 6 ..	13	808	199	Sept. 3– 7 ..	50	811	350
7–11 ..	14	803	199	8–12 ..	51	802	331
12–16 ..	15	795	**194**	13–17 ..	52	816	330
17–21 ..	16	800	204	18–22 ..	53	818	316
22–26 ..	17	790	202	23–27 ..	54	828	319
27–31 ..	18	780	201	28– 2 ..	55	828	306
April 1– 5 ..	19	764	212	Oct. 3– 7 ..	56	835	295
6–10 ..	20	762	214	8–12 ..	57	828	281
11–15 ..	21	756	218	13–17 ..	58	823	266
16–20 ..	22	755	230	18–22 ..	59	833	266
21–25 ..	23	755	232	23–27 ..	60	836	247
26–30 ..	24	751	234	28– 1 ..	61	839	248
May 1– 5 ..	25	744	237	Nov. 2– 6 ..	62	849	254
6–10 ..	26	**741**	251	7–11 ..	63	836	229
11–15 ..	27	743	259	12–16 ..	64	838	224
16–20 ..	28	**741**	260	17–21 ..	65	845	218
21–25 ..	29	747	279	22–26 ..	66	859	221
26–30 ..	30	744	293	27– 1 ..	67	842	207
31– 4 ..	31	758	308				
June 5– 9 ..	32	751	310	Dec. 2– 6 ..	68	850	211
10–14 ..	33	744	313	7–11 ..	69	843	200
15–19 ..	34	754	329	12–16 ..	70	**863**	207
20–24 ..	35	761	340	17–21 ..	71	857	209
25–29 ..	36	761	357	22–26 ..	72	862	200
30– 4 ..	37	770	361	27–31 ..	73	853	196

TABLE 27.—SERIAL VALUES OF THE RAINFALL IN EACH MONTH AND YEAR, 1868–1917.

Beckley Gauge. (All entries to be corrected by 3 %, see p. 65).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.	in.
1868..	6·55	5·79	4·19	3·90	2·93	1·47	0·59	4·60	3·10	4·44	4·10	6·20	47·86
69..	4·52	6·32	0·94	1·48	0·99	2·11	2·65	1·03	6·25	1·77	4·23	5·58	37·87
70..	4·18	6·31	0·93	1·46	3·15	1·84	2·52	1·76	3·71	4·61	1·84	4·06	36·37
71..	3·72	4·86	3·00	4·51	1·11	2·77	4·62	3·66	1·60	3·10	3·27	4·85	41·07
72..	6·05	3·09	2·61	0·92	3·68	8·54	2·52	5·19	8·78	3·69	5·11	6·00	**56·18**
73..	6·67	2·03	2·44	0·20	3·47	2·54	5·33	4·56	6·16	6·35	2·39	2·25	44·45
74..	3·40	0·83	2·95	1·79	2·49	0·78	3·68	4·38	4·12	7·12	3·74	2·07	37·35
75..	6·39	1·38	1·84	1·38	1·09	3·08	1·52	2·55	4·42	4·88	4·27	3·78	36·58
76..	2·66	4·67	4·26	2·03	0·57	2·83	3·20	4·70	2·70	6·37	3·49	6·11	43·59
77..	7·31	4·59	2·06	3·14	0·92	3·16	2·96	6·60	1·42	5·34	6·62	4·79	48·91
78..	4·46	1·93	1·67	2·79	3·45	2·73	0·58	2·86	5·20	4·19	1·60	1·91	33·37
79..	1·13	1·69	3·84	1·60	2·66	5·49	4·75	5·64	3·91	2·56	1·40	2·27	36·94
80..	2·12	2·80	2·89	3·67	0·90	2·25	3·96	0·83	2·94	0·79	5·40	4·20	32·75
81..	0·46	4·59	2·88	1·32	2·98	3·24	4·10	3·77	2·35	2·36	4·64	2·94	35·63
82..	3·66	3·29	3·30	2·53	2·36	3·69	4·62	2·85	3·91	4·32	5·27	3·40	43·20
83..	5·86	2·15	1·25	2·13	2·11	2·68	3·89	4·85	3·22	3·56	5·28	4·16	41·14
84..	5·83	5·29	2·22	1·29	2·83	1·09	6·15	2·60	3·39	3·42	3·78	5·41	43·30
85..	2·59	3·03	1·46	1·52	3·44	0·72	1·23	2·51	4·92	3·85	2·14	1·83	29·24
86..	3·02	1·75	3·00	1·16	2·63	1·42	2·30	1·81	4·96	3·42	3·47	3·16	32·10
87..	2·02	3·00	2·03	2·23	1·12	0·81	2·86	4·72	3·72	1·57	3·14	3·75	30·97
88..	2·81	0·71	3·14	1·97	3·22	2·42	4·98	2·14	1·28	1·70	4·83	3·59	32·79
89..	2·03	2·28	1·31	2·00	4·07	0·97	2·38	4·89	1·88	3·32	2·43	2·99	30·55
90..	5·65	0·66	2·44	1·99	2·87	3·96	4·01	3·81	4·27	2·44	5·38	1·40	38·88
91..	2·68	0·45	3·11	1·05	2·99	1·13	1·23	4·86	4·89	3·75	3·64	6·65	36·43
92..	2·18	2·19	0·69	0·58	4·19	4·85	1·98	6·52	4·19	4·15	3·35	2·19	37·06
93..	1·32	3·71	1·49	1·36	3·09	1·57	2·62	3·12	2·89	4·81	3·77	4·18	33·93
94..	4·24	**8·82**	3·17	1·97	3·06	2·92	3·17	5·63	**0·08**	3·12	3·12	3·60	42·90
95..	1·37	0·29	2·03	1·64	0·40	2·16	4·12	6·94	1·25	3·46	4·56	4·61	32·83
96..	2·13	1·74	4·09	2·10	0·78	4·36	4·16	2·18	4·87	3·69	1·05	4·71	35·86
97..	1·54	2·70	3·91	1·78	2·53	6·55	2·21	4·56	3·55	2·05	2·49	5·77	39·64
98..	2·69	2·65	1·38	2·15	2·44	1·92	1·34	5·22	3·91	3·80	5·03	4·85	37·38
1899..	6·44	2·25	3·31	3·78	4·87	1·83	3·97	1·12	3·92	3·09	5·13	3·49	43·20
1900..	4·56	2·86	0·43	2·04	2·16	4·34	3·54	4·91	3·38	5·44	5·86	7·34	46·86
01..	2·46	1·55	2·04	2·55	1·70	3·20	2·57	3·61	2·90	3·61	2·99	3·84	33·02
02..	2·99	1·48	2·26	0·79	2·13	1·95	2·85	2·56	2·99	1·84	2·64	4·57	**29·05**
03..	7·28	6·21	6·93	1·55	2·59	1·90	3·25	5·94	4·08	8·29	2·54	2·76	53·32
04..	3·41	2·28	1·39	4·03	3·20	1·80	3·65	3·93	3·51	1·31	1·91	3·32	33·74
05..	2·21	2·09	3·27	2·42	1·52	0·66	2·96	4·06	2·71	2·28	3·53	2·97	30·68
06..	4·36	2·56	3·21	1·33	4·36	1·44	2·38	4·99	1·89	5·14	4·45	3·89	40·00
07..	2·14	2·61	3·98	1·72	3·99	4·15	2·96	5·28	1·40	6·80	2·23	5·48	42·74
08..	4·23	2·31	4·21	1·36	3·38	2·56	2·22	2·64	5·23	1·92	2·75	3·03	35·84
09..	4·61	1·72	2·86	3·41	2·98	3·14	3·46	3·22	1·78	5·50	2·28	4·27	39·23
10..	4·17	3·53	1·84	4·43	1·84	2·08	4·62	6·67	1·48	1·83	3·14	3·62	39·25
11..	2·16	6·10	1·21	2·85	1·98	2·22	2·18	2·13	1·75	3·23	5·00	5·45	36·26
12..	2·77	3·31	4·28	1·35	1·31	4·86	2·25	4·14	2·85	3·64	4·03	6·21	41·00
13..	3·45	2·92	3·94	2·84	3·37	3·00	1·29	1·05	2·28	1·71	5·29	3·41	34·55
14..	3·09	3·21	4·58	2·29	1·68	0·54	2·80	4·21	1·98	1·27	4·58	6·02	36·25
15..	2·27	4·09	1·22	2·19	1·77	2·08	3·72	1·99	1·34	2·76	1·95	5·10	30·48
16..	5·02	3·96	2·15	3·35	4·54	2·25	3·42	3·78	0·80	7·16	3·24	4·94	44·61
1917..	1·92	0·93	2·05	1·22	3·88	2·91	3·36	4·12	2·04	5·58	5·57	3·09	36·67
1874–1917	3·39	2·80	2·67	2·11	2·56	2·58	3·08	3·88	3·01	3·69	3·70	4·03	37·50

TABLE 28.—DIURNAL AND ANNUAL VARIATION OF RAINFALL, 1874–1917.

Departures from the 44-year Normals.

(Unit 1 inch per 10,000 hour.)

Hour.	1	2	3	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20	21	22	23	Mdt.	Mean Rainfall.
Jan. ..	0	+ 2	0	− 2	+ 2	+ 6	+ 6	− 1	− 3	+ 5	− 9	− 1	+ 3	+ 3	+ 3	+ 5	0	− 2	− 1	− 1	− 1	− 3	− 4	− 3	43
Feb. ..	− 5	− 1	0	− 1	+ 3	+ 1	+ 1	+ 3	0	+ 2	− 5	− 4	+ 1	− 2	+ 5	+ 1	+ 1	+ 3	0	+ 5	+ 1	+ 1	0	+ 1	40
Mar. ..	− 2	+ 1	0	+ 1	+ 6	+ 3	+ 3	+ 1	+ 6	+ 8	− 4	− 2	− 3	− 3	+ 1	− 1	− 1	+ 3	+ 4	− 1	− 2	− 6	0	− 4	34
Apr. ..	+ 2	+ 9	+ 9	+ 3	+ 3	+ 1	− 2	− 6	− 2	− 6	− 7	− 4	− 5	+ 1	+ 1	− 5	− 1	+ 2	+ 6	+ 1	0	− 1	0	+ 2	**29**
May ..	+ 1	− 1	− 2	+ 2	+ 3	+ 1	− 3	− 8	− 1	− 2	−10	− 9	− 5	+ 5	+ 7	+12	+ 7	0	+ 4	0	+ 7	+ 3	− 2	− 6	34
June ..	− 2	+ 1	+ 3	+ 1	+ 2	− 3	− 5	−12	− 9	− 5	− 5	+ 4	− 1	+ 1	+ 5	+ 1	+13	+11	+ 1	− 5	− 3	+ 5	− 2	− 4	36
July ..	+ 3	+ 3	+ 2	− 4	+ 7	+ 1	+ 5	+ 1	− 7	− 2	− 2	− 5	− 2	− 4	− 2	− 2	− 1	+ 8	+ 6	0	+ 1	− 4	− 4	− 7	41
Aug. ..	− 3	− 1	+10	+11	+10	+ 9	− 2	− 9	−12	−14	−18	−10	− 4	0	+ 5	+13	**+26**	+ 5	− 9	− 3	+ 1	− 6	0	+ 3	52
Sept. ..	− 3	− 3	+ 6	+ 2	+12	+ 9	− 2	− 1	− 5	− 2	− 7	+ 1	+ 1	− 2	+ 2	0	+ 1	− 2	−10	− 4	+ 1	+ 1	− 2	− 1	42
Oct. ..	+ 1	+ 5	+ 3	+ 2	− 1	+ 1	+ 5	+ 5	− 1	+ 2	−14	− 5	− 5	0	− 3	0	0	+ 3	− 2	0	+ 2	− 4	− 4	0	49
Nov. ..	+ 6	− 5	− 2	− 1	− 2	− 6	−10	− 7	0	+ 6	− 9	− 4	+ 8	+ 7	+ 7	+ 7	+ 4	+ 1	− 6	− 2	+ 1	− 2	− 3	+ 2	51
Dec. ..	− 1	+ 3	− 4	− 2	+ 3	− 1	− 1	+ 2	+ 8	+10	−20	− 6	+ 3	− 5	0	+ 5	0	− 1	+ 2	+ 6	0	− 1	− 7	+ 6	**54**
Year ..	0	+ 1	+ 2	+ 1	+ **4**	+ 2	0	− 3	− 2	0	− **9**	− 4	− 1	0	+ 3	+ 3	+ **4**	+ 3	0	0	+ 1	− 1	− 2	− 1	42

TABLE 29.—FIVE-DAY NORMALS OF RAINFALL STATISTICS, 1874–1917.

No. of Period.*	Average Rainfall in 5 days. Unit 0·01 in.	Percentage of days with rain	Percentage of hours with rain	Number of Years with 10 9 8 / 7 6 5 4 3 / 2 1 0 Fore- or after-noons with rain.			No. of Period.*	Average Rainfall in 5 days. Unit 0·01 in.	Percentage of days with rain	Percentage of hours with rain	Number of Years with 10 9 8 / 7 6 5 4 3 / 2 1 0 Fore- or after-noons with rain.		
1	58	66	21	2	29	13	38	54	61	16	2	27	15
2	56	64	21	3	26	15	39	49	49	13	1	20	23
3	48	62	19	4	24	16	40	48	56	14	1	21	22
4	55	64	19	3	25	16	41	49	60	13	0	25	19
5	55	58	18	2	23	19	42	60	59	14	1	26	17
6	59	66	21	5	24	15	43	42	52	12	0	21	23
7	45	58	16	0	25	19	44	57	58	16	1	24	19
8	51	61	18	3	24	17	45	69	62	15	1	22	21
9	52	61	19	1	27	16	46	59	55	15	1	26	17
10	58	61	20	3	25	16	47	50	59	15	1	26	17
11	41	57	17	1	23	20	48	67	66	17	2	32	10
12	48	64	19	7	23	14	49	**86**	63	19	2	30	12
13	47	61	19	8	16	20	50	51	57	15	0	26	18
14	52	64	19	3	26	15	51	42	54	13	0	18	26
15	43	59	17	2	22	20	52	41	51	13	1	19	24
16	37	62	17	2	24	18	53	37	47	13	1	20	23
17	37	51	14	0	22	22	54	60	62	17	2	28	14
18	43	54	17	3	23	18	55	58	60	17	4	20	20
19	38	53	15	1	24	19	56	57	59	18	4	19	21
20	**30**	51	13	2	18	24	57	62	66	18	3	24	17
21	35	51	13	1	19	24	58	71	55	17	2	23	19
22	35	50	13	1	18	25	59	51	57	17	1	25	18
23	37	52	15	1	21	22	60	58	59	19	1	29	14
24	36	56	13	0	21	23	61	61	61	18	3	23	18
25	44	54	16	1	20	23	62	76	63	20	3	27	14
26	36	52	14	1	17	26	63	66	65	20	3	30	11
27	39	51	13	1	21	22	64	60	63	18	4	23	17
28	51	54	15	1	22	21	65	41	56	17	3	23	18
29	33	52	11	0	22	22	66	70	64	21	6	19	19
30	43	49	13	1	20	23	67	56	65	20	2	26	16
31	45	56	14	3	21	20	68	84	71	**26**	5	31	8
32	42	**44**	13	0	16	28	69	72	**72**	25	6	27	11
33	31	45	**10**	0	20	24	70	63	71	21	4	25	15
34	42	46	11	0	18	26	71	56	61	20	1	27	16
35	57	64	16	1	27	16	72	50	65	19	0	30	14
36	45	50	13	0	21	23	73	69	64	22	5	26	13
37	46	61	15	3	23	18							

* For dates of Periods see Table 26.

TABLE 30.—NUMBER, *n*, OF HOURS, (0 m TO 60 m.), PER HUNDRED THOUSAND HOURS IN WHICH THE RAINFALLS ARE EQUAL TO OR EXCEED THE UNDERNOTED QUANTITIES, *r*, 1874–1906.

TABLE 31.—NUMBER, *n*, OF DAYS (MIDNIGHT TO MIDNIGHT) PER HUNDRED DAYS IN WHICH THE RAINFALLS ARE EQUAL TO OR EXCEED THE UNDERNOTED QUANTITIES, *r*, 1874–1917.

TABLE 30.

r	*n*	*De-parture.**	*r*	*n*	*De-parture.**	*r*	*n*	*De-parture.**
Inch.			Inch.			Inch,		
0·000	100000	—	0·125	360	+10	0·31	14	0
·005	11966	+ 38	·135	291	+11	·33	10	+3
·015	7357	− 24	·145	232	+ 5	·35	9	+4
·025	5141	+112	·155	188	+ 4	·37	8	+4
·035	3728	+147	·165	153	+ 3	·39	7	+4
·045	2768	+144	·175	126	+ 3	·41	5	+3
·055	2066	+104	·185	105	+ 4	·43	4	+2
·065	1573	+ 84	·195	85	+ 2	·49	3	+2
·075	1203	+ 58	·205	65	− 3	·67	2	+2
·085	935	+ 45	·23	42	0	·85	1	+1
·095	731	+ 34	·25	30	+ 1	·89	2/3	—
·105	570	+ 20	·27	23	+ 2	1·29	1/3	—
·115	457	+ 20	·29	19	+ 4	—	—	—

TABLE 31.

r	*n*	*r*	*n*
Inch.		Inch.	
0·000	100·00	0·6	2·89
·005	56·82	0·7	1·77
·01	53·67	0·8	1·11
·02	47·76	0·9	0·75
·03	43·91	1·0	0·54
·04	41·09	1·1	0·36
·06	36·41	1·2	0·21
·08	32·64	1·3	0·19
·10	29·23	1·4	0·13
·2	18·25	1·5	0·10
·3	11·24	1·6	0·07
·4	7·31	1·8	0·04
·5	4·63	2·0	0·02

* *See p.* 67.

TABLE 32.—PERCENTAGE OF DAYS IN WHICH THE RAINFALL LIES WITHIN THE UNDERNOTED LIMITS, *r*, 1874–1917. ANNUAL VARIATION.

r in inches.	No rain.	0·005 to 0·05	0·05 to 0·1	0·1 to 0·2	0·2 to 0·5	0·5 to 1·0	More than 1·0
Whole Year	43·2	18·1	9·5	11·0	13·6	4·1	0·5
January..	37·9	19·8	9·5	12·5	16·3	3·7	0·3
February	40·0	19·9	10·3	12·8	13·3	3·0	0·7
March	42·9	20·5	10·7	10·4	12·1	3·1	0·3
April	49·6	18·6	10·4	9·1	9·9	2·2	0·2
May	48·8	17·7	8·9	10·3	11·0	3·2	0·1
June	50·9	16·1	9·6	9·3	9·8	3·8	0·5
July	44·5	19·2	8·7	10·9	12·1	3·8	0·8
August	42·4	15·9	9·7	10·4	15·2	5·2	1·2
September	45·8	18·1	7·6	10·1	13·3	4·6	0·5
October	42·2	16·1	9·1	11·3	14·7	5·9	0·7
November	38·7	17·8	8·7	11·8	17·2	4·9	0·9
December	34·7	17·1	11·1	12·8	18·2	5·5	0·6

TABLE 33.—FREQUENCY OF EXCESSIVE RAINFALLS, 1868–1917.

Rainfalls, r, in inches, which were Reached or Exceeded 1, 5, 15, 50, 100 times in each Period, p.

p	r					Calculated probable maximum rainfall.	Months arranged in order of heaviest rainfalls.
	1	5	15	50	100		
0·25 hour	0·84	0·60	0·37	0·24	0·19	0·9	Aug., July, . . . Feb., Mar.
0·5 ,, ...	1·02	0·76	0·43	0·32	0·23	1·1	May, Aug., . . Feb., Dec.
1 ,, ...	1·29	0·89	0·52	0·37	0·30	1·3	Aug., May, . . Mar., Dec.
2 hours	1·77	0·97	0·68	0·51	0·42	1·6	Aug., July, . Apr., Dec.
4 ,, ...	2·01	1·06	0·95	0·70	0·59	2·0	July, Aug., . . Apr., Dec.
8 ,, ...	2·11	1·48	1·22	0·95	0·78	2·4	July, Aug., . . . Dec., Apr.
16 ,, ...	2·36	1·98	1·52	1·17	0·99	3·0	June, Aug., . Mar., Apr.
1 day	2·51	2·30	1·79	1·36	1·13	3·4	Aug., June, . Jan., Mar.
2 days..	3·44	2·51	2·15	1·64	1·38	4·2	Feb., Aug., . Mar., Jan.
4 ,, ...	3·57	2·95	2·55	2·18	1·85	5·3	June, Feb., . . Mar., Apr.
8 ,, ...	5·21	4·15	3·47	2·88	2·48	6·8	June, Jan., . Sept., Apr.
16 ,, ...	7·22	6·12	5·54	4·26	3·61	8·9	
32 ,, ...	10·28	8·46	7·72	6·44	5·34	12·2	
12 months	55·23	47·93	40·40	—	—	55·2	

TABLE 34.—FREQUENCY OF RAINFALL IN LONG PERIOD, 1868–1917.

Number, n, of Periods, p, in 50 Years in which the Rainfall, r, did not exceed respectively 0·25, 0·5, 1·0, 2·0, 3·0 inches.

p \ r	0·25 in.	0·5 in.	1·0 in.	2·0 in.	3·0 in.
10 to 14 days	227				
15 ,, 19 ,, ...	106	141			
20 ,, 24 ,, ...	40	65	117		
25 ,, 29 ,, ...	13	30	61		
30 ,, 34 ,, ...	9	13	39		
35 ,, 39 ,, ...	—	11	21	48	
40 ,, 44 ,, ...	1	2	10	32	
45 ,, 49 ,, ...	—	1	5	24	
50 ,, 54 ,, ...	—	1	3	12	27
55 ,, 59 ,, ...	—	—	2	4	28
60 ,, 64 ,, ...	—	—	2	7	14
65 ,, 69 ,, ...	—	—	—	4	9
70 ,, 74 ,, ...	—	—	—	—	7
75 ,, 79 ,, ...	—	—	—	—	1
80 ,, 84 ,, ...	—	—	—	—	4
85 ,, 89 ,, ...	—	—	—	1	1
97 days	—	—	—	—	1
Percentage of total number of days ..	34	32	41	33	31
Rate of rainfall in percentage of mean rate	14	21	33	42	47

SPECIAL EDITION

FORM 2324

AIR MINISTRY—METEOROLOGICAL OFFICE.

AREA FORECAST for CORONATION OF H.M. QUEEN ELIZABETH II

FOR THE PERIOD FROM EARLY HOURS 2 JUNE 195/3 TO EARLY HOURS 3 JUNE 195 3

ALL HEIGHTS IN THE FORECAST ARE ABOVE MEAN SEA LEVEL.

THE TIME STANDARD USED IN THE FORECAST IS .....

INFERENCE :

A DEEP DEPRESSION ETC.

SURFACE WIND : NORTH 10 knots.

UPPER WINDS AT : **TEMPERATURES**

,000 feet		
,000 feet		
,000 feet		
,000 feet	/	
,000 feet		
,000 feet		
,000 feet		
,000 feet		

WEATHER : OVERCAST, FREQUENT SHOWERS HEAVY AT TIMES (ABOUT ONE SHOWER PER MINUTE)

VISIBILITY : POOR (especially for those on back row)

CLOUD : 8/8 at 1000 feet.

FREEZING LEVEL : **BAROMETRIC CHANGES**

ICE FORMATION :

ADDITIONAL NOTES :

OUTLOOK: PROBABLY SIMILAR OR WORSE.

FOR LOVELY FREE POITRAT OF H.M. Q.E.II SEE OVER.

LAST LINE FOR ' POITRAT' READ ' POITRAIT'.

STATION .....

ISSUED AT ..... HOURS.

Meteorological Officer.

(33917) Wt. 17577—BJ/290 7250 pads 9/52 G.S.St.

TABLE 35.—DISTRIBUTION OF PERIODS OF DROUGHT WITH REFERENCE TO SEASON AND YEAR.

Number of Days in each Month belonging to Periods of Drought expressed in Percentage of their Average Numbers 1868–1917.

—	0·25 inch in 15 to 43 days.	0·5 inch in 20 to 50 days.	1·0 inch in 30 to 64 days.	2·0 inches in 45 to 85 days.	3·0 inches in 60 to 97 days.	25 Longest Periods of Drought.
January	69	37	41	40	58	60
February	94	116	110	74	83	60
March	125	155	175	146	164	170
April	183	195	177	181	203	220
May	123	139	182	196	161	160
June	148	153	162	156	144	160
July	76	71	70	91	109	110
August	76	82	78	96	74	70
September	88	108	97	87	70	60
October	111	73	63	72	61	60
November	64	47	23	31	32	30
December	45	27	24	29	42	40
1868 to 1872	85	80	90	112	55	1
1873 to 1877	85	108	92	76	52	2
1878 to 1882	124	91	116	73	154	4
1883 to 1887	100	83	91	128	58	2
1888 to 1892	105	90	120	98	127	4
1893 to 1897	78	97	102	132	163	4
1898 to 1902	91	90	91	105	100	1
1903 to 1907	91	100	58	52	71	2
1908 to 1912	131	153	103	108	75	2
1913 to 1917	111	108	136	117	146	3
Percentage of Total Number of Days	19	18	17	15	14	10
Rate of Rainfall in Percentage of Mean Rate	12	18	25	35	41	—

TABLE 36.—NUMBER OF "DAYS WITH RAIN" IN EACH MONTH AND YEAR, 1868–1917.

Departures from the 50-year Normals (given in the last line).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1868..	− 1	+ 9	+ 6	+ 3	+ 2	+ 1	−10	+ 4	0	+ 6	− 3	+ 3	+19
69..	+ 6	+10	− 6	0	− 3	− 3	+ 1	− 7	+ 9	+ 1	+ 5	− 3	+10
70..	0	+ 1	− 8	+ 3	− 1	+ 3	− 2	− 5	− 4	0	− 8	0	−22
71..	− 6	+ 3	− 2	+ 2	− 5	− 1	+ 9	− 5	− 3	+ 5	− 6	+ 2	− 7
72..	+ 5	+ 3	0	− 3	+ 5	+11	− 1	+ 7	+ 9	+ 4	+ 2	0	+41
73..	+ 4	− 9	+ 2	− 9	+ 6	+ 2	+ 7	+ 4	+ 1	+ 2	0	0	+10
74..	+ 5	0	+ 1	+ 4	− 3	− 6	+ 3	+ 2	+10	+ 3	0	− 9	+ 9
75..	+ 4	− 7	− 9	− 5	0	+ 4	− 6	0	− 1	+ 4	− 1	− 1	−18
76..	− 3	+ 2	+ 4	+ 6	− 7	+ 2	+ 3	+ 3	+ 2	+ 7	+ 4	+ 7	+29
77..	+ 9	+ 7	+10	0	− 5	+10	+10	+ 7	− 2	+ 4	**+12**	+ 3	**+65**
78..	+ 3	− 4	− 5	− 1	+ 9	− 2	−10	− 1	+ 3	+ 2	− 5	− 9	−21
79..	−10	+ 2	+ 3	+ 3	+ 3	**+12**	+ 4	+ 5	+ 7	− 5	−10	− 8	+ 6
80..	− 4	+ 9	− 1	+ 7	− 3	+ 2	0	**−13**	+ 1	− 9	+ 3	+ 5	− 4
81..	− 6	− 1	+ 2	− 2	+ 4	+ 7	**+12**	+ 7	+ 4	− 6	+ 8	+ 2	+31
82..	− 1	0	+ 9	+ 1	− 1	+ 4	+ 7	− 2	+ 1	+ 6	+ 8	− 2	+29
83..	+ 3	+ 4	− 5	− 3	− 2	+ 3	+ 8	+ 1	0	+ 5	+ 6	+ 3	+23
84..	+ 8	+ 7	+ 6	+ 1	+ 4	+ 3	+ 9	0	+ 7	0	− 2	+ 2	+44
85..	− 2	+ 7	− 2	0	**+12**	− 4	− 3	− 6	+10	0	− 5	− 3	+ 4
86..	+ 6	+ 2	+ 2	− 1	+ 2	− 3	− 3	− 3	− 1	+ 3	+ 1	− 3	+ 1
87..	− 5	− 6	− 5	− 5	− 7	− 7	+ 4	− 4	+ 2	− 8	− 2	0	**−43**
88..	− 7	− 3	− 3	+ 2	− 1	− 4	+ 6	+ 2	− 6	− 6	+ 4	− 2	−19
89..	− 2	+ 2	− 1	+ 3	+ 4	− 8	− 1	+ 1	− 5	− 4	+ 1	− 1	−11
90..	+ 5	− 8	+ 2	− 6	− 1	**+12**	+ 2	− 1	+ 1	0	+ 5	− 8	+ 2
91..	− 3	−10	− 3	− 4	+ 3	− 6	− 6	+ 4	+ 5	0	+ 3	+ 2	−15
92..	+ 2	+ 2	− 9	− 4	+ 3	+ 4	− 7	+ 2	+ 2	+ 1	0	− 4	− 9
93..	− 1	+ 2	−10	− 8	− 2	− 9	− 6	− 3	+ 3	0	− 5	+ 3	−36
94..	+ 2	+ 7	− 2	+ 2	+ 3	+ 1	− 3	− 4	−11	0	+ 4	0	− 2
95..	− 5	−12	+ 4	+ 3	− 8	− 5	− 1	+ 9	− 5	− 1	0	− 3	−24
96..	− 3	− 2	+ 4	− 2	−12	0	− 1	− 3	+ 5	0	− 6	+ 1	−20
97..	− 8	+ 2	+ 5	− 1	− 1	+ 3	− 4	+ 2	− 1	− 7	− 4	0	−14
98..	+ 1	+ 3	− 4	+ 2	− 2	0	− 8	+ 2	− 1	− 3	+ 1	+ 6	− 4
1899..	+ 2	− 1	0	+ 5	− 1	− 2	− 2	− 7	+ 7	0	+ 1	− 2	0
1900..	+ 6	− 3	−10	+ 4	+ 1	+ 2	+ 5	− 1	0	+ 2	+ 3	+ 8	+16
01..	− 3	− 9	− 3	− 1	− 3	0	− 9	+ 2	− 2	+ 2	− 7	+ 1	−32
02..	− 1	− 7	+ 6	− 2	+ 5	0	0	− 4	− 1	− 3	+ 1	− 4	−11
03..	− 1	+ 3	+ 7	0	0	− 2	+ 3	+ 7	− 1	+10	+ 5	− 4	+27
04..	+ 1	0	− 4	+ 9	+ 2	− 3	− 3	+ 4	− 6	− 3	0	− 2	− 6
05..	0	+ 3	+ 8	0	− 5	− 8	+ 2	+ 4	− 1	− 8	− 2	− 5	−12
06..	+ 5	− 2	− 5	− 3	+ 7	− 4	+ 1	+ 2	− 6	+ 8	+ 4	− 1	+ 5
07..	0	− 3	0	− 1	+ 4	+ 8	− 5	+ 5	−11	+ 3	− 1	+ 2	+ 1
08..	− 3	+ 1	0	− 2	+ 6	− 1	− 4	− 1	+ 7	− 4	+ 1	+ 2	+ 1
09..	− 2	− 7	− 1	0	− 2	− 1	+ 4	− 1	− 5	+ 4	− 6	− 6	−23
10..	+ 2	+ 3	− 6	+ 3	+ 1	− 4	− 2	+ 3	−10	− 8	− 4	+ 3	−20
11..	− 3	+ 1	− 3	0	− 1	− 3	0	− 4	− 4	− 6	+ 3	+ 7	−13
12..	− 3	− 1	+ 8	− 6	− 3	+ 9	− 6	+ 1	− 7	+ 1	− 2	+ 5	− 5
13..	− 2	− 3	+ 7	+ 3	+ 4	+ 4	−10	− 8	− 7	0	+ 4	− 3	−11
14..	− 3	+ 8	+ 4	0	+ 1	− 4	− 3	0	− 4	− 2	+ 4	+ 2	+ 2
15..	− 4	+ 5	− 4	+ 6	− 7	− 4	+ 5	+ 1	− 5	− 6	− 9	+ 2	−20
16..	+ 5	+ 7	0	+ 4	+ 8	+ 1	− 2	− 4	− 5	+ 4	+ 3	+ 4	+24
17..	−10	− 4	+ 1	+ 3	0	0	− 6	+ 5	+ 6	+ 6	+ 5	− 4	+ 2
1868–1917	19·6	17·3	17·8	**15·2**	16·3	15·3	17·6	18·2	16·7	18·6	18·3	**20·8**	211·6

TABLE 37.—SERIAL VALUES OF THE DURATION OF SUNSHINE IN EACH MONTH AND YEAR, 1881–1920.

Departures (in Hours) from 40-year Normals (given in the last line).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1881..	− 6	+ 3	− 5	+39	+68	−12	−36	+14	−34	+20	+ 4	− 1	+ 55
82..	−10	− 5	+ 5	− 3	+63	− 9	−15	+32	−12	−24	−10	− 3	+ 10
83..	− 2	+10	+20	−20	− 5	− 3	+23	− 4	+10	+25	+ 8	+ 3	+ 66
84..	− 4	− 3	−26	−22	− 4	−37	−27	−11	+14	−10	+ 9	−13	−133
85..	− 6	+ 9	+11	+13	−23	+ 9	+21	+ 1	+ 7	+14	−12	+ 3	+ 48
86..	+10	− 9	−26	+32	−54	+ 2	+20	−20	− 3	− 9	+18	+22	− 16
87..	− 6	+ 6	− 6	+12	+ 9	+31	− 2	+19	−14	+ 5	−25	− 9	+ 21
88..	+ 8	+13	+ 5	−33	+17	+45	−55	+ 2	−11	− 6	−14	− 1	− 29
89..	− 4	+20	+ 5	−28	−34	+44	− 3	−17	+ 8	−22	+ 6	+ 6	− 18
90..	+ 3	−14	− 4	+21	+16	−65	− 4	+ 6	− 8	− 1	+ 8	−12	− 53
91..	+ 4	−10	+21	− 5	−14	+ 1	+23	−12	−14	+20	−13	+ 5	+ 7
92..	+ 4	+12	+28	+31	+ 3	− 5	0	+ 9	+ 3	+21	−11	+ 7	+103
93..	+ 9	+ 8	+19	+52	−22	+27	+ 1	+22	+10	+13	+23	+ 2	+165
94..	− 3	−14	+58	−26	− 4	−12	+ 8	+ 1	+16	− 6	+ 6	+10	+ 35
95..	+21	− 3	−24	− 3	+20	+45	−24	−37	+31	+26	− 1	− 3	+ 49
96..	− 3	−24	+10	+11	+79	−30	−28	+22	−38	+15	− 5	0	+ 10
97..	+21	−22	−27	+11	+49	−73	+38	− 1	+10	+15	0	+ 1	+ 23
98..	− 6	+38	− 1	−35	+42	−12	+63	− 9	−29	−21	−11	− 2	+ 18
1899..	− 5	− 8	+ 7	−33	−18	− 9	−24	+12	+ 9	+ 6	−11	− 8	− 81
1900..	+13	+ 8	0	− 6	− 8	−17	−26	−41	+ 5	+ 3	− 7	− 7	− 82
01..	− 4	+18	−10	+33	+47	+29	− 3	+35	− 9	+ 9	+ 5	+ 4	+155
02..	− 4	−11	−11	− 1	− 2	−49	− 1	+10	−20	− 4	−19	− 9	−120
03..	−15	−24	− 8	0	−28	0	− 5	+30	+26	−18	+ 6	−14	− 49
04..	−10	−24	−17	− 3	−33	+20	−21	+10	+24	+18	+ 1	+ 3	− 31
05..	+ 1	+20	− 3	−13	−11	**+73**	+15	− 7	+ 9	+24	− 2	− 8	+ 99
06..	0	+47	+31	+10	−71	+15	+29	−19	+38	− 9	− 3	+ 3	+ 72
07..	− 1	+17	+44	− 3	−29	−74	+ 7	−14	− 1	−25	+ 4	−14	− 88
08..	−10	+13	−17	−19	+ 2	+28	−28	+43	−38	−19	− 1	− 2	− 47
09..	− 4	− 2	−34	+ 7	+32	+ 9	−20	+17	−22	− 7	+13	+ 4	− 6
10..	+ 1	− 2	+ 1	−19	+ 1	+ 7	+ 2	−60	+ 8	− 5	+ 7	+ 2	− 56
11..	− 2	− 3	+ 3	−35	+42	+31	+30	+39	+14	− 7	+ 6	− 4	+115
12..	− 2	− 1	− 9	+29	−17	−95	− 2	−83	− 8	−13	−17	**−15**	**−232**
13..	−16	−27	− 8	−25	−50	−47	+36	−10	−47	+10	+ 2	+ 4	−177
14..	−15	−19	− 9	+29	−60	− 1	−41	+17	+12	−17	+ 2	− 4	−105
15..	+ 5	− 5	+28	+12	+50	+48	+15	−32	+25	−20	+18	+ 5	+150
16..	+ 3	+10	− 9	+ 4	− 6	− 1	−42	+17	+ 4	−21	+ 5	+ 4	− 31
17..	+ 6	0	+ 8	−15	−44	+20	+32	− 8	−14	− 2	+ 3	+10	− 3
18..	+ 7	−11	−21	+40	−27	+40	+ 6	−44	+23	−19	+ 4	+ 8	+ 7
19..	+ 3	−11	+ 5	−17	+27	+12	+71	+52	+ 9	+33	+ 9	+10	**+204**
20..	+ 7	− 3	−16	−19	−23	+32	−36	+ 3	+ 7	−10	−15	− 3	− 75
1881–1920	22·7	43·9	84·4	128·1	160·5	**168·4**	148·9	130·6	101·0	65·5	28·7	**16·6**	1099·5

TABLE 38.—NUMBER OF DAYS WITH SUNSHINE IN EACH MONTH AND YEAR, 1881–1920.

Departures from the 40-year Normals (given in the last line).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1881..	− 4	− 5	− 4	+ 2	+ 3	− 1	0	− 2	− 3	+ 3	+ 2	+ 5	− 4
82..	+ 3	+ 2	+ 3	− 2	+ 4	0	− 1	+ 3	− 2	0	+ 1	− 3	+ 7
83..	− 2	+ 7	+ 5	− 1	+ 1	+ 1	+ 1	+ 3	+ 1	+ 2	0	+ 2	+20
84..	− 3	+ 1	− 3	− 2	+ 1	0	− 1	+ 1	+ 4	− 2	+ 4	− 5	− 6
85..	0	0	+ 1	− 1	+ 1	0	0	+ 3	− 1	+ 1	− 4	+ 6	+ 6
86..	+ 1	− 1	− 4	+ 3	− 4	+ 2	+ 2	− 1	− 2	+ 1	+ 5	+ 6	+ 7
87..	− 3	+ 1	− 5	+ 2	+ 3	− 1	+ 2	0	+ 1	+ 1	− 8	− 1	− 8
88..	+ 2	+ 6	− 2	0	− 3	− 3	− 7	− 3	− 1	+ 3	+ 2	− 3	−10
89..	0	+ 5	− 3	− 5	− 1	+ 2	+ 1	− 3	− 1	− 1	− 2	+ 4	− 4
90..	+ 3	0	+ 1	+ 2	− 2	0	+ 2	+ 3	− 1	− 3	+ 1	− 6	− 1
91..	+ 3	− 5	+ 4	− 1	+ 3	+ 1	0	+ 3	− 5	+ 4	− 2	+ 2	+ 7
92..	+ 2	+ 6	+ 1	− 1	+ 2	+ 1	− 2	− 1	+ 1	+ 1	− 2	+ 1	+ 8
93..	+ 1	+ 4	+ 3	0	0	0	+ 2	+ 2	+ 3	+ 1	+ 2	+ 5	+23
94..	+ 1	− 3	+ 3	0	0	− 3	0	+ 2	+ 1	− 3	+ 5	+ 3	+ 5
95..	+ 3	− 3	− 2	+ 2	+ 3	+ 3	− 1	+ 1	+ 4	+ 2	− 1	− 3	+ 8
96..	+ 5	− 5	+ 1	− 1	+ 4	− 1	− 1	+ 2	0	+ 6	− 2	− 2	+ 5
97..	+ 3	− 5	0	− 2	+ 1	− 3	0	+ 3	0	+ 3	− 1	+ 2	+ 1
98..	− 1	+ 7	− 1	− 3	+ 2	0	+ 2	+ 1	+ 1	− 5	− 6	+ 5	+ 1
1899..	− 2	0	− 1	− 1	0	− 3	− 4	+ 1	+ 2	− 2	− 1	− 6	−17
1900..	+ 2	+ 3	0	+ 1	+ 1	0	− 4	− 3	− 1	0	− 2	0	− 4
01..	+ 3	+ 3	0	0	+ 1	+ 2	+ 1	+ 1	+ 1	− 3	− 4	+ 7	+12
02..	− 3	− 5	+ 2	+ 1	− 3	− 4	− 3	+ 1	0	0	− 4	− 4	−23
03..	− 2	− 4	+ 3	+ 1	− 3	− 3	− 3	− 1	+ 3	− 1	+ 1	− 9	−18
04..	− 1	− 5	− 3	+ 3	− 2	+ 1	− 3	+ 1	+ 2	+ 3	+ 2	+ 1	− 2
05..	− 2	+ 4	+ 1	− 1	0	+ 3	+ 2	− 1	+ 2	+ 2	+ 1	− 2	+ 9
06..	+ 2	+ 6	− 1	+ 1	− 5	+ 3	+ 1	0	+ 4	+ 1	0	+ 3	+14
07..	+ 3	+ 2	+ 5	+ 2	− 1	− 5	0	− 1	0	− 2	− 2	− 2	− 1
08..	− 2	+ 7	− 1	− 2	0	0	− 1	+ 3	− 7	− 1	− 1	− 1	− 7
09..	+ 1	− 4	− 4	0	+ 1	+ 3	− 2	0	0	+ 1	+ 3	− 1	− 2
10..	+ 2	+ 5	+ 4	− 2	+ 2	+ 2	− 4	+ 1	+ 3	+ 1	+ 1	+ 3	+17
11..	+ 1	− 5	+ 2	− 3	+ 3	0	− 1	+ 1	+ 4	+ 2	+ 5	+ 3	+12
12..	− 3	0	+ 2	0	− 1	− 5	+ 2	− 3	− 1	− 3	+ 3	− 5	−15
13..	− 9	− 7	+ 3	+ 2	− 3	+ 1	− 2	− 1	− 3	+ 1	+ 6	+ 4	− 8
14..	− 5	− 4	− 2	+ 3	− 3	− 2	+ 2	+ 3	+ 3	+ 1	0	0	− 5
15..	− 1	+ 2	+ 1	+ 3	+ 1	+ 1	+ 2	− 1	+ 1	− 3	+ 2	0	+ 8
16..	− 1	+ 5	− 6	+ 1	− 6	+ 1	− 7	+ 2	− 2	0	− 1	− 2	−17
17..	0	− 4	0	+ 3	− 7	+ 2	+ 1	+ 1	− 1	+ 1	+ 1	+ 3	0
18..	+ 2	− 1	− 4	− 2	− 5	+ 1	+ 3	0	+ 4	− 3	− 2	+ 2	− 6
19..	− 1	− 3	0	0	+ 3	+ 1	+ 2	+ 1	0	− 1	+ 2	+ 4	+ 8
1920..	+ 8	− 3	− 4	− 2	0	+ 1	+ 1	− 4	0	+ 1	− 2	0	− 5
1881–1920	13·1	17·1	22·9	26·0	26·8	26·9	**27·5**	27·4	24·3	22·2	14·5	**10·4**	259·4

TABLE 39A.—DIURNAL AND ANNUAL VARIATION OF THE DURATION OF SUNSHINE PER HOUR, 1881 TO 1920.

(Unit 0·001 hour.)

Local Apparent Solar Time.	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20
January	—	—	—	—	—	15	84	153	159	165	123	30	—	—	—	—	—
February.. ..	—	—	—	—	22	119	198	243	264	262	233	163	49	1	—	—	—
March	—	—	1	49	171	260	315	339	327	340	315	292	220	88	4	—	—
April	—	4	77	198	279	362	404	408	428	430	421	408	378	313	145	11	—
May	2	61	189	262	322	375	414	444	458	453	455	440	425	403	326	142	5
June . ..	5	114	234	308	354	396	432	449	461	469	461	449	433	405	363	240	38
July	3	93	193	262	314	348	369	385	390	401	421	397	382	343	298	184	19
August	—	16	116	210	284	335	371	390	395	397	394	383	352	314	212	43	—
September ..	—	—	9	88	209	280	324	370	381	387	386	362	327	204	36	—	—
October	—	—	—	4	79	196	258	289	303	316	291	236	124	13	—	—	—
November ..	—	—	—	—	—	40	134	185	191	186	154	67	3	—	—	—	—
December ..	—	—	—	—	—	3	46	112	135	143	88	6	—	—	—	—	—

TABLE 39B.—DIURNAL AND ANNUAL VARIATION OF THE DURATION OF SUNSHINE PER HOUR.

Departure of Observed Sunshine from Calculated Sunshine (*see p.* 71).

(Unit 0·01 hour.)

Local Apparent Solar Time.	4	5	6	7	8	9	10	11	Noon	13	14	15	16	17	18	19	20
January	—	—	—	—	—	− 4	− 4	− 3	− 4	− 2	0	− 3	—	—	—	—	—
February.. ..	—	—	—	—	− 5	− 5	− 5	− 4	− 3	− 2	− 1	− 1	− 3	—	—	—	—
March	—	—	—	− 6	− 5	− 4	− 2	− 2	− 4	− 2	− 2	0	0	− 2	—	—	—
April	—	—	− 5	− 4	− 4	0	+ 1	0	+ 2	+ 2	+ 3	+ 4	+ 6	+ 7	+ 2	—	—
May	—	− 4	− 4	− 5	− 4	− 2	0	+ 2	+ 3	+ 3	+ 4	+ 4	+ 6	+ 9	+10	+ 4	—
June	− 5	− 4	− 3	− 3	− 3	− 1	+ 1	+ 1	+ 2	+ 3	+ 4	+ 4	+ 5	+ 7	+10	+ 8	− 2
July	− 4	− 3	− 6	− 6	− 6	− 6	− 5	− 5	− 4	− 3	0	− 1	+ 1	+ 2	+ 5	+ 6	− 3
August	—	− 5	− 4	− 6	− 6	− 4	− 3	− 3	− 2	− 2	− 1	0	+ 1	+ 4	+ 5	− 2	—
September ..	—	—	− 6	− 6	− 5	− 5	− 4	− 1	0	0	+ 2	+ 3	+ 6	+ 5	− 3	—	—
October	—	—	—	− 6	− 3	− 3	− 2	− 2	− 2	+ 1	+ 1	+ 1	+ 1	− 5	—	—	—
November ..	—	—	—	—	− 4	− 3	− 3	− 3	− 4	− 3	− 1	0	− 4	—	—	—	—
December ..	—	—	—	—	—	− 3	− 4	− 3	− 2	0	0	− 3	—	—	—	—	—

TABLE 40.—STATISTICS FOR SUNSHINE. FIVE-DAY NORMALS. 1881–1920

Number of Period.*	Average Daily Sunshine (Hundredths of Hours).		Percentage of Possible.	Highest Record in a Day.	Days with Sunshine.		Percentage of Days with Sunshine lasting.			Average Cloudiness, 1868–1917.
	Observed.	Departure†			Observed.	Departure†	4–8h.	8–12h.	12–16h.	
				Hours.	Per cent.					
1.. ..	56	+ 1	10	5·2	35	+ 2	4	—	—	81
2.. ..	67	+ 5	11	5·7	37	+ 1	6	—	—	78
3.. ..	72	+ 1	12	4·8	42	+ 4	6	—	—	78
4.. ..	63	−20	10	5·4	39	− 2	3	—	—	80
5.. ..	80	−16	12	6·3	47	+ 2	7	—	—	81
6.. ..	98	−14	13	6·5	53	+ 5	6	—	—	81
7.. ..	112	−17	15	6·9	53	+ 1	11	—	—	79
8.. ..	131	−16	16	6·8	56	+ 1	14	—	—	80
9.. ..	159	− 7	19	7·5	62	+ 4	19	—	—	77
10.. ..	165	−22	19	7·6	58	− 4	21	—	—	77
11.. ..	172	−35	19	8·0	63	− 2	18	1	—	77
12.. ..	179	−49	19	8·3	69	+ 1	17	1	—	79
13.. ..	210	−38	21	8·4	67	− 3	21	1	—	77
14.. ..	230	−38	22	10·3	72	− 1	24	2	—	75
15.. ..	281	− 7	26	10·2	78	+ 3	26	7	—	74
16.. ..	266	−43	24	10·0	74	− 3	25	8	—	75
17.. ..	291	−36	25	10·6	74	− 5	29	6	—	72
18.. ..	362	+16	30	11·0	80	− 1	29	14	—	71
19.. ..	393	+28	32	11·8	84	+ 2	34	14	—	72
20.. ..	416	+33	33	11·8	84	+ 1	31	17	—	71
21.. ..	372	−28	28	12·0	85	+ 1	25	16	1	76
22.. ..	431	+15	32	12·5	87	+ 2	24	20	1	76
23.. ..	472	+40	34	13·0	90	+ 3	31	21	2	74
24.. ..	475	+28	34	13·2	89	+ 2	33	18	4	75
25.. ..	412	−48	28	13·2	84	− 4	24	19	3	71
26.. ..	471	− 3	32	14·1	80	− 9	20	20	7	72
27.. ..	498	+12	33	13·8	88	− 1	27	20	6	74
28.. ..	542	+44	35	14·3	90	0	27	23	8	75
29.. ..	535	+27	34	14·8	89	− 1	27	20	9	74
30.. ..	**636**	+118	40	15·2	89	− 1	26	23	15	71
31.. ..	509	−16	32	**15·3**	85	− 5	21	20	9	73
32.. ..	586	+55	36	15·2	90	− 1	29	20	12	73
33.. ..	623	+87	38	15·2	**92**	+ 1	28	25	12	70
34.. ..	550	+13	34	15·0	90	− 1	23	20	11	71
35.. ..	518	−20	32	15·3	88	− 3	22	21	10	77
36.. ..	560	+23	34	14·6	91	0	35	23	6	72
37.. ..	527	− 6	32	14·6	89	− 2	29	15	10	75
38.. ..	426	−102	27	14·4	89	− 2	26	14	5	80
39.. ..	502	−20	31	14·7	89	− 1	25	21	7	75
40.. ..	547	+33	35	14·5	88	− 2	31	21	4	75

* For dates of Periods see Table 26. † See p. 72.

TABLE 40.—STATISTICS FOR SUNSHINE. FIVE-DAY NORMALS—*continued.*

Number of Period.*	Average Daily Sunshine (Hundredths of Hours).		Percentage of Possible.	Highest Record in a Day.	Days with Sunshine.		Percentage of Days with Sunshine lasting.			Average Cloudiness. 1868–1917.
	Observed.	Departure.			Observed.	Departure.	4–8h.	8–12h.	12–16h.	
				Hours.	Per cent.					
41.. ..	496	− 7	32	14·5	89	− 1	27	25	4	78
42.. ..	443	−51	29	13·9	88	− 1	29	18	3	77
43.. ..	469	−14	31	14·7	93	+ 4	29	17	5	75
44.. ..	416	−54	28	14·0	89	+ 1	25	17	4	78
45.. ..	448	− 8	31	14·1	93	+ 5	28	15	4	75
46.. ..	436	− 6	31	13·4	89	+ 2	38	14	1	75
47.. ..	423	− 4	31	11·9	86	0	33	18	1	74
48.. ..	375	−35	28	12·4	84	− 1	27	14	1	77
49.. ..	396	+ 2	31	11·6	86	+ 2	32	17	—	72
50.. ..	390	+13	31	12·1	85	+ 2	32	13	—	73
51.. ..	415	+56	34	11·1	84	+ 3	33	17	—	70
52.. ..	362	+21	31	10·5	85	+ 5	33	12	—	71
53.. ..	318	− 5	28	10·8	80	+ 2	26	11	—	74
54.. ..	239	−64	22	9·9	76	− 1	24	4	—	78
55.. ..	255	−29	24	9·6	79	+ 5	25	2	—	74
56.. ..	240	−24	23	9·0	71	− 1	24	5	—	78
57.. ..	227	−17	23	8·7	74	+ 4	21	3	—	75
58.. ..	226	+ 2	24	9·0	73	+ 6	23	2	—	77
59.. ..	173	−31	19	8·2	67	+ 3	16	1	—	77
60.. ..	209	+25	24	8·9	74	+13	21	1	—	74
61.. ..	157	− 6	19	7·4	63	+ 5	15	—	—	78
62.. ..	118	−26	15	6·7	54	0	10	—	—	78
63.. ..	108	−18	14	6·8	53	+ 2	7	—	—	75
64.. ..	106	− 4	15	6·6	47	− 1	9	—	—	77
65.. ..	88	− 7	13	5·6	48	+ 4	7	—	—	75
66.. ..	73	− 8	11	5·9	42	+ 1	4	—	—	82
67.. ..	73	+ 3	12	5·5	45	+ 7	4	—	—	78
68.. ..	58	− 3	10	5·7	36	+ 1	3	—	—	79
69.. ..	63	+10	11	5·1	37	+ 4	6	—	—	79
70.. ..	41	− 8	7	4·8	30	− 2	2	—	—	81
71.. ..	58	+10	10	4·9	35	+ 4	3	—	—	80
72.. ..	44	− 4	8	4·7	28	− 3	2	—	—	80
73.. ..	48	− 2	8	4·7	33	+ 1	2	—	—	83

* For dates of Periods see Table 26.

TABLE 41A.—DIURNAL AND ANNUAL VARIATION OF CLOUD AMOUNT, 1868–1917.

Occurrences (in percentages) of Four Degrees of Cloudiness (10 and haze, . . .), and Departures at 9 a.m., 2 p.m., and 9 p.m.

Cloudiness.. / Month	Occurrences. at 9 a.m., 2 p.m., 9 p.m.				Departures. 9 a.m.				2 p.m.				9 p.m.			
	10 and haze	9 to 7	6 to 4	3 to 0	10 and haze	9 to 7	6 to 4	3 to 0	10 and haze	9 to 7	6 to 4	3 to 0	10 and haze	9 to 7	6 to 4	3 to 0
January ..	59	20	9	12	0	+ 2	+ 1	− 3	− 1	+ 3	− 1	− 1	0	− 5	0	+ 4
February ..	56	21	11	12	+ 1	+ 2	− 1	− 2	− 2	+ 3	+ 3	− 4	+ 1	− 5	− 2	+ 6
March ..	50	23	14	13	+ 3	+ 1	0	− 3	− 2	+ 6	+ 1	− 5	− 1	− 7	− 2	+ 9
April ..	45	27	15	13	+ 1	+ 3	+ 1	− 5	− 3	+ 6	+ 2	− 5	+ 2	− 9	− 3	+10
May ..	41	29	15	15	+ 4	+ 2	− 1	− 5	− 4	+ 5	+ 3	− 4	+ 1	− 7	− 2	+ 8
June ..	42	27	16	15	+ 1	+ 2	− 1	− 2	− 4	+ 6	+ 1	− 3	+ 2	− 8	0	+ 6
July ..	43	29	17	11	+ 4	− 1	0	− 4	− 5	+ 8	+ 1	− 3	0	− 6	− 1	+ 7
August ..	44	28	16	12	+ 1	+ 4	− 1	− 4	− 2	+ 6	+ 2	− 6	+ 2	−10	− 1	+ 9
September ..	46	26	16	12	+ 5	− 1	0	− 5	− 4	+ 6	+ 2	− 5	− 1	− 6	− 3	+10
October ..	51	22	14	13	+ 2	0	0	− 2	− 4	+ 6	+ 3	− 5	+ 2	− 6	− 3	+ 7
November ..	56	20	12	12	+ 1	+ 1	− 1	− 1	− 2	+ 5	+ 2	− 5	+ 2	− 6	− 1	+ 5
December ..	58	21	10	11	0	+ 2	+ 1	− 3	− 2	+ 4	+ 1	− 2	+ 2	− 5	− 2	+ 5
Year ..	49	24	14	13	+ 2	+ 1	0	− 3	− 3	+ 5	+ 2	− 4	+ 1	− 7	− 2	+ 7

TABLE 41B.—DIURNAL VARIATION OF CLOUD AMOUNT IN TEN-YEAR PERIODS, 1868–1918.

Number of Days (in percentages).

	9 a.m.				2 p.m.				9 p.m.			
	10 and haze	9 to 7	6 to 4	3 to 0	10 and haze	9 to 7	6 to 4	3 to 0	10 and haze	9 to 7	6 to 4	3 to 0
1868–1877	48	26	14	12	—	—	—	—	46	20	13	21
1878–1887	54	21	14	11	49	23	17	11	54	14	10	22
1888–1897	52	23	15	10	45	29	17	9	50	15	12	23
1898–1907	50	31	11	8	46	34	13	7	52	20	11	17
1908–1913	—	—	—	—	43	36	14	7	—	—	—	—
1908–1917	51	28	14	7	—	—	—	—	49	20	14	17

TABLE 42.—PERCENTAGE OF CLEAR DAYS IN FIVE-YEAR PERIODS. SEASONAL VARIATION.

Period.	Quarters.				Year.
	I.	II.	III.	IV.	
1868–1872	8	8	12	11	10
1873–1877	14	13	11	14	13
1878–1882	14	16	12	13	14
1883–1887	10	9	7	9	9
1888–1892	7	7	5	3	6
1893–1897	10	12	7	11	10
1898–1902	5	7	4	4	5
1903–1907	4	4	4	2	3
1908–1912	3	7	5	4	5
1913–1917	4	7	6	2	5

TABLE 43.—RADIATION. SERIAL VALUES OF THE MEAN BLACK BULB TEMPERATURE FOR EACH MONTH AND YEAR, 1868–1917.

Departures from 50-year Normals (given in the penultimate line).

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year	Highest
1868 ..	− 22	+ 39	+ 83	+ 35	− 27	+ 99	+ 39	− 27	− 42	− 48	− 67	+ 8	+ 6	141·3
69 ..	+ 20	+ 29	+ 21	+ 29	−108	+ 1	+ 38	+ 16	− 70	− 82	− 56	− 13	− 14	140·1
70 ..	− 40	− 46	− 23	+ 5	−104	− 69	− 41	+ 34	− 32	− 51	− 42	− 65	− 39	130·0
71 ..	−103	− 37	+ 1	− 89	+ 37	+ 3	− 34	− 26	− 38	− 24	+ 18	+ 42	− 20	132·8
72 ..	+ 37	− 11	+ 8	+ 9	− 25	− 91	+ 1	− 32	− 42	+ 59	+ 41	+ 11	− 2	132·2
73 ..	+ 36	+ 48	− 8	+ 39	− 29	+ 5	− 25	− 62	− 36	− 83	− 18	+ 42	− 7	134·0
74 ..	+ 60	− 15	− 34	− 74	−186	−216	−248	−274	−240	−153	− 72	**−109**	−130	110·7
75 ..	− 33	−145	−206	−215	−282	−333	−246	−277	−251	−168	− 83	− 24	**−188**	106·7
76 ..	− 52	−146	−256	−302	+ 34	+ 26	+ 23	+ 20	+ 56	+ 9	− 8	0	− 49	133·8
77	+ 27	+192	+ 58	− 42	+ 17	+ 39	− 17	− 30	+ 82	+ 4	+114	+ 47	+ 41	143·2
78 ..	+ 65	+ 11	+137	+ 47	+ 41	+ 14	+ 90	+ 29	+ 47	+ 34	+ 94	− 6	+ 51	140·4
79 ..	− 9	− 48	− 7	− 36	+ 35	+ 2	− 38	+ 47	+ 19	+ 53	+101	− 1	+ 10	134·2
80 ..	+ 9	+153	+ 77	+102	+104	+ 62	+ 46	+ 63	+ 82	+129	+ 23	+ 42	+ 75	140·1
81 ..	− 61	− 16	− 6	+ 60	+ 95	+ 50	+ 3	+ 6	− 16	+ 61	+ 76	+ 66	+ 27	139·4
82 ..	+ 74	+100	+106	+ 18	+106	+ 73	+ 66	+ 86	+ 7	+ 18	− 5	− 7	+ 54	140·0
83 ..	+ 43	+115	+ 91	+ 30	+ 38	+ 50	+ 74	+ 37	+ 84	+117	+ 79	+ 54	**+ 68**	135·8
84 ..	+ 58	+ 35	− 22	− 10	+ 31	+ 27	− 13	+ 37	+ 39	− 35	− 42	− 22	+ 7	136·6
85 ..	− 35	+ 30	+ 21	+ 43	− 23	+ 40	+ 41	+ 14	+ 22	+ 51	− 18	+ 19	+ 18	142·5
86 ..	+ 10	− 57	− 63	+ 25	− 87	− 6	+ 42	− 27	− 11	+ 34	+ 57	+ 5	− 6	131·1
87 ..	− 8	+ 21	− 27	+ 35	+ 62	+ 34	+ 77	+ 60	+ 64	+ 91	− 30	+ 2	+ 32	137·2

TABLE 43.—RADIATION. SERIAL VALUES OF THE MEAN BLACK BULB TEMPERATURE FOR EACH MONTH AND YEAR 1868–1917—*continued.*

Departures from 50-year Normals.

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Highest
1888 ..	+ 17	+ 43	− 9	− 13	+ 3	− 10	− 82	− 10	− 28	+ 73	+ 9	+ 20	+ 2	138·0
89 ..	+ 4	+ 70	− 17	− 13	+ 7	+ 47	+ 36	− 43	+ 29	+ 1	+ 10	+ 23	+ 13	132·0
90 ..	+ 79	− 32	+ 79	+ 61	+ 32	− 27	+ 42	+ 54	+ 37	+ 23	0	− 65	+ 24	131·3
91 ..	− 1	+ 17	+ 3	− 46	+ 27	+ 45	+ 83	+ 22	+ 18	+ 87	− 38	+ 25	+ 21	135·0
92 ..	− 6	+ 28	+ 19	+ 31	+ 50	+ 25	+ 5	+ 18	+ 7	+ 18	− 24	− 21	+ 13	134·0
93 ..	+ 15	+ 34	+ 65	+ 45	+ 55	+ 78	+ 83	+ 99	+ 56	+ 8	− 52	+ 14	+ 42	142·6
94 ..	− 23	− 37	+117	+ 47	+ 65	0	+ 19	+ 41	− 43	− 45	+ 32	+ 39	+ 18	136·8
95 ..	− 48	− 78	− 34	+ 49	+124	**+127**	+ 8	+ 65	+ 88	− 71	− 38	− 50	+ 12	142·4
96 ..	− 5	− 12	+ 91	+115	+176	+ 45	− 5	+124	− 14	− 3	− 40	− 29	+ 37	142·6
97 ..	− 6	− 31	+ 46	+ 79	+ 98	− 33	+ 92	+ 84	+ 52	+ 63	+ 12	+ 2	+ 39	142·5
98 ..	+ 39	+ 83	− 7	− 27	+ 48	+ 74	+ 30	+ 28	+ 41	− 44	− 46	+ 42	+ 22	140·9
1899 ..	− 19	− 36	+ 9	− 23	− 63	+ 46	+ 19	+ 48	+ 7	− 7	+ 10	− 60	− 5	143·4
1900 ..	+ 19	− 18	− 49	+ 33	+ 65	+ 68	+ 41	− 92	− 30	− 32	− 35	+ 2	− 2	143·2
01 ..	− 33	+ 5	− 15	+ 53	+ 76	+ 9	+ 45	+ 5	0	− 6	− 16	+ 22	+ 13	135·0
02 ..	− 25	− 85	+ 16	− 6	+ 1	− 79	− 28	+ 17	− 5	+ 27	− 19	− 5	− 15	130·2
03 ..	− 51	− 26	+ 8	+ 13	− 45	− 1	− 27	+ 9	+ 39	− 12	+ 6	− 47	− 11	135·2
04 ..	− 5	− 90	− 80	+ 5	− 62	+ 34	− 37	+ 29	+ 19	+ 30	− 29	− 25	− 17	131·2
05 ..	− 4	+ 17	+ 29	− 32	+ 33	+ 87	+ 86	+ 13	+ 49	+ 11	− 52	+ 1	+ 20	137·4
06 ..	+ 25	+ 11	− 31	+ 11	−107	+ 69	+ 16	+ 4	+ 77	− 10	+ 8	− 38	+ 3	136·8
1907 ..	− 26	− 36	+ 54	+ 15	− 28	−132	+ 64	− 18	+ 46	− 29	− 31	− 12	− 10	141·5
1908 ..	− 27	+ 59	− 61	− 21	+ 35	+ 22	+ 20	+ 84	− 43	+ 12	− 9	− 12	+ 5	144·2
09 ..	− 5	− 41	−105	− 20	+ 18	+ 18	− 31	+ 8	− 36	+ 4	− 44	− 47	− 23	134·7
10 ..	+ 1	+ 18	+ 48	− 37	+ 28	+ 51	− 45	− 61	+ 10	− 13	− 76	+ 31	− 3	135·0
11 ..	− 2	− 62	− 27	− 19	+ 73	+ 13	+ 10	+ 17	+ 60	− 74	− 35	− 7	− 4	135·8
12 ..	− 32	− 17	+ 54	+ 18	− 18	−135	− 39	−118	− 61	− 17	+ 12	+ 25	− 27	121·1
13 ..	− 25	− 34	+ 8	− 31	− 88	− 53	− 46	− 42	− 82	+ 25	+ 73	+ 40	− 21	125·9
14 ..	− 19	+ 2	− 20	+ 56	− 69	− 46	− 59	− 28	− 8	+ 6	+ 9	+ 13	− 13	124·5
15 ..	+ 8	+ 28	+ 28	+ 15	− 22	− 54	− 23	− 58	+ 18	− 35	− 14	− 4	− 9	125·0
16 ..	+ 75	+ 32	− 77	− 26	−119	− 38	−130	− 6	− 15	− 18	+ 20	− 3	− 25	129·3
1917 ..	− 3	− 49	− 30	− 43	−137	− 53	− 3	+ 2	− 15	− 5	+ 48	+ 18	− 22	127·0
1868–1917..	50·9	62·4	76·7	92·7	103·4	110·9	**112·3**	107·7	95·1	76·7	58·1	**48·5**	82·9	144·2
Highest ..	87·3	115·3	125·4	134·1	139·8	143·4	144·2	143·2	134·9	119·9	106·4	80·8	144·2	

TABLE 44.—RADIATION. SERIAL VALUES OF THE MEAN GRASS MINIMUM TEMPERATURE FOR EACH MONTH AND YEAR, 1868–1917.

Departures from 50-year Normals (given in the penultimate line).

(Unit 0·1 degree Fahr.).

	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Absolute Minimum.
1868 ..	− 35	+ 20	+ 16	+ 5	+ 18	+ 7	+ 14	+ 35	+ 33	− 22	− 22	+ 35	+ 9	16·3
69 ..	+ 46	+ 49	− 32	+ 25	− 26	− 14	+ 23	− 23	+ 35	+ 25	− 21	− 74	+ 1	4·7
70 ..	− 6	− 41	− 19	+ 29	+ 18	+ 29	+ 42	− 10	− 5	+ 9	− 41	− 67	− 5	5·0
71 ..	− 46	+ 50	+ 19	+ 7	+ 4	+ 3	+ 3	+ 9	+ 3	+ 9	− 32	+ 5	+ 3	11·0
72 ..	+ 18	+ 29	+ 31	+ 10	− 12	+ 9	+ 19	+ 22	+ 14	− 5	− 12	+ 1	+ 10	14·0
73 ..	+ 21	− 54	+ 11	+ 5	− 15	+ 6	+ 1	− 11	− 21	− 22	− 3	+ 50	− 3	10·0
74 ..	+ 26	− 7	+ 36	+ 24	− 29	− 44	− 24	− 36	− 52	− 32	− 8	−110	− 21	5·5
75 ..	+ 1	− 31	− 9	− 21	+ 36	− 8	− 13	+ 13	+ 1	+ 4	− 56	− 15	− 8	8·9
76 ..	− 22	− 45	− 37	− 6	− 1	− 22	− 50	− 49	− 25	+ 35	− 43	+ 9	− 21	13·1
77 ..	− 26	− 5	− 20	− 18	− 35	+ 3	+ 5	..	− 38	+ 12	+ 16	+ 13	− 17	7·8
78 ..	− 1	+ 41	− 12	+ 29	+ 15	+ 1	+ 11	+ 24	+ 25	+ 50	− 44	−113	+ 2	5·8
79 ..	− 97	− 33	− 18	− 21	− 40	+ 1	+ 9	+ 14	− 17	− 32	− 28	− 41	− 25	8·0
80 ..	− 7	+ 49	+ 6	+ 9	− 8	− 15	0	+ 34	+ 15	− 65	− 41	− 1	− 2	5·0
81 ..	**−124**	− 20	− 14	− 22	+ 2	− 24	+ 4	− 32	+ 7	− 29	+ 47	0	− 17	−4·0
82 ..	+ 49	+ 53	+ 39	+ 3	− 13	− 7	− 5	− 10	− 30	+ 22	− 20	− 34	+ 4	10·0
83 ..	+ 23	+ 32	− 40	+ 2	− 21	− 12	− 20	− 32	+ 8	− 1	+ 1	+ 24	− 3	13·4
84 ..	+ 52	+ 23	+ 35	+ 2	− 10	− 19	+ 8	− 5	+ 18	+ 7	− 28	− 11	+ 6	14·2
85 ..	− 19	+ 7	− 30	0	− 22	− 18	− 23	− 43	− 18	− 39	+ 3	− 2	− 17	9·8
86 ..	− 44	− 23	− 22	− 11	+ 4	− 13	− 9	− 11	+ 6	+ 59	+ 30	− 53	− 7	7·5
87 ..	+ 22	+ 16	− 2	− 26	− 7	− 2	+ 13	− 19	− 25	− 52	− 12	− 35	− 11	12·9
88 ..	+ 17	− 18	− 35	− 23	− 8	− 25	− 14	− 12	− 19	+ 7	+ 36	+ 34	− 5	10·5
89 ..	+ 15	− 24	− 4	+ 7	+ 47	+ 8	− 21	+ 1	− 11	− 19	+ 27	+ 12	+ 3	15·2
90 ..	+ 38	− 16	+ 18	− 19	+ 27	− 6	− 24	− 17	+ 41	+ 4	− 38	− 31	− 2	10·4
91 ..	− 28	0	− 40	− 32	− 46	+ 6	− 15	− 1	+ 23	− 8	− 2	+ 16	− 11	9·8
92 ..	− 12	− 11	− 47	− 32	− 3	− 28	− 14	0	− 24	− 50	+ 13	− 39	− 21	4·8
93 ..	− 13	+ 11	+ 12	+ 14	+ 54	+ 22	+ 7	+ 15	− 21	− 9	− 32	+ 38	+ 8	5·9
94 ..	− 7	+ 14	+ 9	+ 36	− 46	− 19	− 5	− 18	− 51	− 29	+ 50	+ 30	− 3	6·1
95 ..	− 80	−113	+ 24	+ 28	+ 3	− 11	− 18	+ 32	+ 20	− 69	+ 2	− 7	− 16	0·4
96 ..	+ 10	+ 25	− 14	− 8	− 3	+ 37	− 14	− 30	+ 5	− 71	− 9	− 25	− 8	14·3
97 ..	− 53	+ 16	+ 5	− 45	− 32	+ 24	− 2	+ 15	− 42	+ 8	+ 63	+ 5	− 3	12·9
98 ..	+ 65	+ 4	+ 3	+ 42	− 21	+ 5	− 14	+ 8	+ 28	+ 47	+ 2	+ 48	+ 18	12·6
1899 ..	− 23	− 12	0	− 1	− 16	+ 6	+ 35	+ 19	− 20	+ 7	+ 78	− 11	+ 5	12·0
1900 ..	+ 21	− 62	− 33	+ 9	+ 1	+ 23	+ 34	− 1	− 19	− 21	+ 13	+ 61	+ 2	5·8
01 ..	− 3	− 52	− 12	− 15	+ 1	− 2	+ **46**	+ 11	+ 40	− 1	− 7	− 14	− 1	12·3
02 ..	− 5	− 39	+ 22	− 16	− 42	+ 15	− 21	− 19	+ 12	− 2	+ 25	+ 22	− 4	8·0
03 ..	− 10	+ 49	+ 18	− 45	+ 4	+ 3	0	− 8	− 1	+ 32	+ 14	− 3	+ 4	10·6
04 ..	+ 19	− 8	− 10	+ 17	+ 1	+ 10	+ 21	− 5	− 8	+ 14	− 3	+ 11	+ 5	14·9
05 ..	+ 23	+ 3	+ 19	− 19	+ 8	+ 13	+ 20	− 16	− 12	− 52	+ 3	+ 70	+ 5	18·0
06 ..	+ 30	− 42	− 16	− 43	+ 8	+ 16	− 24	+ 23	− 2	+ 37	+ 46	− 2	+ 3	11·6
07 ..	+ 6	− 24	+ 18	+ 2	+ 6	− 20	− 6	− 23	+ 8	+ 24	− 11	+ 19	0	12·9
08 ..	− 9	+ 20	− 5	− 40	+ 30	+ 16	+ 12	− 4	+ 38	+ 80	+ 33	+ 20	+ 16	11·6
09 ..	+ 29	+ 16	− 10	+ 16	+ 18	− 1	+ 2	+ 5	− 18	+ 9	− 50	− 13	0	10·9
10 ..	− 8	+ 15	+ 36	+ 8	+ 33	+ 10	+ 3	+ 44	+ 16	+ 57	− 53	+ 59	+ 18	6·7
11 ..	+ 38	+ 24	+ 25	+ 16	+ 35	− 4	+ 29	+ 32	− 2	− 6	0	+ 41	+ 19	15·0
12 ..	+ 23	+ 36	+ 67	+ 54	+ 20	+ 38	+ 14	− 17	− 24	+ 2	+ 24	+ 50	+ 24	10·4
13 ..	+ 26	+ 34	+ 25	+ 9	+ 23	+ 14	− 9	− 13	+ 34	+ 58	+ 55	+ 31	+ 24	17·5
14 ..	+ 19	+ 49	+ 6	+ 18	+ 20	+ 11	+ 4	+ 22	+ 18	+ 35	+ 18	+ 8	+ 19	17·3
15 ..	− 3	+ 6	+ 7	+ 23	− 9	+ 9	− 14	+ 16	+ 9	− 7	− 84	+ 11	− 3	9·8
16 ..	+ 68	− 1	− 5	+ 28	+ 5	− 25	+ 14	+ 20	+ 4	+ 17	+ 40	− 1	+ 14	18·5
17 ..	+ 5	− 17	− 15	− 24	+ 29	− 6	− 9	+ 35	+ 34	− 22	+ 64	− 17	+ 5	13·2
1868–1917	29·7	30·2	30·4	33·1	37·3	42·8	**46·0**	45·2	41·0	35·3	31·5	**29·4**	36·0	−4·0
Lowest ..	−4·0	0·4	9·8	11·6	18·2	25·0	29·4	27·5	20·1	11·0	8·2*	4·7	−4·0	

* 6·3 in 1919.

TABLE 45.—FIVE-DAY NORMALS OF MAXIMUM AND MINIMUM RADIATION TEMPERATURES, 1868–1917.

Number of Period.*	Maximum Temperature in Sun.			Minimum Temperature on Grass.			Number of Period.*	Maximum Temperature in Sun.			Minimum Temperature on Grass.		
	Normal.	Extremes.		Normal.	Extremes.			Normal.	Extremes.		Normal.	Extremes.	
1	49·4	74·8	27·0	30·6	47·5	5·9	38	110·5	142·4	58·3	45·6	56·2	29·4
2	49·4	78·6	20·8	29·6	47·0	6·1	39	113·3	140·8	63·0	46·0	57·7	31·7
3	49·2	74·7	24·7	29·5	45·1	3·0	40	112·4	143·2	61·6	46·5	59·0	32·0
4	50·6	84·2	25·2	30·4	44·7	**−4·0**	41	113·3	140·9	66·5	**46·6**	**59·5**	32·0
5	52·1	87·3	29·9	**28·4**	46·3	2·0	42	111·7	142·5	64·0	45·7	57·0	29·9
6	54·2	84·6	**15·7**	29·9	48·5	6·7	43	112·4	140·2	66·5	45·8	59·0	30·8
7	56·1	83·7	25·0	30·5	48·2	9·6	44	109·5	143·2	58·4	46·4	58·6	29·2
8	58·7	96·9	20·0	30·5	47·1	2·8	45	108·1	139·2	58·6	46·2	58·5	25·2
9	61·6	96·1	34·9	29·3	45·8	0·4	46	108·5	142·4	59·0	45·8	59·1	31·3
10	64·2	115·3	28·5	30·6	46·0	4·8	47	106·2	140·0	60·0	44·5	57·1	29·9
11	66·3	110·2	37·0	30·2	47·8	10·0	48	103·9	138·6	55·4	44·4	55·7	30·0
12	66·6	102·2	33·0	30·3	45·2	7·8	49	103·0	132·2	49·0	42·3	55·6	27·5
13	71·3	108·9	38·3	30·7	46·3	12·2	50	101·9	134·9	57·6	43·3	58·1	27·7
14	73·6	114·3	36·6	30·3	46·9	9·8	51	99·4	127·0	60·2	40·9	59·0	25·5
15	76·0	114·0	36·7	29·9	47·0	10·5	52	95·6	132·5	57·7	40·5	57·3	23·8
16	77·8	116·9	39·0	31·0	47·0	11·9	53	92·2	130·9	51·1	39·8	55·1	21·9
17	80·5	118·2	35·8	30·3	46·3	12·0	54	89·5	126·3	53·9	40·6	56·3	20·1
18	83·7	125·4	33·2	30·3	43·9	12·3	55	86·6	119·0	53·0	38·9	58·3	21·3
19	88·5	118·3	46·4	31·4	48·0	14·1	56	82·6	119·9	49·4	37·8	54·6	20·2
20	90·4	125·7	47·8	31·9	47·2	18·8	57	81·3	112·9	46·0	36·2	54·3	17·7
21	90·3	118·0	41·1	32·7	47·3	15·9	58	77·6	116·4	44·3	35·4	53·0	15·8
22	93·7	128·3	47·0	33·7	46·4	15·1	59	74·1	108·2	41·1	35·0	52·5	11·0
23	95·9	130·1	49·9	34·4	49·2	11·3	60	70·7	110·8	32·5	32·9	54·7	13·7
24	97·4	134·1	49·0	34·2	46·9	21·0	61	67·3	102·8	37·1	33·2	52·7	15·0
25	98·0	128·8	50·4	34·7	48·9	18·2	62	64·6	106·4	40·1	34·6	48·0	11·2
26	99·1	130·0	48·6	36·3	50·9	20·7	63	61·4	93·9	30·1	31·8	52·3	9·0
27	102·2	136·8	50·6	36·8	51·0	21·4	64	58·3	94·2	23·3	30·5	49·1	10·2
28	104·7	136·8	55·1	36·9	54·4	21·1	65	54·7	92·4	24·3	30·1	49·8	8·2
29	106·5	136·8	52·7	39·0	51·1	21·1	66	53·1	94·7	31·0	31·1	51·0	10·4
30	108·8	139·8	52·9	39·6	53·1	25·8	67	52·0	87·3	26·4	30·2	51·2	10·4
31	106·9	136·8	53·9	40·9	53·4	27·7	68	50·0	75·1	23·0	32·0	48·3	8·0
32	109·7	143·1	55·9	41·8	54·3	26·3	69	48·8	74·1	27·0	28·6	46·4	8·9
33	111·4	136·3	68·0	41·4	55·3	26·0	70	48·1	74·8	29·0	30·0	47·2	8·0
34	111·5	138·9	64·3	42·5	55·8	27·8	71	48·3	75·0	23·2	30·2	47·4	5·0
35	110·7	142·0	59·2	44·5	57·0	28·7	72	47·4	73·0	21·9	28·6	47·4	5·5
36	113·3	**152·1**	63·2	44·8	58·2	25·0	73	**47·0**	74·2	23·3	29·0	46·0	4·7
37	**113·4**	144·2	63·8	45·7	56·5	29·0							

* For Dates of Periods, see Table 26.

TABLE 46.—FREQUENCY OF NIGHTS WITH GROUND FROST, 1868–1917.

	Percentage of Days with Minimum on Grass less than				
	5°	10°	20°	25°	32°
January	0·5	1·4	12·5	24·5	60·2
February	0·4	0·8	8·4	22·2	57·2
March	—	0·1	6·0	21·3	57·9
April	—	—	2·0	10·9	42·1
May	—	—	0·1	3·0	21·0
June	—	—	—	—	0·5
July	—	—	—	—	0·5
August	—	—	—	—	1·5
September	—	—	—	0·7	11·9
October	—	—	3·2	10·6	35·2
November	—	0·2	9·2	21·1	51·7
December	0·1	1·4	13·7	28·3	60·9
Whole Year	0·1	0·3	4·6	11·8	33·63

TABLE 47.—RADIATION AT NIGHT, 1868–1917.

Number of Days, in Percentage, on which the Difference of the Minimum Temperatures in Screen and on Grass exceeded 10°.

(A)

Difference.	10°·0 to 10°·9	11°·0 to 11°·9	12°·0 to 12°·9	13°·0 to 13°·9	14°·0 to 14°·9	15° to 20°	20° to 25°	10° to 25°
Percentage of days.	5·1	3·4	1·8	0·87	0·38	0·35	0·12	12·0

(B) Annual Curve.

Difference. \ Month.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
> 10°	6·6	4·8	6·9	11·0	14·3	13·5	10·0	11·6	18·3	19·5	16·3	10·6	12·0

(C) Secular Variations.

Difference. \ Period.	1868 to 1872	1873 to 1877	1878 to 1882	1883 to 1887	1888 to 1892	1893 to 1897	1898 to 1902	1903 to 1907	1908 to 1912	1913 to 1917	1868 to 1917
10°·0 to 12°·0	3·5	11·3	9·5	9·0	10·8	11·6	8·9	7·3	6·2	7·1	8·5
12°·0 to 15°·0	1·3	7·2	4·1	3·1	2·9	4·8	1·7	1·4	1·4	2·5	3·0
> 15°	0·4	2·0	0·6	0·6	0·3	0·2	0·2	0·2	0·3	0·1	0·5
> 10°	5·2	20·4	14·2	12·7	14·0	16·6	10·9	8·9	7·8	9·7	12·0

TABLE 48.—TRANSPARENCY OF THE ATMOSPHERE, 1880·3–1913·3.

Number of Days, in Percentage, on which during Mid-day Sunshine the Coefficient (p) of Transmission of the Atmosphere had the Undernoted Values. (*See p.* 76)

(A) Annual Variation.

p	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
	In percentage of Days.												
More than 0·80 ..	0·2	0·2	0·2	0·4	0·5	0·1	0·1	0·5	0·1	0·2	0·2	0·4	0·3
0·79–0·70	10	10	8	9	11	9	11	12	12	12	7	9	10
0·69–0·60	16	26	33	35	39	38	38	35	30	29	20	13	29
0·59–0·50	6	13	17	22	20	22	18	19	18	15	11	4	15
Sunshine, but none at noon.	11	12	17	20	18	21	21	23	21	16	10	7	16
No sunshine ..	57	39	25	14	11	10	12	11	19	28	52	67	29
	In percentage of "Days with Sunshine."												
0·69–0·60	38	43	44	41	43	42	43	41	38	41	42	38	41
0·59–0·50	14	22	23	25	23	24	21	21	22	21	23	11	22

(B) Secular Variations.

p	Nov. to Jan.			Feb. to Apr.			May to July.			Aug. to Oct.			Year.		
	More than 0·70	0·69 to 0·60	0·59 to 0·50	More than 0·70	0·69 to 0·60	0·59 to 0·50	More than 0·70	0·69 to 0·60	0·59 to 0·50	More than 0·70	0·69 to 0·60	0·59 to 0·50	More than 0·70	0·69 to 0·60	0·59 to 0·50
1880–1883.. ..	25	8	4	22	28	12	15	46	17	24	32	8	22	29	10
1884–1887.. ..	12	18	6	8	35	18	4	41	29	14	38	13	10	33	17
1888–1891.. ..	13	19	5	10	34	15	6	37	30	9	37	20	9	32	18
1892–1895.. ..	6	21	12	8	36	21	16	39	18	15	33	19	11	32	18
1896–1899.. ..	7	18	9	15	26	15	20	38	8	17	27	18	15	27	12
1900–1903.. ..	4	11	4	6	28	16	10	38	13	3	36	18	6	28	13
1904–1907.. ..	2	14	6	4	35	21	8	37	13	11	29	16	6	29	14
1908–1912.. ..	5	18	7	2	31	22	5	30	30	6	24	24	4	26	21

TABLE 49.—VISIBILITY, OCTOBER, 1899–SEPTEMBER, 1919.

Number of Observations, in percentage, when the Several Grades of Transparency Occurred. (*See p.*77)

(A) Diurnal Variation.

Departures from Mean Values.

Grade.	October to March.				April to September.			
	All Observations.	9 a.m.	2 p.m.	Sunset.	All Observations.	9 a.m.	2 p.m.	Sunset.
1	0·5	−0·3	+0·8	−0·4	2·7	−1·1	+1·9	−0·9
2	8	−2	+5	−4	18	−1	+5	−3
3	18	−3	+4	−1	30	−4	+3	+1
4	11	−1	0	+2	13	−2	−1	+3
5	43	−2	−1	+3	32	+4	−6	+2
6	10	+2	−5	+3	2	+2	−2	0
7	9	+6	−4	−3	2	+3	−2	−1
8—Fog	0·8	+0·5	−0·3	−0·3	0·0	+0·1	0·0	0·0
	100				100			

(B) Annual Variation.

Grade.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
1	0·1	0·1	1·8	2·1	2·7	3·3	4·3	2·1	1·7	0·9	0·4	—	1·6
2	5	7	14	18	13	22	22	15	14	10	6	5	13
3	17	19	22	28	30	31	31	35	27	19	17	13	24
4	11	10	10	12	16	14	15	13	11	12	12	9	12
5	46	45	41	33	35	29	26	32	38	42	40	47	38
6	12	11	6	4	2	0·4	1	2	4	8	9	11	6
7	9	7	5	3	1	0·2	0·3	1	5	8	13	14	5
8—Fog	0·3	0·5	—	0·1	—	—	—	—	0·1	0·1	2·6	1·2	0·4

(C) Secular Variations.

Departures from Mean Values, 1899–1919.

Grade.	1899 to 1903	1903 to 1907	1907 to 1911	1911 to 1915	1915 to 1919	1899 to 1919
						Per cent.
1	+1·1	−0·6	−0·1	−0·8	+0·4	1·6
2	−1·0	0·0	+0·3	−1·2	+1·9	12·8
3	−1·0	+3·3	+0·4	−3·0	+0·1	24·2
4	+1·8	−2·4	−5·7	+4·0	+2·3	12·2
5	−2·0	+0·9	+5·6	+2·0	−6·7	37·8
6	+0·3	−2·6	−1·8	+0·4	+3·6	5·9
7	+1·2	+1·2	+0·6	−1·3	−1·8	5·3
8—Fog ..	−0·2	−0·2	+0·4	−0·2	0·0	0·4

TABLE 50.—SERIAL VALUES OF THE MEAN VELOCITY OF THE WIND FOR EACH MONTH AND YEAR, 1868–1917.

Departures (Miles per Hour) from 50-year Normals for the Months (given in the penultimate line).

—	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.	Highest.
1868 ..	+5·3	+10·5	+4·1	+2·8	+2·8	+5·2	+1·1	+4·6	+1·6	+2·1	−0·2	+1·8	**+3·3**	69
69 ..	+1·4	+4·1	+0·1	+1·0	+2·7	−0·1	+2·0	+0·1	+5·1	+1·5	+2·7	+1·6	+1·9	53
70 ..	−2·6	+2·8	−1·0	+3·3	+3·0	+1·8	+0·7	−0·2	+0·7	+2·3	−2·3	−0·9	+0·6	47
71 ..	−1·2	+3·1	+2·3	+0·7	−1·1	0·0	+0·9	+0·8	0·0	+0·8	−1·4	+1·0	+0·5	53
72 ..	+2·3	+2·2	+1·5	+3·9	−0·6	−0·9	+0·3	−0·3	+1·7	+1·8	+3·7	+0·5	+1·3	60
73 ..	+3·2	−1·7	+0·3	+1·2	−0·1	+1·8	+0·6	+2·9	+1·5	+1·4	+3·4	+5·9	+1·7	52
74 ..	**+6·0**	−0·8	+4·3	+1·8	−0·4	+0·6	+0·8	+2·1	+3·7	+3·8	+0·3	−1·7	+1·7	63
75 ..	+0·8	−0·5	+1·1	−1·8	+2·5	+1·4	+0·4	+1·1	+1·0	+3·1	0·0	+1·3	+0·9	44
76 ..	−0·2	−0·1	+3·4	+0·4	−0·3	+2·0	+2·6	+2·5	−1·3	+0·9	−1·3	+4·1	+1·1	50
77 ..	+2·2	+3·6	+0·6	+2·5	+2·7	+3·4	+3·4	+0·9	−0·6	+2·4	+2·8	+1·6	+2·1	47
78 ..	−1·4	−0·4	+1·0	+1·0	+1·6	−0·9	0·0	+0·6	+2·4	+1·5	−3·1	−4·4	−0·2	48
79 ..	−4·0	−1·8	+3·3	−0·7	−1·2	0·0	+1·4	+1·0	+1·7	−1·2	−0·7	−1·7	−0·3	58
80 ..	−1·7	+2·9	−0·6	+0·1	+1·6	+0·6	−0·5	−1·6	−0·9	−1·4	+1·5	+1·1	+0·1	53
81 ..	−5·0	−2·2	+1·3	+1·3	+0·5	+1·1	+1·9	+1·0	−2·3	+1·8	+4·3	+0·1	+0·3	56
82 ..	+2·3	+2·6	+4·2	+1·8	−0·4	0·0	−0·5	+0·4	−2·3	−1·7	−0·5	−1·9	+0·3	62
83 ..	+0·6	+3·7	−0·5	+0·3	+1·2	−0·5	−0·8	+1·5	+0·8	+0·6	+0·7	+1·3	+0·7	50
84 ..	+4·8	+3·4	−0·7	−3·0	+1·0	−1·7	−1·3	−1·3	+0·6	+1·5	−0·3	+0·7	+0·3	50
85 ..	−1·2	+1·0	−0·4	+0·1	−0·4	−0·5	−0·7	−1·1	+1·3	+0·3	−0·1	+1·3	0·0	47
86 ..	+0·7	−4·1	−0·9	+1·7	+0·4	+0·7	+0·6	0·0	+0·7	−0·6	−0·8	−1·8	−0·3	44
87 ..	+0·5	−1·2	−3·4	−1·5	−0·7	−0·2	+1·4	−1·5	−1·8	−1·1	−0·3	−1·7	−1·0	47
88 ..	−1·7	−1·8	−1·1	−0·4	+1·9	+1·8	−0·8	−0·4	−2·4	+0·1	+6·5	−1·2	0·0	50
89 ..	−0·9	+0·2	−1·0	+1·6	−1·1	−1·7	−1·1	−0·6	−0·7	−1·3	−1·9	−0·8	−0·8	40
90 ..	+4·2	−3·3	+1·6	−1·1	+0·4	+0·9	+0·6	−0·3	+1·0	+1·2	−1·4	−2·9	+0·1	50
91 ..	−1·7	−3·0	+0·7	−0·7	−1·4	+1·9	−0·2	+0·2	+2·3	+0·4	−2·2	+0·5	−0·3	48
92 ..	+0·5	−0·8	−3·1	−1·3	+0·7	−0·5	+0·9	+1·5	+2·8	−1·5	−0·8	−2·4	−0·3	40
93 ..	−1·0	0·0	+0·1	−1·6	−0·7	−1·7	+0·4	−0·6	+0·5	+0·8	+0·9	+3·2	0·0	45
94 ..	+2·8	+3·9	−0·3	−0·2	+0·5	−0·9	−0·4	−0·1	**−3·6**	−3·0	+1·3	+0·4	0·0	59
95 ..	−2·8	−4·5	−1·1	−0·4	−1·7	−1·8	−0·1	−0·9	−0·6	−1·7	+0·6	+2·6	−1·0	50
96 ..	−1·5	−1·3	−0·1	0·0	−2·0	+0·2	−0·5	−0·1	+0·9	−0·7	−1·3	−1·7	−0·7	45
97 ..	−2·5	+0·3	+1·0	−0·3	+1·3	−0·1	+1·5	−0·2	−0·6	−0·7	+0·1	−0·3	0·0	43
98 ..	+0·6	+2·9	−0·7	−0·5	−0·1	−0·7	−0·1	+1·4	−0·4	+1·2	−0·9	+5·3	+0·7	49
1899 ..	−3·2	−2·7	+0·1	−0·9	−1·4	−1·5	0·0	−1·5	+1·2	−0·4	+4·2	−2·5	−0·7	41
1900 ..	+0·3	−2·6	−3·7	0·0	+0·1	−1·5	−0·3	−1·3	−0·2	−0·8	−2·1	+3·9	−0·7	55
01 ..	−0·2	−5·3	−1·1	−0·8	−2·3	+0·8	−1·4	+0·4	+0·8	−1·0	−0·8	+0·3	−0·9	40
02 ..	+0·4	−3·2	−0·9	−1·5	−0·5	−1·0	−0·3	−1·2	−1·0	−0·1	−0·3	+2·8	−0·6	45
03 ..	+1·3	+5·5	+2·8	−0·3	−0·6	−1·4	−0·3	+2·0	+0·3	+0·3	−0·5	−2·9	+0·5	42
04 ..	−0·5	−2·9	−2·6	+3·9	+0·1	+1·0	+0·8	−0·8	−0·7	−0·3	−1·0	−1·6	−0·4	53
05 ..	+2·1	+1·3	−1·0	−1·1	−1·3	+1·2	−0·2	+0·1	+1·1	−2·1	−1·4	+1·7	0·0	41
06 ..	+1·7	−0·4	+0·1	−2·3	−0·7	−1·4	+0·4	−1·1	−2·4	0·0	+0·5	−1·2	−0·6	40
07 ..	−0·5	−0·4	−0·4	−0·2	+1·0	+0·6	−1·5	+1·8	−1·7	−1·5	−2·1	−0·7	−0·5	42
08 ..	−0·1	+1·6	−1·9	−1·9	−0·4	+0·1	−1·0	+0·1	+0·1	−2·2	−0·3	−2·3	−0·7	42
09 ..	−0·2	−3·1	−2·1	−1·9	−0·5	−2·1	+1·4	−0·1	−2·1	+0·4	−3·0	−2·1	−1·3	41
10 ..	+0·2	−0·6	−1·7	+0·1	+1·3	−0·1	−1·2	−0·7	−2·4	−0·2	−4·1	+0·6	−0·7	40
11 ..	−0·7	−0·3	+0·6	+0·3	−0·5	+0·4	0·0	0·0	−0·8	−1·9	+1·7	−1·1	−0·2	57
12 ..	−3·2	−1·4	−1·3	−1·0	−1·5	−1·2	−1·0	−1·0	−0·1	−1·0	−0·6	+2·8	−0·9	52
13 ..	−1·8	−2·2	+1·4	−1·6	−0·4	0·0	−2·5	−2·8	−1·2	+0·3	+2·2	0·0	−0·7	40
14 ..	−2·0	+1·0	−1·8	−0·1	−1·5	−0·3	−1·2	−1·6	−0·4	−3·4	−0·3	+0·7	−0·9	46
15 ..	−3·0	−0·3	−2·1	+0·4	−1·9	−1·7	−0·9	−2·3	−2·1	−3·3	−4·2	−2·0	**−1·9**	41
16 ..	+4·2	+0·3	−0·5	−1·2	−2·4	−1·0	−2·6	−2·2	−0·5	+0·7	+1·6	−3·1	−0·6	46
1917 ..	−1·6	−5·5	−1·2	−0·9	−0·1	−0·5	−2·1	−0·6	+1·6	+0·4	+2·2	−2·2	−0·9	47
1868–1917	12·8	12·5	12·8	12·0	11·3	10·6	10·2	10·1	10·2	10·9	11·5	11·9	11·4	
Highest ..	69	59	52	58	44	45	42	49	48	63	60	58	69	

TABLE 51.—NORMAL FREQUENCY IN EACH MONTH OF EIGHT WIND DIRECTIONS EXPRESSED IN PERCENTAGES, 1868–1917.

	Date.	Calm.	N.	NE.	E.	SE.	S.	SW.	W.	NW.
January,	1868–1877	11·1	1·2	9·0	12·4	9·1	18·8	24·8	11·3	2·3
	1878–1887	14·3	3·6	10·6	11·9	5·4	11·9	24·8	14·2	3·3
	1888–1897	13·9	6·2	9·7	9·5	4·1	10·8	23·8	16·9	5·1
	1898–1907	14·9	2·1	4·5	9·8	4·5	7·2	30·4	22·9	3·7
	1908–1917	13·6	4·9	5·8	12·6	5·9	8·0	26·7	18·0	4·5
	1868–1917	13·6	3·6	7·9	11·2	5·8	11·3	26·1	16·7	3·8
February,	1868–1877	8·6	4·1	11·6	13·1	6·4	10·7	22·8	17·1	5·6
	1878–1887	12·2	2·1	11·5	12·5	6·1	13·4	23·7	14·0	4·5
	1888–1897	15·4	5·3	15·3	11·3	2·9	7·4	22·9	15·8	3·7
	1898–1907	17·8	6·3	8·0	10·2	4·4	8·0	19·0	19·6	6·7
	1908–1917	13·4	4·3	7·7	10·1	5·9	12·7	20·7	20·4	4·8
	1868–1917	13·5	4·4	10·8	11·4	5·2	10·4	21·8	17·4	5·1
March,	1868–1877	7·8	4·8	15·6	11·7	3·6	10·4	18·8	19·5	7·8
	1878–1887	11·9	6·7	11·6	15·3	3·5	7·1	18·6	17·7	7·6
	1888–1897	12·2	6·2	11·7	10·0	4·3	7·3	23·2	18·5	6·6
	1898–1907	14·9	7·3	9·8	8·2	3·2	8·3	23·4	19·3	5·6
	1908–1917	11·1	9·9	12·1	15·4	4·4	6·7	16·5	18·4	5·5
	1868–1917	11·6	7·0	12·1	12·1	3·8	8·0	20·1	18·7	6·6
April,	1868–1877	11·5	4·2	16·5	15·7	3·4	7·5	18·7	16·9	5·6
	1878–1887	10·6	4·4	23·6	23·2	4·2	7·0	12·5	11·0	3·5
	1888–1897	11·5	5·2	18·0	19·3	4·8	6·5	12·6	16·5	5·6
	1898–1907	16·2	3·6	9·6	11·2	5·1	7·6	16·7	24·0	6·0
	1908–1917	11·8	5·0	8·7	14·0	3·7	6·1	19·5	24·5	6·7
	1868–1917	12·3	4·5	15·3	16·7	4·3	6·9	16·0	18·5	5·5
May,	1868–1877	12·1	3·3	17·8	15·7	2·3	8·5	15·7	19·5	5·1
	1878–1887	10·2	4·7	16·7	14·6	3·2	9·0	17·4	18·2	6·0
	1888–1897	11·5	4·3	15·9	20·1	4·0	6·5	12·3	18·8	6·6
	1898–1907	15·7	4·7	16·5	20·6	2·7	6·4	12·6	16·8	4·0
	1908–1917	12·2	2·3	14·2	22·8	3·0	5·4	15·2	20·5	4·4
	1868–1917	12·3	3·9	16·2	18·7	3·1	7·2	14·6	18·8	5·2
June,	1868–1877	11·9	2·2	9·0	11·8	3·1	8·2	23·7	25·2	4·9
	1878–1887	13·2	2·4	16·4	13·1	3·0	7·7	16·5	22·4	5·3
	1888–1897	12·7	2·7	17·9	19·6	2·0	5·3	14·2	21·0	4·6
	1898–1907	15·0	1·7	14·1	20·4	2·2	6·4	16·0	21·3	2·9
	1908–1917	14·2	3·8	13·3	17·5	2·2	4·6	14·2	24·5	5·7
	1868–1917	13·4	2·6	14·2	16·5	2·5	6·4	16·9	22·9	4·6
July,	1868–1877	12·9	2·1	9·4	8·0	3·9	12·4	25·5	21·5	4·3
	1878–1887	13·3	2·6	10·3	8·2	3·3	9·5	23·2	25·2	4·4
	1888–1897	13·3	3·0	10·1	16·4	2·1	4·5	17·7	25·7	7·2
	1898–1907	17·5	1·9	9·5	10·2	1·6	3·0	20·7	30·4	5·2
	1908–1917	16·7	4·6	8·9	13·2	2·5	4·6	17·7	25·6	6·2
	1868–1917	14·7	2·9	9·6	11·2	2·7	6·8	20·9	25·7	5·5
August.	1868–1877	13·1	2·9	15·1	11·6	3·0	6·5	19·7	22·4	5·7
	1878–1887	15·9	2·0	12·4	11·1	2·4	8·0	20·0	22·9	5·3
	1888–1897	15·6	3·2	6·9	7·3	3·3	7·4	24·3	26·2	5·8
	1898–1907	19·9	1·9	9·0	10·8	3·0	5·8	19·4	26·6	3·6
	1908–1917	19·1	2·8	10·6	11·5	3·3	6·4	17·4	23·8	5·1
	1868–1917	16·7	2·6	10·8	10·4	3·0	6·8	20·2	24·4	5·1

TABLE 51.—NORMAL FREQUENCY IN EACH MONTH OF EIGHT WIND DIRECTIONS EXPRESSED IN PERCENTAGES, 1868–1917—*continued.*

Date.		Calm.	N.	NE.	E.	SE.	S.	SW.	W.	NW.
September,	1868–1877	14·6	2·9	13·8	12·8	3·9	9·3	20·0	17·2	5·5
	1878–1887	18·2	3·3	10·9	10·0	3·5	8·4	23·9	18·0	3·8
	1888–1897	18·2	3·2	9·4	9·0	3·0	5·7	25·0	20·6	5·9
	1898–1907	21·9	1·2	6·6	13·2	4·6	7·3	19·9	22·8	2·5
	1908–1917	19·8	5·1	9·3	13·9	3·3	6·0	16·3	21·5	4·8
	1868–1917	18·5	3·1	10·0	11·8	3·7	7·4	21·0	20·0	4·5
October,	1868–1877	12·8	2·7	12·9	9·5	5·4	12·9	21·5	16·7	5·6
	1878–1887	15·2	6·1	14·4	10·9	4·3	7·0	16·8	19·5	5·8
	1888–1897	17·9	7·5	11·3	8·9	3·0	8·9	20·2	15·1	7·2
	1898–1907	22·3	2·2	9·2	11·6	4·8	7·5	20·9	18·0	3·5
	1908–1917	18·8	3·4	11·7	18·2	5·9	8·9	17·4	12·9	2·8
	1868–1917	17·4	4·4	11·9	11·8	4·6	9·0	19·4	16·5	5·0
November,	1868–1877	14·5	4·5	16·5	12·8	5·4	10·5	15·5	14·1	6·2
	1878–1887	15·9	6·1	12·7	6·6	4·7	11·5	21·8	14·5	6·2
	1888–1897	13·5	4·2	11·2	15·1	5·1	11·2	22·3	14·0	3·4
	1898–1907	21·4	4·1	10·0	12·5	3·4	6·7	19·5	19·4	3·0
	1908–1917	19·5	5·3	7·6	7·3	2·3	6·6	24·0	21·2	6·2
	1868–1917	17·0	4·9	11·6	10·8	4·2	9·3	20·6	16·6	5·0
December,	1868–1877	14·4	5·7	11·9	9·8	4·4	12·3	23·7	12·5	5·3
	1878–1887	19·3	4·8	8·4	6·0	3·8	8·4	24·8	17·3	7·2
	1888–1897	13·7	2·6	10·5	12·0	6·7	12·7	23·0	14·3	4·5
	1898–1907	17·9	2·3	6·5	13·4	6·5	6·9	26·0	16·9	3·6
	1908–1917	16·1	3·0	8·1	11·4	5·4	9·5	24·5	17·3	4·7
	1868–1917	16·3	3·7	9·1	10·5	5·4	9·9	24·4	15·6	5·1
Whole Year,	1868–1877	12·1	3·4	13·3	12·0	4·5	10·7	20·9	17·8	5·3
	1878–1887	14·2	4·1	13·3	11·9	3·9	9·1	20·3	17·9	5·3
	1888–1897	14·1	4·4	12·3	13·2	3·8	7·9	20·1	18·7	5·5
	1898–1907	17·9	3·3	9·4	12·7	3·8	6·8	20·4	21·5	4·2
	1908–1917	15·5	4·5	9·9	14·0	4·0	7·1	19·2	20·7	5·1
	1868–1917	14·8	3·9	11·6	12·8	4·0	8·3	20·2	19·3	5·1

TABLE 52.—CHANGE OF VELOCITY AND DIRECTION OF WIND IN COURSE OF 50 YEARS, 1868–1917.

Period	1868–72	1873–77	1878–82	1883–87	1888–92	1893–97	1898–1902	1903–07	1908–12	1913–17
Velocity	12·9	12·9	11·4	11·3	11·1	11·1	11·0	11·2	10·6	10·4
0·01 $p \cos A$	−0·12		−0·08		−0·06		−0·10		−0·06	
0·01 $p \sin A$	−0·14		−0·14		−0·14		−0·20		−0·17	
D	20·4		21·4		22·4		21·6		22·3	
p %	19		16		15		22		18	

TABLE 53.—DIURNAL AND ANNUAL VARIATION OF VELOCITY OF WIND, 1868–1917.

Departures from 50-year Normals.

(Unit 0·1 mile per hour.)

Hour	1	2	3	4	5	6	7	8	9	10	11	noon	13	14	15	16	17	18	19	20	21	22	23	mdt.	Mean Velocity (miles per hour).
Jan.	− 5	− 5	− 5	− 6	− 6	− 6	− 6	− 4	− 3	− 1	+ 7	+11	+13	+13	+10	+ 6	+ 4	+ 3	+ 1	− 1	− 2	− 3	− 3	− 4	**12·8**
Feb.	− 8	− 9	− 9	−12	−11	−12	−11	− 8	− 5	+ 1	+11	+17	+22	+21	+18	+12	+ 5	0	− 3	− 5	− 5	− 5	− 7	− 8	12·5
Mar.	−16	−18	−18	−18	−19	−19	−17	−12	− 2	+ 9	+22	+27	+30	**+31**	+30	+26	+18	+ 6	− 4	−10	−11	−12	−15	−16	**12·8**
Apr.	−21	−22	−24	−25	−26	−25	−19	− 8	+ 4	+14	+25	+28	+31	+34	+33	+32	+27	+17	+ 4	− 7	−12	−15	−18	−20	12·0
May	−24	−26	−28	−28	−29	−26	−16	− 4	+ 4	+11	+20	+23	+26	+29	+30	+30	+29	+23	+11	0	− 9	−14	−17	−21	11·3
June	−23	−25	−26	−27	−26	−22	−13	− 3	+ 4	+12	+21	+22	+24	+28	+28	+29	+27	+21	+12	+ 2	− 7	−12	−18	−21	10·6
July	−23	−24	−25	−25	**−26**	−22	−14	− 3	+ 4	+11	+21	+24	+28	+31	+31	+30	+25	+20	+ 9	− 2	− 9	−15	−19	−22	10·2
Aug.	−20	−21	−23	−23	−24	−23	−18	− 7	+ 3	+11	+21	+24	+27	+31	+31	+30	+25	+16	+ 4	− 5	−11	−14	− 6	−17	**10·1**
Sept.	−16	−16	−16	−16	−18	−18	−16	− 9	+ 2	+12	+22	+25	+28	+30	+28	+26	+17	+ 6	− 2	− 7	−11	−12	−14	−14	10·2
Oct.	−10	−11	−13	−13	−12	−12	−11	− 9	− 3	+ 4	+17	+23	+25	+24	+20	+14	+ 4	+ 1	− 4	− 5	− 8	− 9	−11	− 9	10·9
Nov.	− 5	− 5	− 6	− 6	− 6	− 6	− 6	− 5	− 3	0	+10	+16	+17	+16	+11	+ 6	+ 2	0	− 1	− 2	− 3	− 5	− 8	− 5	11·5
Dec.	− 2	− 4	− 3	− 4	− 6	− 5	− 3	− 1	− 2	− 1	+ 4	+ 9	+11	+10	+ 7	+ 4	+ 3	+ 2	0	− 1	− 3	− 2	− 2	− 3	11·9
Year	−14	−15	−16	**−17**	**−17**	−16	−12	− 6	0	+ 7	+17	+21	+24	**+25**	+23	+20	+16	+10	+ 2	− 4	− 8	−10	−12	−13	11·4

TABLE 54.—DIURNAL VARIATION

Ten-day Means of cos θ and sin θ, θ being

Hour	2		4		6		8		10		Noon	
Period.	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ
Jan. 1–10	−·22	−·13	−·21	−·12	−·21	−·12	−·22	−·13	−·22	−·13	−·22	−·14
11–20	−·21	−·18	−·21	−·18	−·23	−·18	−·23	−·17	−·24	−·15	−·24	−·18
21–31	−·19	−·23	−·18	−·22	−·19	−·20	−·18	−·20	−·20	−·20	−·19	−·22
Feb. 1–10	−·17	−·22	−·17	−·20	−·17	−·22	−·15	−·20	−·18	−·19	−·16	−·20
11–20	−·14	−·12	−·13	−·13	−·12	−·12	−·12	−·12	−·12	−·13	−·14	−·15
21–29	−·04	−·06	−·05	−·05	−·05	−·05	−·05	−·05	−·05	−·03	−·04	−·05
Mar. 1–10	−·11	−·22	−·08	−·24	−·07	−·22	−·08	−·24	−·07	−·23	−·07	−·24
11–20	−·04	−·14	−·03	−·15	−·03	−·14	−·02	−·15	·00	−·16	−·01	−·17
21–31	+·03	−·10	+·04	−·08	+·03	−·07	+·05	−·06	+·04	−·08	+·02	−·12
Apr. 1–10	−·06	−·09	−·04	−·11	−·02	−·09	−·01	−·10	−·02	−·11	−·04	−·15
11–20	+·02	+·06	+·02	+·06	+·05	+·06	+·07	+·09	+·04	+·04	+·01	−·03
21–30	+·01	+·05	+·03	+·07	+·04	+·08	+·04	+·07	+·03	+·04	+·03	−·04
May 1–10	+·04	+·06	+·03	+·07	+·04	+·08	+·06	+·10	+·06	+·05	+·04	·00
11–20	+·05	+·08	+·05	+·08	+·05	+·09	+·08	+·08	+·08	+·04	+·07	−·07
21–31	−·07	·00	−·05	+·01	−·06	+·02	−·04	+·01	−·03	−·03	−·06	−·12
June 1–10	−·01	+·02	·00	+·02	−·02	+·02	+·02	−·01	+·05	−·07	+·03	−·11
11–20	−·02	−·01	−·01	+·01	−·02	+·03	·00	−·03	+·01	−·11	−·01	−·21
21–30	−·09	−·13	−·08	−·11	−·08	−·09	−·06	−·11	−·07	−·19	−·10	−·27
July 1–10	−·13	−·22	−·12	−·19	−·10	−·21	−·09	−·26	−·08	−·32	−·12	−·36
11–20	−·12	−·24	−·12	−·22	−·11	−·21	−·09	−·25	−·08	−·31	−·08	−·35
21–31	−·12	−·20	−·12	−·17	−·12	−·18	−·10	−·20	−·07	−·23	−·07	−·29
Aug. 1–10	−·13	−·21	−·12	−·20	−·10	−·19	−·08	−·21	−·05	−·23	−·10	−·28
11–20	−·10	−·16	−·09	−·16	−·09	−·16	−·09	−·17	−·08	−·22	−·08	−·27
21–31	−·11	−·28	−·09	−·27	−·06	−·23	−·05	−·22	−·08	−·26	−·09	−·30
Sept. 1–10	−·10	−·24	−·09	−·22	−·07	−·21	−·07	−·22	−·08	−·27	−·13	−·31
11–20	−·12	−·27	−·10	−·24	−·07	−·24	−·08	−·22	−·05	−·24	−·07	−·28
21–30	−·12	−·07	−·08	−·08	−·08	−·05	−·08	−·04	−·06	−·05	−·07	−·10
Oct. 1–10	−·09	−·13	−·07	−·13	−·08	−·11	−·08	−·11	−·09	−·15	−·08	−·19
11–20	−·10	−·15	−·08	−·14	−·08	−·14	−·09	−·13	−·08	−·15	−·08	−·17
21–31	−·05	−·04	−·04	−·02	−·04	−·03	−·06	−·04	−·06	−·02	−·05	−·05
Nov. 1–10	−·11	−·18	−·10	−·15	−·12	−·14	−·13	−·14	−·12	−·14	−·10	−·16
11–20	−·04	−·18	−·02	−·18	−·03	−·15	−·04	−·15	−·03	−·15	−·01	−·16
21–30	−·07	−·11	−·06	−·10	−·05	−·10	−·06	−·11	−·06	−·10	−·03	−·11
Dec. 1–10	−·11	−·22	−·09	−·21	−·12	−·18	−·09	−·17	−·13	−·17	−·11	−·19
11–20	−·16	−·13	−·17	−·14	−·14	−·15	−·13	−·15	−·13	−·16	−·12	−·21
21–31	−·16	−·15	−·18	−·16	−·17	−·16	−·18	−·16	−·17	−·15	−·19	−·17
Year	−·087	−·127	−·079	−·119	−·075	−·110	−·066	−·115	−·065	−·137	−·074	−·179

OF WIND DIRECTION, 1868–1917.

the veer of the Wind from the North.

14		16		18		20		22		Midnight		Day	
cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ	cos θ	sin θ
−·21	−·15	−·19	−·13	−·21	−·12	−·20	−·13	−·18	−·12	−·21	−·12	−·21	−·13
−·23	−·19	−·21	−·19	−·20	−·20	−·21	−·19	−·23	−·20	−·20	−·20	−·22	−·18
−·20	−·25	−·22	−·25	−·22	−·23	−·22	−·23	−·22	−·22	−·21	−·23	−·20	−·23
−·16	−·22	−·19	−·22	−·19	−·21	−·18	−·21	−·20	−·19	−·19	−·20	−·18	−·21
−·14	−·17	−·12	−·17	−·15	−·13	−·14	−·13	−·14	−·12	−·15	−·11	−·14	−·13
−·02	−·13	−·03	−·13	−·05	−·10	−·08	−·07	−·08	−·07	−·07	−·03	−·05	−·07
−·08	−·25	−·11	−·26	−·11	−·24	−·12	−·21	−·12	−·20	−·12	−·21	−·09	−·23
−·06	−·19	−·04	−·22	−·04	−·21	−·06	−·17	−·04	−·16	−·04	−·14	−·03	−·17
+·02	−·15	+·05	−·14	+·02	−·12	+·02	−·09	+·01	−·10	+·02	−·10	+·03	−·10
−·02	−·19	−·02	−·19	−·02	−·17	−·05	−·09	−·06	−·09	−·06	−·07	−·04	−·12
−·04	−·08	−·04	−·10	−·02	−·06	−·01	−·02	−·02	+·01	−·02	+·03	+·01	·00
+·01	−·10	+·03	−·11	+·02	−·08	·00	−·01	−·02	+·01	−·01	+·05	+·02	·00
·00	−·06	+·01	−·09	+·04	−·07	+·03	−·02	·00	+·04	+·02	+·07	+·03	+·02
+·06	−·07	+·09	−·08	+·09	−·07	+·06	−·01	+·03	+·03	+·05	+·05	+·06	+·01
−·04	−·18	−·05	−·19	−·03	−·16	−·05	−·11	−·08	−·05	−·08	−·01	−·05	−·07
·00	−·11	+·01	−·12	+·03	−·11	+·05	−·04	·00	+·01	·00	+·05	+·01	−·04
−·06	−·23	−·04	−·25	−·02	−·26	−·02	−·17	−·04	−·10	−·03	−·04	−·02	−·11
−·09	−·30	−·07	−·32	−·07	−·33	−·08	−·30	−·11	−·20	−·11	−·15	−·08	−·21
−·10	−·39	−·12	−·40	−·09	−·40	−·09	−·35	−·13	−·30	−·12	−·28	−·11	−·31
−·09	−·36	−·09	−·38	−·11	−·37	−·10	−·35	−·11	−·27	−·12	−·24	−·10	−·30
−·10	−·33	−·08	−·34	−·08	−·31	−·10	−·29	−·13	−·25	−·13	−·23	−·10	−·25
−·11	−·36	−·11	−·38	−·09	−·38	−·10	−·32	−·13	−·28	−·12	−·23	−·10	−·27
−·07	−·28	−·07	−·29	−·08	−·26	−·11	−·22	−·14	−·18	−·13	−·18	−·09	−·21
−·09	−·36	−·11	−·37	−·11	−·37	−·13	−·33	−·13	−·30	−·11	−·29	−·10	−·30
−·15	−·37	−·15	−·39	−·17	−·36	−·16	−·30	−·16	−·27	−·13	−·26	−·12	−·28
−·09	−·31	−·09	−·32	−·09	−·31	−·09	−·27	−·10	−·24	−·08	−·24	−·09	−·27
−·11	−·15	−·14	−·16	−·14	−·11	−·17	−·07	−·17	−·05	−·16	−·06	−·11	−·08
−·11	−·23	−·11	−·22	−·10	−·20	−·11	−·17	−·11	−·15	−·13	−·16	−·09	−·16
−·09	−·19	−·11	−·18	−·13	−·13	−·13	−·12	−·11	−·11	−·12	−·12	−·10	−·14
−·08	−·10	−·07	−·09	−·06	−·07	−·08	−·08	−·06	−·07	−·06	−·07	−·06	−·06
−·10	−·17	−·11	−·16	−·12	−·14	−·12	−·15	−·11	−·15	−·11	−·17	−·11	−·16
−·01	−·14	−·04	−·15	−·04	−·14	−·04	−·15	−·02	−·16	−·03	−·18	−·03	−·16
−·03	−·13	−·03	−·13	−·06	−·11	−·07	−·10	−·06	−·11	−·05	−·12	−·05	−·11
−·10	−·22	−·12	−·23	−·13	−·21	−·11	−·22	−·13	−·23	−·12	−·24	−·11	−·20
−·13	−·22	−·16	−·20	−·18	−·17	−·20	−·16	−·20	−·14	−·17	−·14	−·16	−·16
−·17	−·19	−·19	−·17	−·19	−·18	−·18	−·16	−·19	−·16	−·19	−·16	−·18	−·16
−·083	−·209	−·084	−·214	−·086	−·198	−·094	−·166	−·102	−·143	−·097	−·133	−·083	−·154

TABLE 55.—DIURNAL INEQUALITY OF AIR-FLOW, 1868–1917.

(See No. 65.)

(A)

—	North component. α	East component. β
Midnight	−0·05	+0·40
3	+0·08	+0·50
6	+0·16	+0·59
9	+0·18	+0·33
Noon	−0·05	−0·50
15	−0·11	−0·97
18	−0·09	−0·51
21	−0·12	+0·15

(B)

—	Maximum departure from daily mean in miles per hour. σ	Time of greatest velocity.	
		West.	East.
January	0·43	15^h	8^h
February	0·65	15	9
March	1·05	15	6
April	1·36	15	6
May	1·55	15	6
June	1·80	15	6
July	2·02	15	4
August	1·79	15	3
September ..	1·46	15	6
October	0·79	15	6
November	0·29	12	·6
December ..	0·50	15	6

TABLE 56.—FIVE-DAY NORMALS OF WIND VELOCITY AND DIRECTION, 1868–1917.

Number of Period.*	Velocity and Direction.			Frequency of Daily Velocities.					Number of Period.*	Velocity and Direction.			Frequency of Daily Velocities.				
	V.	D.	*p*.	< 5	5 to 7·5.	7·6 to 10·0.	10·1 to 15·0.	> 15		V.	D.	*p*.	< 5	5 to 7·5.	7·6 to 10·0.	10·1 to 15·0.	> 15
	Mi/hr.			%	%	%	%	%		Mi/hr.			%	%	%	%	%
1 ..	12·7	17	25	11	13	16	26	34	38 ..	10·8	22	39	2	20	25	39	14
2 ..	12·8	19	19	7	15	16	29	33	39 ..	10·3	22	37	6	21	25	36	12
3 ..	12·3	20	24	12	14	10	34	30	40 ..	11·5	23	29	3	25	26	33	13
4 ..	13·0	19	33	7	13	18	28	34	41 ..	9·7	22	31	6	28	26	32	8
5 ..	12·4	22	25	14	14	17	27	28	42 ..	10·0	22	21	9	22	27	30	12
6 ..	**14·0**	20	31	9	11	14	27	39	43 ..	10·5	23	33	5	23	20	35	17
7 ..	13·0	21	24	10	13	16	24	37	44 ..	10·5	22	26	5	22	26	30	17
8 ..	12·1	20	31	12	15	15	26	32	45 ..	10·1	22	28	7	22	26	33	12
9 ..	12·2	21	20	12	15	16	28	29	46 ..	9·5	22	23	10	29	26	24	11
10 ..	12·2	19	20	8	15	18	28	31	47 ..	**9·4**	23	22	11	27	22	32	8
11 ..	12·4	21	11	8	19	18	25	30	48 ..	10·7	22	27	6	23	21	35	15
12 ..	13·6	20	9	5	16	16	27	36	49 ..	10·2	23	38	10	16	27	34	13
13 ..	13·8	22	25	4	14	15	32	35	50 ..	10·1	22	31	11	22	25	30	12
14 ..	12·7	23	28	7	13	14	34	32	51 ..	9·9	22	32	15	23	21	24	17
15 ..	12·9	22	20	7	14	14	32	33	52 ..	10·2	22	32	15	19	22	29	15
16 ..	13·0	24	14	5	15	14	35	31	53 ..	10·5	25	9	13	22	24	21	20
17 ..	13·9	28	6	5	15	22	32	26	54 ..	10·6	19	23	10	26	19	25	20
18 ..	12·1	25	21	5	18	19	31	27	55 ..	10·4	19	12	14	18	20	33	15
19 ..	12·5	22	25	4	17	15	34	30	56 ..	10·8	22	19	10	23	17	29	21
20 ..	12·1	1	3	6	15	21	31	27	57 ..	10·7	21	27	12	19	20	32	17
21 ..	11·9	2	5	3	16	23	33	25	58 ..	11·3	21	18	12	15	20	29	24
22 ..	11·9	19	3	4	18	21	30	27	59 ..	10·7	15	5	12	22	20	27	19
23 ..	12·0	1	1	3	22	16	32	27	60 ..	11·0	21	10	11	20	18	30	21
24 ..	11·7	1	2	3	17	22	35	23	61 ..	11·3	20	7	14	16	16	33	21
25 ..	11·4	19	5	4	17	26	33	20	62 ..	11·8	20	21	12	16	17	29	26
26 ..	11·3	5	14	4	21	20	38	17	63 ..	11·3	22	20	11	19	15	32	23
27 ..	11·3	3	5	2	18	25	36	19	64 ..	10·8	22	15	14	19	18	31	18
28 ..	11·3	32	8	4	18	19	38	21	65 ..	10·9	24	18	18	13	18	30	21
29 ..	11·2	20	8	3	22	21	34	20	66 ..	12·0	21	13	14	14	17	29	26
30 ..	11·2	22	9	2	19	21	38	20	67 ..	12·3	23	12	9	15	18	29	29
31 ..	11·7	19	7	2	14	22	39	23	68 ..	11·9	21	21	13	17	17	26	27
32 ..	10·8	28	9	2	23	26	31	18	69 ..	12·3	22	28	11	16	15	28	30
33 ..	10·4	26	7	2	26	27	34	11	70 ..	12·2	19	17	8	15	20	32	25
34 ..	9·9	23	12	6	23	27	34	10	71 ..	11·6	20	27	12	18	15	28	27
35 ..	10·8	20	18	4	16	26	39	15	72 ..	11·6	20	31	16	17	15	25	27
36 ..	10·4	23	23	4	27	22	31	16	73 ..	11·9	19	19	11	16	17	28	28
37 ..	10·3	22	21	3	24	25	38	10									

* For dates of Periods see Table 26.

V = Velocity during Period in miles per hour.

D = Point of Compass. (E=8, S=16, W=24, N=32).

p = Prevalence of direction. (See p.).

The last five columns contain the number of the days, in percentage, on which the daily velocities, in miles per hour, lie within the limits given in the heading.

TABLE 57.—FREQUENCY OF DIFFERENT WIND VELOCITIES, 1868–1907.

Velocity in miles per hour recorded by instrument.	Real Velocity	Number of hours.	Percentage of hours.
0 to 1·5	0 to 2·6	9,324	2·68
1·5 ,, 4·5	2·6 ,, 5·2	57,860	16·61
4·5 ,, 6·5	5·2 ,, 7·0	38,643	11·10
6·5 ,, 8·5	7·0 ,, 8·9	37,460	10·76
8·5 ,, 10·5	8·9 ,, 10·8	39,079	11·22
10·5 ,, 12·5	10·8 ,, 12·7	34,047	9·78
12·5 ,, 14·5	12·7 ,, 14·6	30,421	8·74
14·5 ,, 16·5	14·6 ,, 16·5	25,395	7·29
16·5 ,, 18·5	16·5 ,, 18·5	19,777	5·68
18·5 ,, 20·5	18·5 ,, 20·5	17,128	4·92
20·5 ,, 25·5	20·5 ,, 25·5	23,093	6·63
25·5 ,, 30·5	25·5 ,, 30·5	10,192	2·93
30·5 ,, 35·5	30·5 ,, 35·5	3,814	1·10
35·5 ,, 40·5	35·5 ,, 40·5	1,408	0·40
40·5 ,, 45·5	40·5 ,, 45·5	394	0·113
45·5 ,, 50·5	45·5 ,, 50·5	152	0·043
50·5 ,, 60·5	50·5 ,, 60·5	47	0·013
60·5 ,, 70·5	60·5 ,, 70·5	5	0·001
0 to 70·5		348,239	100

TABLE 58.—NUMBER, *n*, OF HOURS, IN PERCENTAGE, DURING WHICH THE VELOCITIES ARE EQUAL TO, OR LOWER THAN, THE UNDERNOTED VELOCITIES, *V*, IN MILES PER HOUR.

Interpolated from Table 57.

V.	*n*.	*V*.	*n*.	*V*.	*n*.
3	4·6	12	58·7	25	95·0
4	10·8	13	63·7	30	98·16
5	17·8	14	68·4	35	99·37
6	24·5	15	72·7	40	99·82
7	30·3	16	76·4	45	99·94
8	36·1	17	79·7	50	99·99
9	41·9	18	82·6	60	100·00
10	47·6	19	85·2		
11	53·3	20	87·6		

TABLE 59.—NUMBER OF HOURS, IN PERCENTAGE, DURING WHICH THE VELOCITY PER HOUR LIES WITHIN THE UNDERNOTED LIMITS, AND MONTHLY DEPARTURES.

Velocity in miles.	Average percentage.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.
0 to 5·2 ..	19·29	−1·89	−1·12	−3·83	−2·29	−2·74	−1·35	−0·01	+1·72	+4·82	+2·78	+1·62	+2·41
5·2 ,, 10·8 ..	33·08	−3·73	−2·38	−3·39	−2·51	+1·21	+4·35	+3·99	+3·39	+1·87	+0·47	−1·35	−2·07
10·8 ,, 20·5 ..	36·40	−0·49	−1·47	+1·97	+3·52	+3·65	+1·80	+1·85	−0·16	−3·15	−3·00	−0·82	−3·92
20·5 ,, 40·5 ..	11·06	+5·84	+4·74	+5·11	+1·38	−1·99	−4·66	−5·67	−4·81	−3·40	−0·19	+0·45	+3·37
40·5 ,, 70·5 ..	0·17	+0·27	+0·21	+0·14	−0·11	−0·14	−0·16	−0·17	−0·15	−0·13	−0·06	+0·10	+0·20
	V	16 to 70	16 to 50	14 to 50	13 to 30	6 to 20	5 to 16	0 to 16	0 to 16	0 to 9	0 to 9 60 to 70	0 to 5 25 to 70	0 to 6 20 to 60

V = Velocities which occur oftener than shown by average percentage.

TABLE 60.—FREQUENCY OF HIGH VELOCITIES. ANNUAL VARIATION.

Number of Hours each Month in 40 Years with Velocities greater than 40 Miles.

—	40 Years.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
40·5 to 45·5 ..	394	81	83	66	9	8	4	1	4	8	24	42	64
45·5 ,, 50·5 ..	152	33	25	20	6	—	—	—	3	5	4	24	32
50·5 ,, 60·5 ..	47	11	3	3	4	—	—	—	—	—	2	12	12
60·5 ,, 70·5 ..	5	4	—	—	—	—	—	—	—	—	1	—	—
40·5 to 70·5 ..	598	129	111	89	19	8	4	1	7	13	31	78	108

TABLE 61.—PERCENTAGES OF TIME BELONGING TO THE UNDERNOTED RANGES OF VELOCITY AND FIVE-YEARLY DEPARTURES.

Velocity in miles per hour.	Average percentage.	1868–72.	1873–77.	1878–82.	1883–87.	1888–92.	1893–97.	1898–1902.	1903–07.
0 to 5·2	19·29	−0·77	−3·63	+1·61	+1·22	+0·89	+0·46	+1·05	−0·87
5·2 ,, 10·8	33·08	−4·06	−3·74	−0·86	+0·27	+0·76	+3·08	+2·32	+2·17
10·8 ,, 20·5	36·40	−0·14	+2·88	−0·49	−1·05	−0·02	−1·07	−0·98	+0·92
20·5 ,, 40·5	11·06	+4·64	+4·45	−0·26	−0·39	−1·55	−2·43	−2·32	−2·11
40·5 ,, 70·5	0·17	+0·33	+0·04	+0·01	−0·03	−0·08	−0·05	−0·07	−0·13
V		19 to 40	13 to 40	0 to 6 15 to 18 36 to 40	0 to 6	0 to 8 11 to 14	3 to 12	3 to 14	5 to 16

V=Velocities 0 to 40 miles which occur oftener than shown by average percentage.

TABLE 62.—FREQUENCY OF HIGH VELOCITIES.

Number of Hours in each Five-Year Period with Velocities greater than 40 Miles.

Velocities.	1868–1907.	1868–72.	1873–77.	1878–82.	1883–87.	1888–92.	1893–97.	1898–1902.	1903–07.
40·5 to 45·5	394	136	62	42	41	31	39	28	15
45·5 ,, 50·5	152	59	18	23	18	9	12	11	2
50·5 ,, 60·5	47	19	9	11	—	—	3	4	1
60·5 ,, 70·5	5	2	1	2	—	—	—	—	—
40·5 to 70·5	598	216	90	78	59	40	54	43	18

TABLE 63.—STATISTICS OF THE 50 STRONGEST GALES, 1868–1917.

	Date.	Maximum Hourly Velocity in miles per hour, tabulated for a period of		Point of Compass at (E = 8, S = 16, W = 24, N = 32)			Duration of Gale in hours.	Atmospheric Pressure.		
								Smallest Barometer Reading Inches.	Change.	
		15 min.	60 min.	Beginning.	Maximum	End.			Δb Unit 0·01 Inch.	Time. Hours.
1	1868 Jan. 24–25 ..	76	68	17	17	22	25	29·0	58	5
2	1882 Jan. 6 ..	76	67	18	19	23	14	28·7	13	6
3	1874 Oct. 20–21 ..	76	64	18	22	25	21	28·6	86	10
4	1871 Mar. 12 ..	76	54	16	16	20	11	28·9	26	9
5	1881 Nov. 21–22 ..	72	57	14	17	19	26	28·5	28	3
6	1879 Dec. 28 ..	68	62	17	18	23	8	29·0	8	1
7	1872 Nov. 6–7 ..	68	61	17	21	22	29	28·9	14	6
8	1894 Dec. 21–22 ..	68	54	17	27	27	19	28·0	85	6
9	1872 Feb. 26 ..	68	49	10	11	12	6	28·6	12	4
10	1874 Jan. 18 ..	64	62	19	21	23	13	28·7	10	4
11	1894 Feb. 11–12 ..	64	61	21	23	28	9	28·2	11	4
12	1900 Dec. 20–21 ..	64	60	17	22	24	20	28·2	53	9
13	1868 Apr. 29 ..	64	54	23	23	23	15	29·5	0	0
14	1880 Nov. 26 ..	64	54	15	19	20	17	28·6	23	4
15	1869 Jan. 5 ..	64	53	14	25	25	14	28·7	34	7
16	1869 Dec. 13–14 ..	64	53	15	17	19	22	28·1	53	15
17	1872 Jan. 1 ..	64	52	17	16	17	12	29·1	17	8
18	1873 Jan. 3 ..	64	52	16	17	22	8	28·7	17	3
19	1873 Dec. 15–16 ..	64	51	19	25	26	20	29·1	6	2
20	1868 Apr. 29–30 ..	64	51	23	23	24	18	29·3	4	5
21	1874 Mar. 19 ..	64	51	19	26	26	14	29·1	5	1
22	1874 Mar. 16–17 ..	64	50	22	24	23	15	29·6	2	4
23	1868 Feb. 20–21 ..	64	49	16	17	18	19	29·0	56	14
24	1877 May 9 ..	64	45	6	6	6	16	29·5	Stat'y	—
25	1877 Jan. 29–30 ..	64	44	22	19	27	11	28·6	59	8
26	1871 Feb. 24–25 ..	64	42	22	22	22	29	29·8	7	20
27	1911 Nov. 5 ..	60	56	20	21	25	17	28·4	42	14
28	1912 Nov. 26 ..	60	55	17	21	23	11	28·2	57	7
29	1883 Dec. 11–12 ..	60	54	18	27	26	17	28·5	27	8
30	1871 Dec. 18 ..	60	53	17	20	24	22	29·0	30	12
31	1868 Nov. 2–3 ..	60	52	22	24	25	21	29·1	49	21
32	1872 Jan. 31 ..	60	52	16	16	16	9	28·9	16	10
33	1888 Nov. 16 ..	60	52	16	18	23	11	29·0	15	4
34	1895 Dec. 4–5 ..	60	52	22	22	25	30	28·8	28	6
35	1904 Dec. 29–30 ..	60	52	24	24	29	20	29·1	71	28
36	1868 Feb. 5–6 ..	60	51	21	21	26	27	29·4	35	10
37	1872 Feb. 1 ..	60	50	17	16	16	6	28·9	—	—
38	1875 Jan. 19 ..	60	50	19	20	21	11	29·0	8	6
39	1890 Jan. 18–19 ..	60	50	16	20	24	24	28·5	9	7
40	1869 Sept. 19 ..	60	48	19	18	26	11	29·5	24	6
41	1885 Dec. 3–4 ..	60	48	16	19	22	15	28·7	26	3
42	1868 Jan. 30–32 ..	60	47	21	22	24	57	28·3	133	52
43	1868 Dec. 10–11 ..	60	47	17	18	21	15	28·7	40	12
44	1869 Nov. 2 ..	60	47	21	21	24	18	29·3	47	13
45	1882 Jan. 10 ..	60	46	21	21	21	10	29·5	11	9
46	1868 Mar. 4 ..	60	45	20	21	24	9	29·3	18	7
47	1886 Apr. 7–8 ..	60	45	16	19	20	10	28·7	11	6
48	1894 Jan. 28 ..	60	45	20	21	23	4	28·9	1	2
49	1869 Jan. 29–30 ..	60	44	19	17	21	27	28·4	6	7
50	1874 Dec. 4 ..	60	44	20	19	26	9	29·3	23	8

TABLE 64.—NUMBER OF GALES IN EACH YEAR, 1868–1917.

	Average Duration (hours).	Total Number.	Local Minimum Barometric Pressure in inches.					Maximum Velocity in miles per hour.				Number of Gales included in Table 63.
			28·0 to 28·5	28·5 to 29·0	29·0 to 29·5	29·5 to 30·0	30·0 to 30·5	40 to 44	45 to 49	50 to 54	More than 54	
1868	15	29	3	5	13	7	1	10	13	5	1	9
69	11	20	2	3	9	6	–	13	5	2	–	5
70	10	8	–	5	2	1	–	6	2	–	–	–
71	15	8	–	3	3	2	–	5	1	2	–	3
72	12	6	1	4	1	–	–	1	1	3	1	4
73	11	12	–	3	8	1	–	8	2	2	–	2
74	12	14	1	4	5	3	1	8	1	3	2	6
75	15	6	–	–	5	1	–	4	1	1	–	1
76	21	4	–	4	–	–	–	3	1	–	–	–
77	8	9	–	2	7	–	–	7	1	1	–	2
78	15	4	–	3	1	–	–	2	1	1	–	–
79	10	7	–	2	4	1	–	6	–	–	1	1
80	14	9	–	4	5	–	–	7	1	1	–	1
81	14	5	1	1	2	1	–	1	2	1	1	1
82	11	6	–	1	3	2	–	2	2	1	1	2
83	7	6	1	2	2	–	1	3	2	1	–	1
84	12	10	2	5	1	2	–	6	3	1	–	–
85	10	4	–	2	2	–	–	3	1	–	–	1
86	8	2	–	2	–	–	–	–	2	–	–	1
87	5	5	1	1	1	1	1	5	–	–	–	–
88	7	3	–	1	1	1	–	2	–	1	–	1
89	16	1	–	1	–	–	–	1	–	–	–	–
90	18	6	–	2	2	2	–	3	1	2	–	1
91	9	5	1	–	1	3	–	3	2	–	–	–
92	8	1	–	–	–	1	–	1	–	–	–	–
93	11	4	1	1	1	1	–	2	2	–	–	–
94	9	10	2	4	4	–	–	5	2	2	1	3
95	13	4	1	2	1	–	–	2	1	1	–	1
96	9	4	–	2	1	1	–	3	1	–	–	–
97	10	3	1	1	1	–	–	3	–	–	–	–
98	19	5	–	–	5	–	–	2	3	–	–	–
1899	10	2	–	1	–	1	–	2	–	–	–	–
1900	12	3	1	–	2	–	–	1	1	–	1	1
01	15	2	–	1	1	–	–	2	–	–	–	–
02	8	5	–	1	1	2	1	4	1	–	–	–
03	8	6	–	2	4	–	–	6	–	–	–	–
04	15	2	–	1	1	–	–	–	1	1	–	1
05	—	–	–	–	–	–	–	–	–	–	–	–
06	10	1	–	–	1	–	–	1	–	–	–	–
07	8	4	–	1	3	–	–	3	1	–	–	–
08	15	1	–	1	–	–	–	1	–	–	–	–
09	5	1	1	–	–	–	–	1	–		–	–
10	—	–	–	–	–	–	–	–	–	–	–	–
11	13	2	1	–	1	–	–	–	1	–	1	1
12	10	4	1	3	–	–	–	1	2	–	1	1
13	4	2	–	1	1	–	–	2	–	–	–	–
14	7	2	–	2	–	–	–	1	1	–	–	–
15	7	1	–	–	1	–	–	1	–	–	–	–
16	5	1	1	–	–	–	–	–	1		–	–
1917	5	1	1	–	–	–	–	–	1	–	–	–
1868–1917 ..	—	260	24	84	107	40	5	153	64	32	11	50
Average Maximum Velocity			48	47	44	43	44					

TABLE 65.—NUMBER OF GALES IN EACH MONTH. TEN-YEAR MEANS.

Mean Velocities.	40–44			45–49			50–54			More than 54.			Totals.			Duration in Hours.		
Period / Month	1868 to 1887	1888 to 1907	1908 to 1917	1868 to 1887	1888 to 1907	1908 to 1917	1868 to 1887	1888 to 1907	1908 to 1917	1868 to 1887	1888 to 1907	1908 to 1917	1868 to 1887	1888 to 1907	1908 to 1917	1868 to 1887	1888 to 1907	1908 to 1917
January	18	11	1	7	4	—	5	2	—	3	—	—	33	17	1	13	10	5
February	19	9	3	10	1	2	2	—	—	—	1	—	31	11	5	13	12	8
March	13	10	—	4	2	1	7	1	—	—	—	—	24	13	1	13	11	6
April	6	1	1	1	1	1	2	—	—	—	—	—	9	2	2	12	7	9
May	2	—	—	3	—	—	—	—	—	—	—	—	5	—	—	10	—	—
June	1	—	—	1	—	—	—	—	—	—	—	—	2	—	—	7	—	—
July	2	—	—	—	—	—	—	—	—	—	—	—	2	—	—	5	—	—
August	2	1	—	1	—	—	1	—	—	—	—	—	4	1	—	6	7	—
September	3	3	—	3	—	—	1	—	—	—	—	—	7	3	—	11	7	—
October	8	—	—	3	3	1	—	—	—	1	—	—	12	3	1	10	11	5
November	8	6	1	5	2	—	3	1	—	2	—	2	18	9	3	12	10	11
December	18	5	1	4	3	1	4	3	—	1	1	—	27	12	2	14	16	11
Year	100	46	7	42	16	6	25	7	—	7	2	2	174	71	15	12	11	9

TABLE 66.—NUMBER OF GALES IN PERIODS OF YEARS AS DEPENDING ON DIRECTION. FIVE-YEAR PERIODS.

Point of Compass.	Five-year Period.										Maximum Velocities.								Total Number.
											1868–1887				1888–1917				
	1868 to 1872	1873 to 1877	1878 to 1882	1883 to 1887	1888 to 1892	1893 to 1897	1898 to 1902	1903 to 1907	1908 to 1912	1913 to 1917	40 to 44	45 to 49	50 to 54	>54	40 to 44	45 to 49	50 to 54	>54	
S.	14	5	6	4	1	—	—	2	—	1	15	5	7	2	3	1	—	—	33
SSW.	9	11	7	4	3	1	1	1	—	—	18	8	3	2	3	2	1	—	37
SW.	9	8	5	7	4	12	2	2	2	—	15	8	4	2	15	3	2	2	51
WSW.	19	3	6	4	5	7	8	4	5	3	17	11	3	1	15	13	2	2	64
W.	6	9	4	4	2	—	6	3	—	2	13	4	6	—	10	2	1	—	36
WNW.	4	3	2	3	1	2	—	1	1	1	9	1	2	—	5	—	1	—	18
NW.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
NNW.	2	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	2
N.	1	—	—	—	—	1	—	—	—	—	—	1	—	—	—	1	—	—	2
NNE.	1	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
NE.	2	3	—	—	—	—	—	—	—	—	4	1	—	—	—	—	—	—	5
ENE.	1	1	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
E.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
ESE.	1	1	—	1	—	—	—	—	—	—	2	1	—	—	—	—	—	—	3
SE.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SSE.	2	—	1	—	—	2	—	—	—	—	3	—	—	—	2	—	—	—	5
Totals	71	45	31	27	16	25	17	13	8	7	100	42	25	7	53	22	7	4	260

TABLE 67.—NORMAL NUMBER OF GALES IN EACH MONTH AS DEPENDING ON DIRECTION. (1) 1868–1887. (2) 1888–1917.

Point of Compass.	Jan.		Feb.		Mar.		Apr.		May.		June.		July.		Aug.		Sept.		Oct.		Nov.		Dec.	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
S. .. 16 and 17	10	–	7	2	1	1	1	–	–	–	–	–	–	–	–	–	1	–	–	1	4	–	5	–
SSW... 18 ,, 19	7	2	3	2	2	–	2	–	1	–	–	–	–	–	–	–	2	–	4	–	3	1	7	1
SW. .. 20 ,, 21	8	5	2	2	6	4	1	–	–	–	–	–	–	–	–	–	2	2	2	–	4	6	4	3
WSW. 22 ,, 23	3	6	10	6	2	5	2	3	2	–	1	–	2	–	3	1	–	1	3	2	2	1	2	7
W. .. 24 ,, 25	4	3	1	1	6	3	2	1	1	–	–	–	–	–	1	–	1	–	1	1	4	2	2	2
WNW. 26 ,, 27	1	1	3	3	5	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	1	2	1
NW. .. 28 ,, 29	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
NNW. 30 ,, 31	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
N. .. 0 ,, 1	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–
NNE... 2 ,, 3	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–
NE. .. 4 ,, 5	–	–	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–	3	–
ENE... 6 ,, 7	–	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–	1	–	–	–	–	–	–	–
E. .. 8 ,, 9	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ESE... 10 ,, 11	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–	–	–
SE. .. 13 ,, 13	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SSE... 14 ,, 15	–	1	2	–	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	–
Totals	33	18	31	16	24	14	9	4	5	–	2	–	2	–	4	1	7	3	12	4	18	12	27	14

TABLE 68.—VEERING OF GALES.

Number of Gales showing Undernoted Changes of Direction.

Point of Compass at beginning of Gale.	Difference of Points of Compass at end and beginning.				
	−4−3−2	−1 0+1	+2+3+4	+5+6+7	+8 and more.
16 and 17 ..	—	12	18	18	5
18 ,, 19 ..	—	6	17	15	2
20 ,, 21 ..	1	11	22	9	1
22 ,, 23 ..	3	31	22	5	—
24 ,, 25 ..	6	10	6	1	—
26 ,, 27 ..	1	3	—	—	—
28 ,, 29 ..	—	—	—	—	—
30 ,, 31 ..	—	2	—	—	—
0 ,, 1 ..	—	3	—	—	—
2 ,, 3 ..	—	1	—	—	—
4 ,, 5 ..	1	2	—	—	—
6 ,, 7 ..	—	3	—	—	1
8 ,, 9 ..	1	—	—	—	—
10 ,, 11 ..	—	1	1	1	—
12 ,, 13 ..	—	1	—	2	—
14 ,, 15 ..	—	1	7	4	3

TABLE 69.—NUMBER OF GALES WHICH HAD THE UNDERNOTED DIRECTIONS, (1) AT BEGINNING; (2) WHEN GALE AT MAXIMUM; (3) AT END OF GALE.

Point of Compass.	1	2	3
16 and 17 ..	53	33	18
18 ,, 19 ..	40	37	20
20 ,, 21 ..	44	51	41
22 ,, 23 ..	61	64	67
24 ,, 25 ..	23	36	60
26 ,, 27 ..	4	18	30
28 ,, 29 ..	—	—	8
30 ,, 31 ..	2	2	1
0 ,, 1 ..	3	2	4
2 ,, 3 ..	1	2	3
4 ,, 5 ..	3	5	3
6 ,, 7 ..	4	2	2
8 ,, 9 ..	1	—	—
10 ,, 11 ..	3	3	1
12 ,, 13 ..	3	—	2
14 ,, 15 ..	15	5	—
	260	260	260

TABLE 70.—NUMBER OF GALES DURING WHICH GUSTS EXERTED THE UNDERNOTED PRESSURES IN POUNDS PER SQUARE FOOT.

Pressures, corrected, in lbs. per square foot. / Period.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	More than 30.	Highest Record.	
							Pressure.	Date.
1868 to 1870	1	14	25	14	1	1	31	1868, Apr. 29.
1871 to 1873	2	8	3	5	2	2	35	1872, Feb. 1.
1873·9 to 1876	—	—	—	—	—	—	—	—
1877 to 1879	—	6	4	6	2	1	41	1879, Dec. 28.
1880 to 1887·9	—	12	12	8	9	—	29	1882, Jan. 6.
1868 to 1887·9	3	40	44	33	14	4	41	1879, Dec. 28.

Pressures, uncorrected, in lbs. per square foot. / Period.	5 to 9.	10 to 14.	15 to 19.	20 to 24.	25 to 29.	More than 30.	Highest Record.	
							Pressure.	Date.
1887·9 to 1892	—	4	9	4	1	—	26	1888, Nov. 16.
1893 to 1897	—	7	10	4	1	1	31	1894, Feb. 11.
1898 to 1902	1	3	9	2	1	1	31	1900, Dec. 20.
1903 to 1907	—	6	3	1	1	1	33	1907, Jan. 28.
1908 to 1912	—	—	—	4	1	3	44	1911, Nov. 5.
1913 to 1917	—	—	5	—	2	—	29	1917, Oct. 25.
1887·9 to 1917	1	20	36	15	7	6	44	1911, Nov. 5.

TABLE 71.—SNOWFALLS, 1868–1917. NUMBER OF PERIODS (MONTHS OR YEARS) IN 50 YEARS IN WHICH SNOW FELL DURING THE UNDERNOTED NUMBER OF DAYS.

Number of days.	Jan.	Feb.	Mar.	Apr.	May.	Sept.	Oct.	Nov.	Dec.	Number of days.	Year.
0	12	12	9	36	49	49	46	24	7	0 to 4	8
1 or 2	15	17	19	12	1	1	3	22	20	5 to 9	9
3 or 4	11	12	10	1	—	—	1	4	11	10 to 14	15
5 or 6	6	5	9	—	—	—	—	—	9	15 to 19	11
7 or 8	2	3	1	—	—	—	—	—	3	20 to 24	5
9	3	1	2	—	—	—	—	—	—	25 to 29	1
11	—	—	—	1	—	—	—	—	—	41	1
12	1	—	—	—	—	—	—	—	—	—	—
Total	50	50	50	50	50	50	50	50	50	—	50
Average number of days with snowfalls	2·9	2·6	2·7	0·7	—	—	0·1	0·9	2·8	—	13

TABLE 72.—MEAN AND MAXIMUM AND MINIMUM NUMBERS OF DAYS PER YEAR WITH SNOWFALLS.

—	Mean.	Maximum.	Minimum.	—	Mean.	Maximum.	Minimum
1868–1872	7·2	14	2	1893–1897	14·6	19	8
1873–1877	6·8	13	3	1898–1902	14·6	19	12
1878–1882	8·8	16	4	1903–1907	15·8	22	10
1883–1887	10·0	24	1	1908–1912	9·4	17	1
1888–1892	17·2	22	11	1913–1917	23·4	41	12

TABLE 73.—NUMBER OF PERIODS (MONTHS OR YEARS) IN 26 YEARS IN WHICH SNOW LAY ON THE GROUND DURING THE UNDERNOTED NUMBER OF DAYS, 1892–1918.

Number of days.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	Number of days.	Year.
0	24	21	10	9	9	13	24	0 to 3	5
1 or 2	2	4	6	4	9	7	2	4 to 7	6
3 or 4	—	—	4	4	3	2	—	8 to 11	4
5 or 6	—	—	2	1	2	4	—	12 to 15	4
7 or 8	—	1	2	3	2	—	—	16 to 19	2
9 or 10	—	—	2	2	—	—	—	20 to 23	2
11 or 12	—	—	—	2	—	—	—	24 to 27	2
13 or 14	—	—	—	—	1	—	—	28 to 31	—
15 or 16	—	—	—	1	—	—	—	33	1
Total	26	26	26	26	26	26	26		26
Average number of days	0·1	0·6	2·6	4·0	2·5	1·5	0·1	—	11

TABLE 74.—MEAN NUMBER, AND MAXIMUM AND MINIMUM NUMBERS OF DAYS PER YEAR WITH SNOW ON GROUND.

—	Average.	Maximum.	Minimum.
1892·5–1897·5 ..	15·0	24	6
1897·5–1902·5 ..	9·2	21	0
1902·5–1907·5 ..	11·4	33	3
1907·5–1912·5 ..	7·8	19	0
1912·5–1917·5 ..	13·0	21	5

TABLE 75A.—VARIATIONS IN THE COURSE OF YEARS OF TEMPERATURE AND PRESSURE.

Departures from Means, 1868–1907.

Years.	Mean Temperature.	Maximum Temperature.	Minimum Temperature.	Atmospheric Pressure.
Unit	0°·1	0°·1	0°·1	0·001 inch
1844–48	− 5	—	—	−15
1845–49	− 4	+ 6	−15	−15
1846–50	− 3	+ 7	−10	− 8
1847–51	− 7	+ 5	−14	+10
1848–52	− 6	+ 9	−14	0
1849–53	− 6	+ 8	−14	+11
1850–54	− 4	+14	−13	+14
1851–55	− 9	+12	−18	+23
1852–56	−10	+11	−17	+18
1853–57	− 7	+12	−11	+33
	No records	1858, 1859,	1860.	
1861–65	− 5	+ 9	− 6	−43
1862–66	− 5	+ 7	− 8	−56
1863–67	− 4	+ 7	−10	−35
1864–68	− 2	+10	− 9	−23
1865–69	+ 1	+10	− 6	−17
1866–70	0	+ 7	− 6	− 3
1867–71	0	+ 5	− 4	+19
1868–1907	46·8	52·3	41·6	29·664

TABLE 75B.—SECULAR VARIATION OF METEOROLOGICAL ELEMENTS.

	Temperature					Yearly Rainfall.	Days with Rain per Year.	Days with Rain exceeding 0·5 inch.	Humidity.	Water Vapour Pressure.	Atmospheric Pressure.	Velocity of Wind.	Yearly Sunshine.	Days with Sunshine per Year.
	in Air.			Radiation.										
	Mean.	Maximum.	Minimum.	Maximum.	Minimum.									
Unit.	0°·1	0°·1	0°·1	1°	0°·1	0·1 in.			0·001 of saturation.	0·001 inch.	0·001 inch.	0·1 mile Miles per hour	Hour.	
1868–72 ..	+ 2	+ 4	− 1	− 1	+ 4	(+64)*	+ 9	+ 5	− 3	+ 1	−21	+15	—	—
1869–73 ..	− 1	+ 1	− 2	− 2	+ 1	(+57)	+ 7	+ 6	− 1	− 1	−18	+12	—	—
1871–75 ..	+ 1	0	+ 1	− 7	− 4	(+56)	+ 7	+ 6	+ 1	+ 1	−24	+12	—	—
1873–77 ..	− 1	− 2	− 1	− 7	−14	+47	+19	+ 3	− 2	− 1	−26	+15	—	—
1875–79 ..	− 5	− 5	− 4	− 3	−14	+24	+13	+ 3	− 1	− 5	−22	+ 7	—	—
1877–81 ..	− 8	− 7	− 9	+ 4	−12	0	+16	+ 1	+ 3	− 7	−14	+ 4	—	—
1879–83 ..	− 7	− 6	− 8	+ 5	− 9	+ 4	+17	0	+ 6	− 5	− 2	+ 2	—	—
1881–85 ..	− 4	− 3	− 4	+ 4	− 5	+10	+27	− 1	+10	0	−12	+ 3	+10	+ 5
1883–87 ..	− 5	− 5	− 6	+ 2	− 6	−21	+ 6	− 4	+ 5	− 3	+ 9	− 1	− 2	+ 4
1885–89 ..	− 7	− 8	− 6	+ 1	− 7	−64	−13	− 7	+ 7	− 5	+21	− 4	+ 2	− 2
1887–91 ..	− 3	− 4	− 1	+ 2	− 5	−36	−17	− 5	+ 6	− 1	+31	− 4	−14	− 3
1889–93 ..	0	0	+ 1	+ 2	− 5	−21	−13	− 3	+ 1	0	+13	− 3	+41	+ 7
1891–95 ..	− 3	+ 1	− 4	+ 2	− 9	− 9	−17	− 1	− 4	− 4	+ 3	− 3	+72	+10
1893–97 ..	+ 3	+ 6	+ 1	+ 3	− 4	− 5	−19	− 1	− 1	+ 2	+20	− 3	+57	+ 8
1895–99 ..	+ 4	+ 5	+ 4	+ 2	− 1	+ 3	−12	+ 1	− 1	+ 4	+23	− 3	+ 4	0
1897–01 ..	+ 6	+ 6	+ 6	+ 1	+ 4	+25	− 6	+ 2	− 2	+ 5	+ 9	− 3	+ 7	− 1
1899–03 ..	+ 1	0	+ 2	0	+ 1	+36	0	+ 3	− 4	0	+ 3	− 5	−35	−10
1901–05 ..	+ 1	− 2	+ 3	0	+ 2	−15	− 6	− 1	− 8	− 1	+11	− 3	+11	− 4
1903–07 ..	+ 1	− 2	+ 5	0	+ 3	+26	+ 3	+ 2	− 2	+ 1	0	− 2	+ 1	0
1905–09 ..	+ 2	0	+ 5	0	+ 5	+ 2	− 5	+ 2	− 6	+ 1	+17	− 6	+ 6	+ 3
1907–11 ..	+ 3	+ 1	+ 5	− 1	+11	+12	−10	+ 3	− 3	+ 2	+ 1	− 7	−16	+ 4
1909–13 ..	+ 5	+ 4	+ 7	− 2	+17	+ 6	−14	0	+ 1	+ 5	−25	− 8	−71	+ 1
1911–15 ..	+ 8	+ 8	+10	− 2	+17	−18	− 9	− 3	+10	+11	−28	− 9	−49	− 2
1913–17 ..	+ 4	+ 4	+ 8	− 2	+12	−10	0	− 3	+13	+ 9	−36	−10	−33	− 4
1915–19 ..	− 2	− 3	+ 1	− 2	+ 1	− 7	+ 4	− 2	+ 9	+ 2	−21	−12	+66	− 1
1916–20 ..	0	− 2	+ 5	− 2	+ 5	+20	+12	− 2	+12	+ 5	−16	− 9	+21	− 4
1868–1912	46·9	52·4	41·7	—	—	—	—	—	80·5	0·259	29·663	—	—	—
1874–1917	—	—	—	—	—	37·5	—	—	—	—	—	—	—	—
1868–1917	—	—	—	82·9	36·0	—	212	17·6	—	—	—	11·4	—	—
1881–1920	—	—	—	—	—	—	—	—	—	—	—	—	1100	259

* The bracketed figures include the rainfalls in the years 1868–1873, which were registered by another rain-gauge.

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